United States Department of The Interior
Office of Surface Mining Reclamation and Enforcement


Trapper Mine


Trapper Mine Reclamation


Columbian Sharp Tailed Grouse

Environmental Assessment
Trapper Mine
Moffat County, Colorado

Federal Coal Leases C-07519 and C-079641
Mining Plan Modification
April 2016

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Acronyms and Abbreviations

2009 Approval	Mining Plan Approval Document Signed by the Assistant Secretary for Land and Minerals Management for the Trapper Mine in 2009
°F	degrees Fahrenheit
μg/g	microgram per gram
μg/L	microgram per liter
$\mu g/m^2$	microgram per square meter
$\mu g/m^3$	microgram per cubic meter
AADT	Annual Average Daily Traffic
AAI	Agapito Associates, Inc.
ACHP	Advisory Council on Historic Preservation
AMPD	Air Markets Program Data
amsl	above mean sea level
ANFO	ammonium nitrate and fuel oil
AP-42	Compilation of Air Pollutant Emission Factors
APCD	Air Pollution Control Division
APE	area of potential effect
APEN	Air Pollutant Emission Notice
AQCR	Air Quality Control Regions
ASLM	Assistant Secretary for Land and Minerals Management
AVF	alluvial valley floor
BA	Biological Assessment
BART	Best Available Retrofit Technology
BGEPA	Bald and Golden Eagle Protection Act
BLM	Bureau of Land Management (U.S.)
BMP	Best Management Practice
BO	Biological Opinion
CAA	Clean Air Act of 1970
CARMMS	Colorado Air Resource Management Modeling Study
CCR	Coal Combustion Residual
CDOT	Colorado Department of Transportation
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
CFR	Code of Federal Regulations
cfs	cubic feet per second
CH_4	methane
CHIA	Cumulative Hydrologic Impact Assessment
CIAA	cumulative impact analysis area
cm	centimeter

CNHP	Colorado Natural Heritage Program
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
COGCC	Colorado Oil and Gas Conservation Commission
CPW	Colorado Parks and Wildlife
CR	County Road
Craig Station	Craig Generating Station
CRS	Colorado Revised Statutes
CSCMRA	Colorado Surface Coal Mining Reclamation Act of 1979
CSLB	Colorado State Land Board
CWA	Clean Water Act
DAU	Data Analysis Unit
dB	decibel
dB(A)	decibel on an A-weighted scale
District Court	U.S. District Court in the State of Colorado
DNR	Department of Natural Resources (Colorado)
DOI	Department of the Interior (U.S.)
DOLA	Department of Local Affairs (Colorado)
dv	deciview
EA	Environmental Assessment
EDCC	Economic Development Council of Colorado
EGU	electric generating unit
EIS	Environmental Impact Statement
EO	Executive Order
EP	Extraction Procedure
ESA	Endangered Species Act of 1973
FCLAA	Federal Coal Leasing Amendments Act of 1976
FCPP	Four Corners Power Plant
Fe	Iron
FLPMA	Federal Land Policy and Management Act of 1976
FMU	Fish Management Unit
FR	Federal Register
GHG	greenhouse gas
GMU	Game Management Unit
gpm	gallons per minute
GWP	global warming potential
H:V	Horizontal to Vertical
HAP	hazardous air pollutant
Hayden Station	Hayden Generating Station
HCFC	hydrochloroflourocarbons
HFC	hydrofluorocarbons
Hg_{2+}	oxidized mercury
IF	Isolated Find

IME	IME Consulting
km	kilometer
kV	kilovolt
lb/GWh	pounds of pollutant per gigawatt – electric output
lb/yr	pounds per year
LSFO	Little Snake Field Office (BLM)
MATS	Mercury and Air Toxics Standards
MBTA	Migratory Bird Treaty Act
MDN	Mercury Deposition Network
MFP	Management Framework Plan
mg/L	milligrams per liter
MLA	Mineral Leasing Act of 1920
MLRA	Major Land Resource Area
MMBtu	Million British thermal unit
MMPA	Mining and Minerals Policy Act of 1970
MMT	million metric tons
MPDD	Mining Plan Decision Document
MT	metric tons
mtpy	million tons per year
MW	megawatt
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act of 1969
NHPA	National Historic Preservation Act
NMEP	Navajo Mine Energy Project
NO_2	nitrogen dioxide
NO_X	nitrogen oxide
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NSPS	New Source Performance Standards
O_3	ozone
OSMRE	Office of Surface Mining Reclamation and Enforcement
P.M.	Prime Meridian
PAP	Permit Application Package
PFC	perfluorocarbons
PFYC	Potential Fossil Yield Classification
PM_{10}	particulate matter 10 microns or less in diameter
$PM_{2.5}$	particulate matter 2.5 microns or less in diameter
ppb	parts per billion
ppm	parts per million
PPV	peak particle velocity
PR	Permit Revision
PSD	Prevention of Significant Deterioration
R	Range

R2P2	Resource Recovery and Protection Plan
RCRA	Resource Conservation and Recovery Act
RIPRAP	Recovery Implementation Program Recovery Action Plan
RMP	Resource Management Plan
RN	Permit Renewal
ROD	Record of Decision
SCC	social cost of carbon
SCR	Selective Catalytic Reduction
SF_6	sulfur hexafluoride
SH	State Highway
SHPO	State Historic Preservation Office(r)
SIP	State Implementation Plan
SMCRA	Surface Mining Control and Reclamation Act of 1977
SNCR	Selective Non-Catalytic Reduction
SO_2	sulfur dioxide
SO_4	sulfate
SPCC Plan	Spill Prevention, Control, and Countermeasure Plan
T	Township
TDS	total dissolved solids
TMI	Trapper Mining Inc.
tpy	tons per year
TRI	Toxic Release Inventory
TSS	total suspended sediment
USACE	U.S. Army Corps of Engineers
U.S.	United States
USC	United States Code
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VER	Valid Existing Rights
VOC	volatile organic compound
VRI	Visual Resource Inventory
VRM	Visual Resource Management
WOTUS	Waters of the U.S.
TRI	Toxic Release Inventory

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1.0 Purpose and Need[1]

1.1 Introduction

The Trapper Mine Federal Coal Leases, C-07519 and C-079641 Mining Plan Modification, Environmental Assessment (EA) has been prepared by the Office of Surface Mining Reclamation and Enforcement (OSMRE), Western Region, with assistance from cooperating agencies including: the Bureau of Land Management (BLM), Little Snake Field Office (LSFO); the State of Colorado, Department of Natural Resources (DNR) (including the Executive Director's Office, Colorado Division of Reclamation, Mining and Safety [CDRMS], Colorado State Land Board [CSLB], and Colorado Parks and Wildlife [CPW]); Colorado Department of Public Health and Environment (CDPHE), Air Pollution Control Division (APCD); Moffat County Commissioners; and Rio Blanco County Natural Resources Department.

The EA describes the environmental impacts that are anticipated to result from the current and future mining operations at the Trapper Mine from July 1, 2015, through the life of the mine within the portions of Federal Coal Leases C-07519 and C-079641 that lie within the approved Surface Mining Control and Reclamation Act of 1977 (SMCRA) permit area (the Project) (**Figure 1-1**).

The EA review has been conducted in accordance with the National Environmental Policy Act of 1969 (NEPA) and the Council on Environmental Quality (CEQ) regulations for implementing NEPA (40 Code of Federal Regulations [CFR] 1500-1508); the Department of the Interior's (DOI's) regulations for implementation of NEPA (43 CFR Part 46); the DOI's Departmental Manual Part 516; and OSMRE's Directive REG-1, Handbook on Procedures for Implementing the National Environmental Policy Act of 1969 (OSMRE 1989). Information gathered from federal, state, and local agencies, Trapper Mining Inc. (TMI), and publicly available literature, as well as in-house OSMRE sources, such as the Trapper Mine Permit Application Package (PAP), were used in the preparation of this EA.

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

1.2 Background

1.2.1 Site History

The Trapper Mine is located approximately six miles (9.7 kilometers [km]) south of the City of Craig in Moffat County, Colorado, east of Colorado State Highway (SH) 13 (**Figure 1-1**).

Utah International, Inc., a subsidiary of General Electric Company, began coal exploration in the Trapper Mine area in 1954. Once coal reserves were identified, Utah International, Inc. signed coal delivery contracts with four utility companies that owned the Craig Generating Station (Craig Station). At that time, Craig Station was owned by Colorado-Ute Electric Association, Inc., Salt River Project Agricultural Improvement and Power District, Tri-State Generation and Transmission Association, Inc., and Platte River Power Authority. Craig Station is a coal-powered, electricity generating facility capable of

[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.

producing up to 1,264 megawatts (MW) of electricity. Construction began on the mine facilities in 1975. Mining operations began in 1977, with the first coal delivery occurring in 1978.

In 1982, Utah International, Inc. formed a Colorado Corporation, called Trapper Mining Inc., to consolidate and hold the properties and rights to the Trapper Mine. In 1983, the four electric utility companies, mentioned above, purchased TMI from Utah International, Inc. In 1990, Colorado-Ute Electric Association, Inc. filed for bankruptcy, and, when the reorganization plan was finalized in 1992, Colorado-Ute Electric Association, Inc.'s interest in TMI was transferred to Tri-State Generation and Transmission Association, Inc. and PacifiCorp.

Following the transfer of interests in TMI, the new owners formed a cooperative and incorporated the company as a Delaware Corporation on December 29, 1997. TMI is jointly owned by the cooperative members who include Salt River Project Agricultural Improvement and Power District, Platte River Power Authority, Tri-State Generation and Transmission Association, Inc., and PacifiCorp.

TMI and its predecessors obtained rights to five tracts of federal coal from 1958 to 1980. Two of these tracts are covered by this EA. Federal Coal Lease C-07519 was issued by the BLM in June of 1958, and Federal Coal Lease C-079641 was issued by the BLM in October of 1962. Both leases were originally issued to General Electric Holdings, Inc. and subsequently assigned to TMI in 1990.

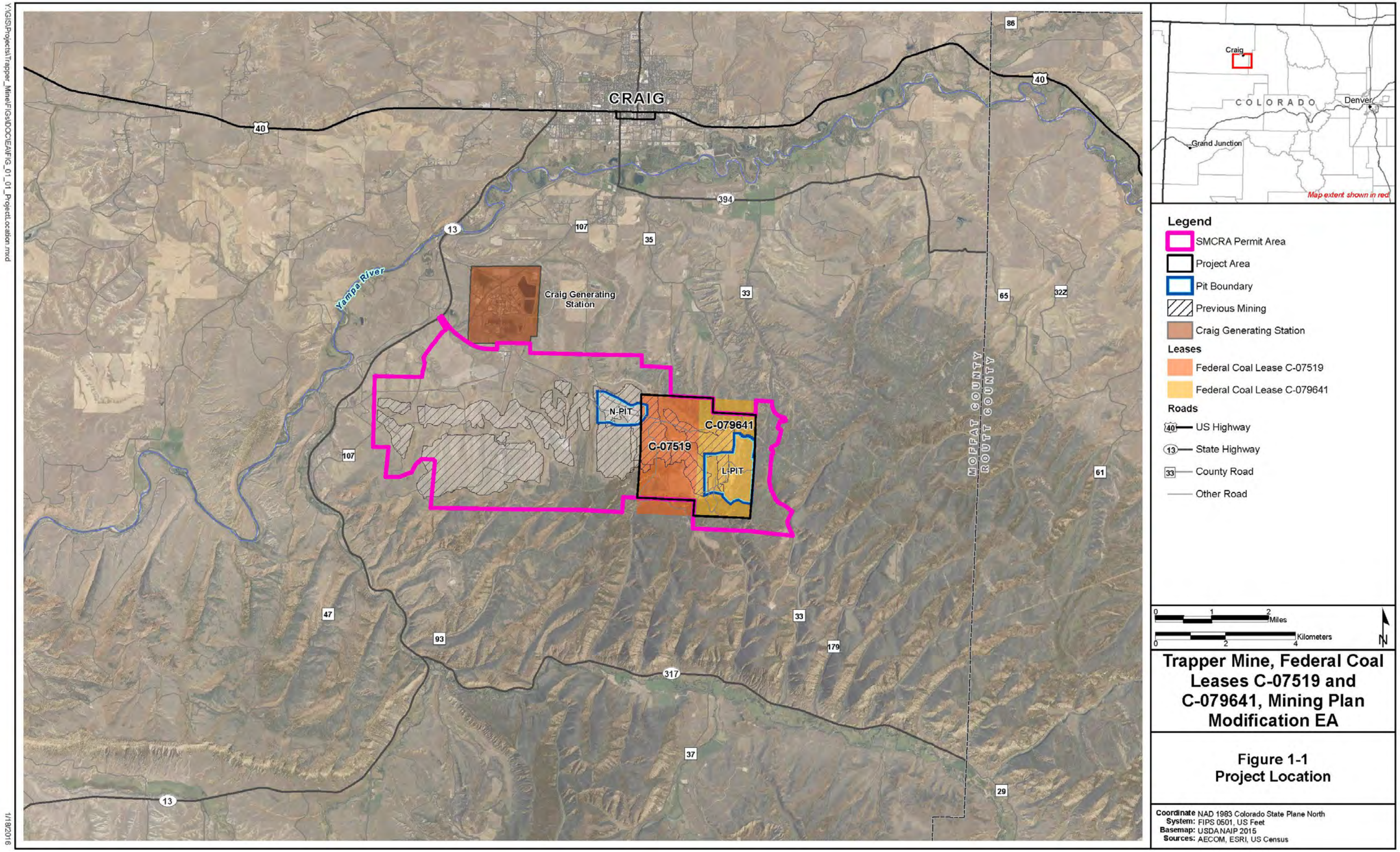
In 1979, BLM completed the Final EIS for the Federal Coal Management Program and the Secretary of the Interior adopted this program for the management of coal resources on federal lands. The potential environmental impacts of leasing federal coal resources in Colorado and Wyoming were analyzed in the Final Green River - Hams Fork Regional Coal EIS (BLM 1980). The federal coal leases covered by this EA were issued prior to adoption of this program. As part of lease readjustments, Federal Coal leases C-07519 and C-079641 were subsequently evaluated through NEPA. A NEPA evaluation was released for readjustment of C-07519 on February 12, 1979, and for readjustment of C-079641 on September 28, 1982 (BLM 1979 and BLM 1982, respectively).

The Trapper Mine produces approximately 2.3 million tons per year (mtpy) and can produce a maximum of 2.6 mtpy based on permit limitations currently in place by the Clean Air Act of 1970 (CAA) permit issued by the CDPHE APCD. The Trapper Mine produces coal from the L Pit located on Federal Coal Lease C-079641. Future mining also is proposed in the N Pit, which is located partially within Federal Coal Lease C-07519. Coal is mined using dragline, truck and shovel, and highwall mining methods. Mining operations are described in detail in Chapter 2.0. The coal is transported by haul truck to the Craig Station located to the north of the mine. TMI currently has no provisions to transport coal to other locations.

TMI operates the Trapper Mine under SMCRA Permit Number C-1981-010 issued by CDRMS in accordance with the approved Colorado State Coal Regulatory Program (30 CFR Part 906). Although SMCRA permits are issued based on the life-of-mine plans for the mining operation, under the Colorado Surface Coal Mining Reclamation Act of 1979 (CSCMRA) permits must be renewed every five years (34 33-101 et seq. Colorado Revised Statutes [CRS] 1973 as amended).

1.2.2 Project Background

On May 8, 2015, the United States (U.S.) District Court for the District of Colorado (the District Court) issued an Order related to NEPA compliance regarding the mining plan modification approval document signed by the Assistant Secretary for Land and Minerals Management (ASLM) for the Trapper Mine in 2009 (2009 Approval). The Order in *WildEarth Guardians v. U.S. Office of Surface Mining Reclamation and Enforcement et al.*, 104 F. Supp. 3d 1208 (D Colo. 2015) concluded:



Trapper Mine, Federal Coal Leases C-07519 and C-079641, Mining Plan Modification EA

Figure 1-1
Project Location

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> "[OSMRE] violated NEPA by failing to notify the public of and involve the public in the preparation of the Colowyo and Trapper EAs and by failing to notify the public once the EAs had been completed and the [findings of no significant impacts] had been issued. [OSMRE] also violated NEPA by failing to take a hard look at the direct and indirect effects of the increased mining operations before determining that there would be no significant impact on the environment. The Secretary of the Interior violated NEPA by approving both of these mining plan modifications in spite of these defects."

In order to address the deficiencies identified by the District Court, this EA was completed pursuant to the Joint Proposed Remedy, proposed by OSMRE, TMI and WildEarth Guardians and approved by the District Court on September 14, 2015. As part of the District Court-approved remedy for the Project, OSMRE agreed to conduct a new, prospective NEPA analysis-this EA-that includes public participation components, on or before April 30, 2016. The EA discloses the potential for direct, indirect, and cumulative impacts to the environment from the Project.

As part of the Joint Proposed Remedy, TMI agreed to on-the-ground restrictions for mining activities on Federal Coal Leases C-07519 and C-079641 during the preparation of this EA, including: 1) limiting mining activities to lands permitted by CDRMS as of July 1, 2015; 2) limiting disturbance to lands already classified as disturbed based on the current disturbance limit; and 3) limiting coal removal to areas west of a line designated as the Coal Removal Limit as shown on **Figure 1-2.** Mining up to the Coal Removal Limit allows TMI to mine an additional approximately four million tons after July 1, 2015. The District Court-approved remedy does not affect TMI's mining or reclamation activities on state, county, or private lands or minerals, or other federal coal leases. The Intervenors appealed the District Court Order is on appeal to the U.S. Court of Appeals for the 10th Circuit (Case Nos. 15-1186 and 1236).

1.2.3 Statutory and Regulatory Background

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

- The PAP;
- Information prepared in compliance with NEPA, including this EA;
- Documentation illustrating compliance with the applicable requirements of federal laws, regulations and Executive Orders (EOs) other than NEPA;
- Comments and recommendations or concurrence from 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 Mineral Leasing Act of 1920 (MLA);
- Findings and recommendations of the CDRMS with respect to the mine permit application C-1981-010 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.

In compliance with other federal laws, regulations and EOs, OSMRE also conducts consultation with other agencies before it makes its recommendation to the ASLM. This consultation includes the U.S. Fish and Wildlife Service (USFWS) Section 7 consultation for threatened and endangered species potentially affected by the proposed mining plan under the Endangered Species Act of 1973 (ESA), and the Colorado State Historic Preservation Office (SHPO) under the National Historic Preservation Act of 1966 (NHPA) Section 106 consultation for the affected area.

1.3 Purpose and Need

1.3.1 Purpose

The purpose of this EA is to re-evaluate the environmental effects of coal mining on the portions of Federal Coal Leases C-07519 and C-079641 that lie within the approved SMCRA permit boundary to assist OSMRE in developing a new recommendation for the ASLM to make a new decision on a mining plan modification for the Project.

1.3.2 Need

Coal mining operators must have a mining plan approved by the ASLM to mine federal coal (30 CFR 746.11). Mining of the coal within the two federal coal lease areas is required under the terms and conditions of the Federal Coal Leases C-07519 and C-079641, and under the terms and conditions of the TMI Logical Mining Unit Application and R2P2. TMI has contractual obligations to deliver approximately 2.3 mtpy plus/minus 200,000 tons to the Craig Station through the year 2020.

OSMRE is the agency responsible for making a recommendation to the ASLM regarding a decision on proposed mining plan modifications (30 CFR 746.13). TMI is presently operating under the 2009 Approval that allows it to mine federal coal from Federal Coal Leases C-07519 and C-079641 in accordance with the SMCRA permit issued by CDRMS.

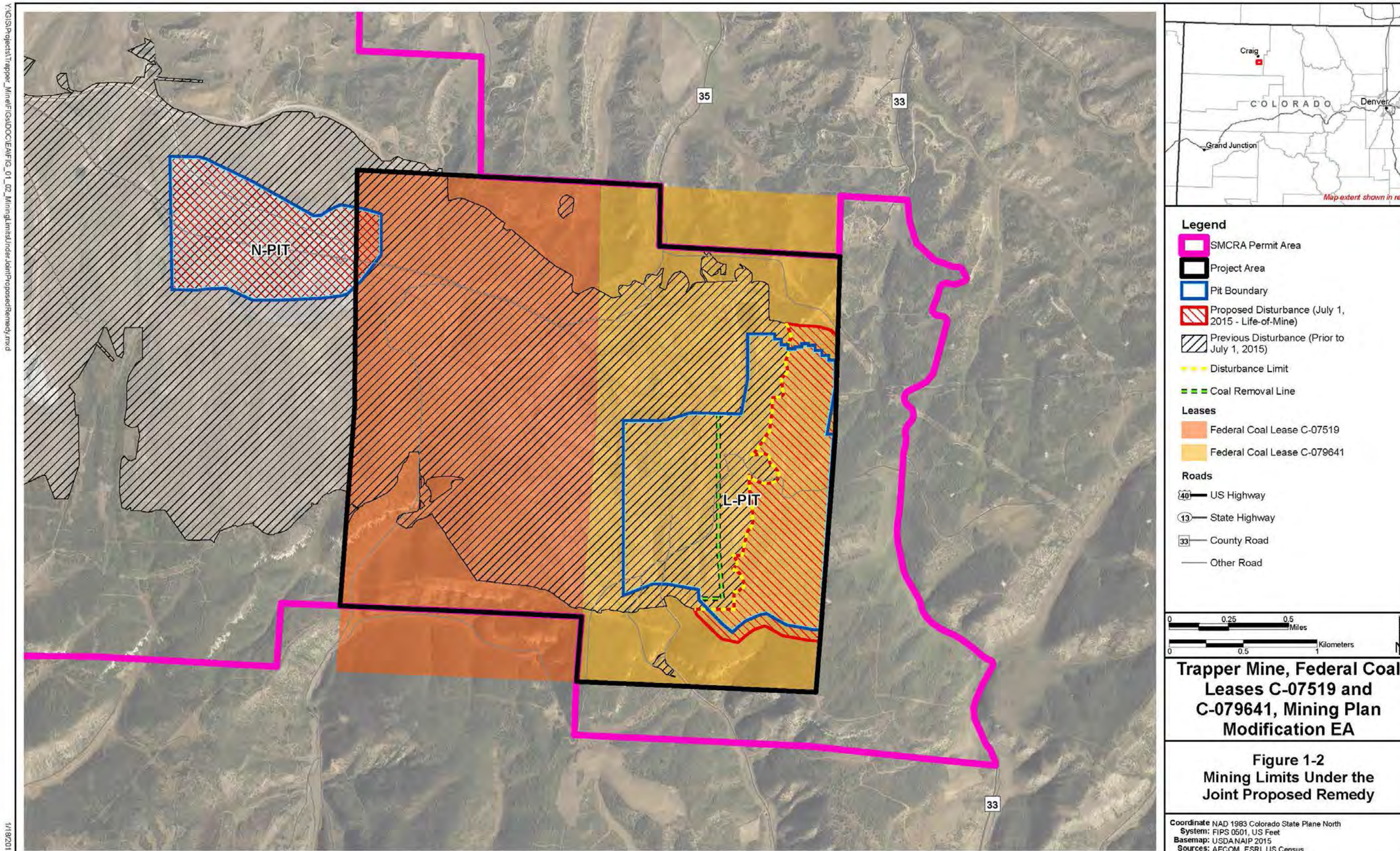
As a result of the District Court's decision in *WildEarth Guardians v. U.S. Office of Surface Mining Reclamation and Enforcement et al.* 104 F. Supp. 3d 1208, (D. Colo. 2015), which determined there were deficiencies in the EA underlying the 2009 Approval, and, pursuant to the District Court-approved remedy, OSMRE has agreed to re-evaluate the environmental impacts of current and future mining activities on these federal leases, beginning July 1, 2015, and continuing through the life of mine within the SMCRA permit boundary.

1.4 Relationship to Statutes, Regulations, and Other Agency Plans

1.4.1 Statutes and Regulations

The following key laws, as amended, relate to the primary authorities, responsibilities, and requirements for developing federal coal resources:

- MLA
- NHPA
- NEPA
- Mining and Minerals Policy Act of 1970 (MMPA)
- CAA
- Clean Water Act of 1972 (CWA)
- ESA
- CSCMRA
- Federal Land Policy and Management Act of 1976 (FLPMA)
- Federal Coal Leasing Amendments Act of 1976 (FCLAA)
- SMCRA



Trapper Mine, Federal Coal Leases C-07519 and C-079641, Mining Plan Modification EA

Figure 1-2
Mining Limits Under the Joint Proposed Remedy

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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 applicable environmental laws to ensure appropriate protection of other resources. BLM then makes the federal coal that is determined suitable for coal development available for leasing. BLM also is responsible for ensuring that the public receives fair market value for the leasing of federal coal. Once a lease is issued, BLM ensures that the maximum economic recovery of coal is achieved during the mining of those federal leases and ensures that waste of federal coal resources is minimized through review and approval of a mine's R2P2 as required under the MLA. BLM implements its responsibilities for leasing and oversight of coal exploration and development under its regulations at Public Lands, Subtitle B, Chapter II, BLM, DOI, Subchapter C – Minerals Management (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 Mineral Resources, Chapter VII – OSMRE, DOI (30 CFR Parts 700-End).

As provided for under SMCRA, OSMRE works with coal producing states and tribes to develop their own regulatory programs to permit coal mining. Once a regulatory program is approved for a state or tribe, OSMRE steps into an oversight role. OSMRE approved the State of Colorado's coal regulatory program on December 15, 1980 (30 CFR 906.10). As a result, CDRMS manages its own program under the CSCMRA (34 33-101 et seq. CRS 1973, as amended). CDRMS has the authority and responsibility to make decisions to approve surface coal mining permits and regulate coal mining in Colorado under Regulations of the Colorado Mined Land Reclamation Board for Coal Mining with oversight from OSMRE. The Cooperative Agreement between OSMRE and CDRMS allows the CDRMS to regulate surface coal mining on federal lands or leases while OSMRE continues to carry out its obligations under the MLA, NEPA and other public laws (30 CFR 906.30) which includes the recommendations related to mining plans and mining plan modifications.

1.4.2 Other Agency Plans

The BLM LSFO in Craig, Colorado, manages approximately 1.3 million surface acres and 1.1 million acres of mineral estate in northwest Colorado, including BLM-managed mineral estate in the Project Area. As required by FLPMA, BLM periodically prepares and revises land use plans to determine those uses that are suitable and compatible on specific portions of public lands, and under what conditions those uses would be authorized to mitigate potential impacts on other resource values and protect human health and safety.

In the late 1950s and early 1960s, when the TMI leases were issued, there were no existing BLM management plans. In the late 1960s and early 1970s, the BLM prepared Management Framework Plans (MFPs) as its land use plans. In 1989 the BLM approved the 1989 Resource Management Plan (RMP) for public lands administered by the BLM LSFO and associated Record of Decision (ROD) (1989 LSFO RMP-ROD) (BLM 1989). In 2011, BLM issued the *Little Snake Record of Decision and Approved Resource Management Plan* (2011 LSFO RMP-ROD) (BLM 2011), which replaced the 1989 LSFO RMP-ROD. In September 2015 the BLM issued the ROD and Northwest Colorado Approved Greater Sage-Grouse Amendment (BLM 2015).

TMI's leases were issued by the BLM prior to the existence of a RMP or MFP and, therefore, were established as valid existing rights (VER) prior to approval of the RMPs/MFPs. As is recognized and stated in the 2011 LSFO RMP-ROD, a valid existing lease conveys certain rights of development to the leaseholder and a stipulation cannot be added after the lease is issued without the consent of both the lessee and lessor. Conditions of Approval and/or Best Management Practices (BMPs) required by the BLM in accordance with the newer RMPs would need to be consistent with the VER granted in existing leases. In this context, BLM made subsequent and periodic decisions regarding readjustment of the lease terms for each lease as required under the MLA and FCLAA. For each readjustment decision, BLM determined whether the lease terms were in conformance with the land use plan in effect at the time. In several cases the BLM, with the concurrence of TMI, added stipulations to the lease adjustments to align the leases with the RMP in place at the time. Further, OSMRE consulted with the BLM LSFO as part of the 2009 Approval process. At that time, in a letter dated July 8, 2009, the BLM LSFO determined and documented that the R2P2, which BLM approved, was in conformance with the MLA; the regulations at 43 CFR 3480; the lease terms and conditions; and maximum economic recovery. In the context of this EA, BLM has again reviewed the Project and determined that it conforms to the MLA, 43 CFR 3480 lease terms and conditions, and, considering VER, conforms with the 2011 LSFO RMP and the 2015 amendments to the RMP.

1.5 Authorizing Actions

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

1.6 Outreach and Issues

Public comments in advance of preparation of this EA were solicited through several methods. OSMRE published legal notices in the *Craig Daily Press* on October 14 and 21, 2015, and the *Rio Blanco Herald Times* on October 22, 2015 (**Appendix A**). The legal notice described the Project in summary form, informed the public that a public outreach meeting for the EA was scheduled for October 29, 2015, at the Moffat County Fairgrounds, Pavilion Building, 640 Victory Way, Craig, Colorado 81625, and informed the public that public comments would be accepted until November 12, 2015. The legal notice was posted at various public locations in Craig and Meeker, Colorado. An outreach letter describing the Project, announcing the public outreach meeting, and soliciting comments was mailed on October 16, 2015, to a total of 15 recipients, including city governments, adjacent landowners, and other interested parties. On October 27, 2015, a total of six letters were sent to American Indian tribes.

OSMRE developed a Project website, which provided additional Project notice, Project information, and comment opportunities: http://www.wrcc.osmre.gov/initiatives/trappermine.shtm. The website was activated on October 16, 2015, and continues to be updated periodically as additional information on the Project becomes available.

The public outreach meeting was held on October 29, 2015, from 4:00 PM until 8:00 PM. Five hundred one individuals signed in at the public meeting, and 195 comment forms were submitted during the meeting. *A total of 4,578 individuals or organizations submitted comments by the end of the comment period.* Ninety-two comments were received after the comment period closed on November 12, 2015. Comments received during and after the comment period were evaluated for relevance in preparing this EA.

Table 1-1 summarizes the comment topics by resource category.

Table 1-1 Public Outreach Comments Categorized by *Key* Resource Category

Comment Category	Number of Comments	% of Total Comments
Air Quality/Climate Change	*4,263*	*91.3*
Community Works	*74*	*1.6*
Environmental Stewardship	*53*	*1.1*
General Support without specific topic	*26*	*0.5*
Mineral Resources	*22*	*0.5*
Socioeconomic	*232*	*5.0*
Total	***4,670***	***100***

The majority of the comments received during the public outreach period were provided as a combined form letter prepared by WildEarth Guardians regarding the Trapper Mine, Spring Creek Mine, and Skyline Mine from the Wild Earth Guardians website. The Spring Creek Mine is located in Montana and operated by Cloud Peak Energy, while the Skyline Mine is located in Utah and operated by Bowie Resource Partners, LLC. These mines have no affiliation with TMI or the Trapper Mine. *The WildEarth Guardians form letter was signed by 4,167 individuals before the public comment period ended and another 91 individuals after the comment period ended, comprising approximately 91 percent of the total comments.* The primary focus of the WildEarth Guardians form letter concerned air quality and climate change impacts associated with burning coal to create energy. The form letter also mentioned the potential for impacts to wildlife and water from mining activities but did not provide any details on these impacts. *Of the remaining 412 comments,* one of which was received after the public comment period ended, five expressed concern for air quality and climate. The environmental concerns related to air quality and climate discussed alternative, clean energy sources in place of coal combustion. In addition, it was asserted that the Craig Station can be supplied with coal by other mines in the area. Concern also was expressed for overseas exportation of coal.

Four hundred and seven were individual comments made in support of Trapper Mine focusing mainly on the economic ramifications of discontinuing the mining operations within the Project Area *but also discussing community works, environmental stewardship, and mineral resources*. Job and tax revenue loss were the largest concerns. Most individual commenters praised TMI for its involvement in the local community and its exemplary reclamation efforts in most individual comments. Many commenters in support focused on the awards TMI has received including the Gold Level Good Neighbor award given in 2004 and the Bronze Award in 2002 by OSMRE for having one of the top three mining reclamation practices. Socioeconomic impacts were discussed in nearly every comment of support for TMI. Individuals who work directly for TMI and businesses in the area that rely on mining to sustain their enterprises expressed concerns for their jobs and family welfare. Other socioeconomic comments outlined that TMI is a major contributor to Moffatt County tax revenue as the fourth largest tax payer. Many comments also incorporated the role TMI plays in community involvement. TMI employees donate time to charitable organizations. TMI donates time, equipment, and materials to provide Craig and the surrounding community with parks, golf courses, and fitness facilities. *Mineral resource comments were the smallest group and addressed coal quality and proximity to the Craig Station.* Mineral resource comments consisted of observations of the proximity of Trapper Mine to the Craig Station, the high quality of the coal mined at the Trapper Mine, and the high percent used directly at the Craig Station. Additional comments were submitted supporting TMI without specific focus on any one subject.

One commenter provided a range of alternatives that they would like to see evaluated in the EA.

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

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2.0 Proposed Action and Alternatives[1]

This chapter provides background information on TMI's existing operations at the Trapper Mine, and describes Alternative A - the Proposed Action Alternative, Alternative B - disapproval of continued mining within the Project Area, and Alternative C - the No Action Alternative. Alternatives that were considered, but eliminated from detailed analysis also are discussed. A more complete description of TMI's existing mining and reclamation methods can be found in the PAP. The PAP, including Permit Renewal (RN) 06 (RN06) which was submitted by TMI to the CDRMS on June 20, 2012, and approved by the CDRMS on August 28, 2013, and Permit Revision (PR) 07 (PR07), which was submitted to the CDRMS May 21, 2013, and approved by CDRMS on October 6, 2015, provides detailed information on the current five-year mining term from 2013 through 2017 (TMI 1981 et seq.). Readers desiring greater detail can review the additional descriptions, maps, and drawings contained in the PAP. The PAP is available at the Trapper Mine Administration Office at 25910 State Highway 13, Craig, Colorado, 81625; the CDRMS at 1313 Sherman Street, Room 215, Denver, Colorado, 80203; and the OSMRE Western Region Office located at 1999 Broadway, Suite 3320, Denver, Colorado, 80202. The PAP also is available online on the CDRMS website at http://mining.state.co.us.

2.1 Trapper Mine SMCRA Permit

TMI operates the Trapper Mine within the SMCRA permit boundary of CDRMS-issued Permit C-1981-010. The SMCRA permit area includes a total of approximately 11,157 acres as shown in **Figure 2-1**. TMI owns or controls the surface and coal resources within the SMCRA permit boundary. The surface ownership includes private entities and the State of Colorado. Coal resources within the SMCRA permit boundary are owned by private entities, the State of Colorado, and the federal government.

Environmental studies for the Trapper Mine began in 1972, with the construction of facilities commencing in 1975. The Colorado Mined Land Reclamation Board approved Permit No. 76-11 for the Trapper Mine on May 28, 1976, and mining operations began in 1977. On February 2, 1981, Utah International, Inc. submitted an application for a new permit under SMCRA. CDRMS issued the Trapper Mine SMCRA permit on December 31, 1982. Permit applications approved under the CDRMS regulations are for a five-year permit term and the permit must be renewed every five years, updating the application with new information and planned changes in the mining or reclamation activities. The Trapper Mine SMCRA permit has been approved for renewal six times since 1982. The current approved permit term for operations at the Trapper Mine, RN06, is from December 31, 2012, to December 31, 2017.

If the mining plan changes during the five-year SMCRA permit term, the changes must be approved by CDRMS through a PR, technical revision, or minor revision. Each time a permit is revised or a RN is approved by the CDRMS, the appropriate changes are made to the PAP so that the PAP remains current with the mining and reclamation plans.

2.2 Project Area

The Project Area for this EA is limited by the Joint Proposed Remedy to lands within Federal Coal Leases C-07519 and C-079641 that lie within the SMCRA permit boundary as shown in **Figure 2-1**. The Project Area is approximately 2,423 acres.

The EA addresses OSMRE's review of a life-of-mine plan for mining in the Project Area from July 1, 2015, through approximately 2025, or beyond depending upon the coal delivery schedule. Because the

[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.

CDRMS approval is only for the current five-year permit term, the current CDRMS mine plan approval does not extend for the life of mining nor does the current CDRMS approval include the full extent of disturbance contemplated in the life-of-mine plan presented in this EA. TMI would be required to obtain RN approval from CDRMS for the periods of December 31, 2017, through December 31, 2022, and December 31, 2022, through December 31, 2027, and obtain CDRMS approval for the mining operations as presented in this EA before fully implementing the life-of-mine plan for the Project Area.

The surface and coal rights in the Project Area are owned or controlled by TMI. The surface is owned by TMI while the coal is owned by the federal government and leased to TMI. Coal rights are controlled by TMI through obtaining coal leases. As described in Chapter 1.0, Purpose and Need, the BLM is the agency with authority to lease federal coal and was the issuing agency for Federal Coal Leases C-07519 and C-079641, the two leases covering the Project Area. The legal description for the two lease areas, which lie within the SMCRA permit boundary, is as follows:

C-07519

Township 5 North (T5N), Range 90 West (R90W), 6th Prime Meridian (P.M.)
Section 6, Lots 8 through 19 inclusive

T6N, R90W, 6th P.M.
Section 31, Lots 5 through 20 inclusive

A total of 1,194.2 acres in lease C-07519 lie within the SMCRA permit boundary.

C-079641

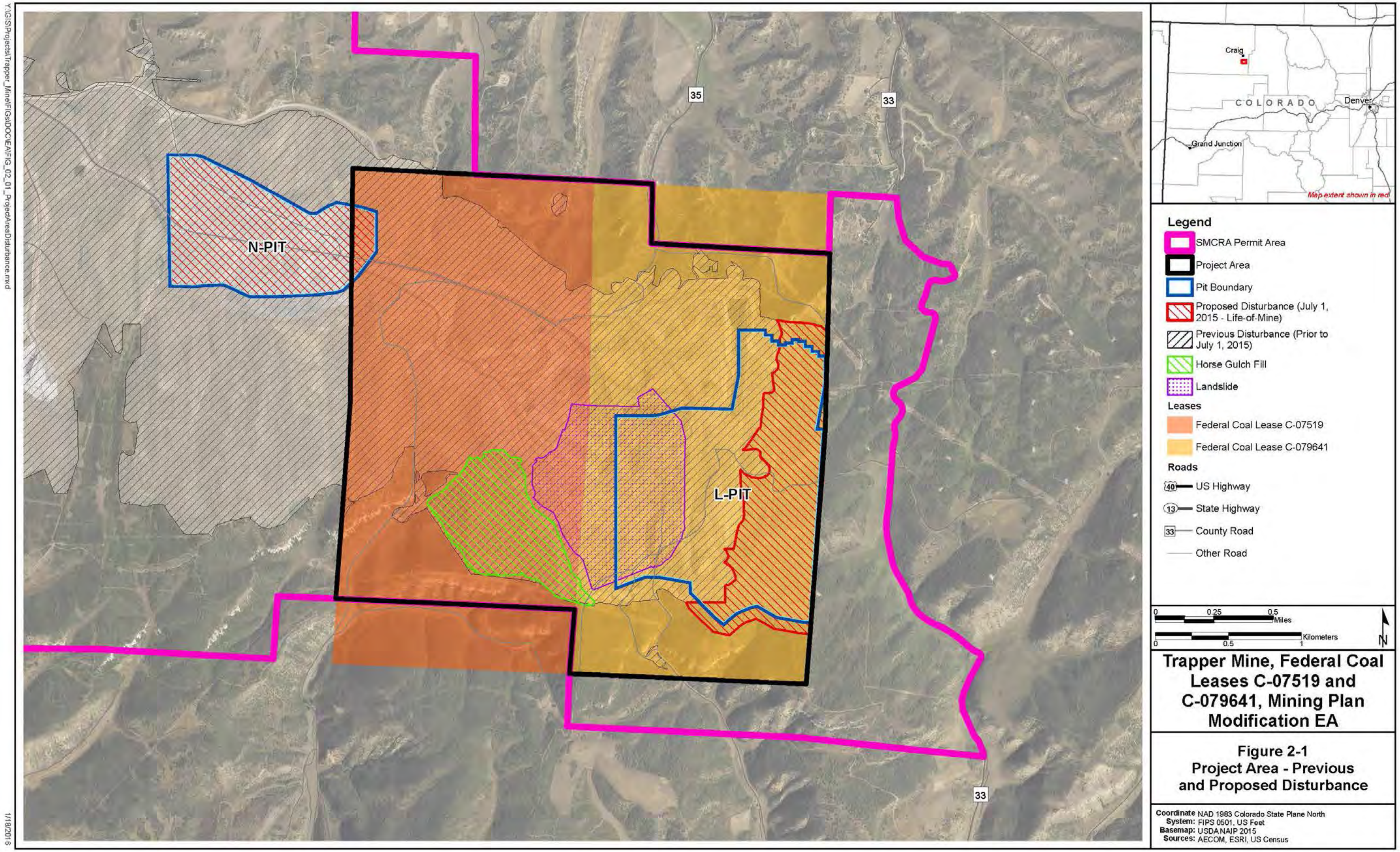
T5N, R90W, 6th P.M.
Section 5, Lots 5 through 20 inclusive

T6N, R90W, 6th P.M.
Section 32, Lots 4 through 16 inclusive

A total of 1,228.6 acres in lease C-079641 lie within the SMCRA permit boundary.

The Trapper Mine is an open-pit sub-bituminous coal mine located approximately six miles (9.7 km) south of the City of Craig in Moffat County, Colorado. The mine is accessed via Colorado SH 13. Development of the Trapper Mine began in 1954 with exploration drilling and continued with acquisition of state and federal coal leases, water rights, and permits to operate. Construction of mine facilities began in 1975 and mining operations began in 1977. The first coal was delivered to the Craig Station in 1978. The Craig Station is located adjacent to the SMCRA permit boundary to the northwest of the Project Area. Mining since 1977 generally has progressed from west to east within the SMCRA permit boundary. The Project Area is located on the eastern portion of the SMCRA permit area as shown in **Figure 2-1**.

Coal mined at the Trapper Mine is delivered by truck to the Craig Station at an average rate of approximately 2.3 mtpy (with a maximum rate of 2.6 mtpy). The coal is mined from seven coal seams of the Upper Williams Fork Formation: the “H,” “I,” “K,” “L,” “M,” “Q,” and “R” seams. Within the Project Area, the “R” seam is too deep for surface mining. Draglines were the primary earthmoving equipment used until October 8, 2006, when a 250-acre landslide occurred within the Project Area. This event required a modification of the SMCRA mining plan and mining method which was approved on July 7, 2008, by CDRMS under Technical Revision 103. Following the landslide, mining has been accomplished by a combination of dragline, dozer, and truck and loader operations, depending on the depth and material being mined. The mining process is described in Section 2.3 below.


Y:\GIS\Projects\Trapper_Mine\FIGs\DOC\EA\FIG_02_01_ProjectAreaDisturbance.mxd
1/18/2016
35
33
N-PIT
L-PIT
33
Craig
COLORADO
Denver
Grand Junction
Map extent shown in red
Legend
SMCRA Permit Area
Project Area
Pit Boundary
Proposed Disturbance (July 1, 2015 - Life-of-Mine)
Previous Disturbance (Prior to July 1, 2015)
Horse Gulch Fill
Landslide
Leases
Federal Coal Lease C-07519
Federal Coal Lease C-079641
Roads
US Highway
State Highway
County Road
Other Road
0 0.25 0.5 Miles
0 0.5 1 Kilometers
N
Trapper Mine, Federal Coal Leases C-07519 and C-079641, Mining Plan Modification EA
Figure 2-1
Project Area - Previous and Proposed Disturbance
Coordinate System: NAD 1983 Colorado State Plane North FIPS 0501, US Feet
Basemap: USDA NAIP 2015
Sources: AECOM, ESRI, US Census

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Some limited highwall mining has occurred and may occur in the future within the Project Area. Highwall mining consists of excavating horizontally along an exposed coal seam, such as in a highwall area, to recover the coal.

The Horse Gulch Fill, shown in **Figure 2-1**, was created following the 2006 landslide to allow permanent placement of overburden materials removed during initial truck and loader mining operations because an adjacent open pit was not available for material placement due to the landslide event. Approximately 24.6 million bank cubic yards of overburden material has been permanently placed in the Horse Gulch Fill. Subsequent to construction of the Horse Gulch Fill, TMI conducted additional evaluations and modified the SMCRA permit plan to allow for additional dragline mining and placement of overburden directly back in the mined pit as backfill. No additional fill placement is planned in Horse Gulch as part of the Project and the Horse Gulch Fill is currently undergoing reclamation.

There are two dual powerlines and one single powerline that cross the Project Area (**Figure 2-2**). The largest dual powerline is a 345-kilovolt (kV) line owned by Tri-State Generation and Transmission Association, Inc., which links the Craig Station with the Hayden Generating Station (Hayden Station), located approximately 21 miles (33.8 km) to the east of the Craig Station. The second dual powerline is a 230-kV line owned by Western Area Power Administration, which distributes power from the Craig Station. The single powerline is a 138-kV line owned by Tri-State Generation and Transmission Association Inc., which distributes power from the Hayden Station west toward the White River Electric Association. The two larger dual powerlines would not be affected by the planned mining operations within the Project Area. The smaller single powerline runs north to south through the proposed L Pit disturbance within the Project Area and would be moved to allow mining. That powerline is privately owned and located on private land and would be moved to private land adjacent to the planned mining areas. The current location and the realignment are shown in **Figure 2-2**.

2.3 Description of Existing Mining and Reclamation Operations

Operations at the Trapper Mine are conducted in accordance with applicable laws and regulations including SMCRA; the CSCMRA, most recently revised August 7, 2006; regulations of the Colorado Mined Land Reclamation Board, last revised September 14, 2005; and the CDRMS-approved PAP. The PAP, including the approved revisions provides the most complete descriptions of mining, environmental protection measures and reclamation activities within the Project Area for the current five-year permit term (2012 through 2017) and, as such, is used and referenced for the purpose of this EA. The general sequence of operations is described below.

In new mine areas, the first action is to create drainage and sediment control for the area to be disturbed. Once drainage and sediment controls are in place, vegetation is cleared and topsoil is removed. Vegetation is removed using dozers. Vegetation is typically pushed into nearby disturbed areas for burial, but also can be used for erosion and sediment control purposes. Topsoil is removed using scrapers or other earthmoving equipment.

Topsoil is hauled directly for placement on graded areas undergoing reclamation or placed in temporary stockpiles. Temporary topsoil stockpiles are graded so the out-slopes are 3 horizontal to 1 vertical (3H:1V) or less and stabilized through revegetation. Topsoil salvage depths and volumes are monitored and recorded for use in material balancing during reclamation. Topsoil removal typically occurs in May through October. As a result, topsoil salvage is typically one to five pit widths in advance of mining operations to allow mining to continue to advance through the winter months.

After the topsoil has been salvaged, mining operations begin to recover the coal. Trapper Mine pits are mined using both a dip-line mining method and a strike-line mining method. Mining is completed in parallel strips. Each pit is adjacent and parallel to the previous pit. Cuts are initiated near the outcrop of the coal seam higher on the hillside and worked down the hill until the coal becomes too deep to recover, or initiated near the economic strip limit and worked up the hill until the coal outcrops.

The overburden, or rock that lies above the coal seams to be mined, is drilled and blasted to break up the rock to allow it to be moved using the mining equipment. Blasting is performed using an ammonium nitrate and fuel oil (ANFO) mixture. After overburden blasting is completed, the overburden removal begins. For the Project Area, overburden removal would occur primarily using trucks and loaders. The maximum coal depth for the Project Area would involve the initial use of trucks and loaders because the draglines cannot economically remove materials deeper than 200 feet. The overburden ranges in depth from 100 to 150 feet.

Following removal of overburden by the trucks and loaders, dozers scrape the remaining thin layer of overburden material to expose the uppermost coal seam. Coal is either ripped with a dozer or drilled and blasted for removal using similar blasting material (ANFO) as is used for overburden. Depending on the depth of the uppermost coal seam within the pit, the uppermost coal seam is mined using draglines or front-end loaders. The coal is loaded into haul trucks for transfer to the Craig Station.

After the uppermost coal seam is removed, interburden, or the non-coal rock material located between multiple coal seams to be mined, is removed using trucks, loaders and dozers, or using draglines and dozers, depending on the depth. Dozers prepare the lower coal seams for mining by clearing the thin layer of interburden above the lower coal seams. The coal is then loaded into haul trucks by loaders and dozers or the draglines and dozers. The draglines typically work one pass down and one pass up each cut removing the deeper interburden and coal. At the Craig Station, coal is end dumped into the primary crushing system or is stockpiled in the immediate vicinity of the crusher. Coal that is stockpiled is placed in the crusher at a later date using front end loaders operated by TMI employees. Once the coal is dumped into the crushing system, it transfers ownership to the Craig Station. Coal Combustion Residuals (CCRs) are utility wastes generated during the burning of coal and include fly ash, bottom ash, and scrubber sludge. CCRs not recycled for use in cement products, wallboard, and road base are hauled back to the Trapper Mine for placement as pit backfill in permitted areas. Approximately 55 percent of the total CCRs produced at Craig Station, an estimated 501,000 tons annually, are placed at the Trapper Mine. CCRs are placed in areas located within the SMCRA permit boundary but outside of the Project Area.

Overburden and interburden, collectively known as spoil, removed to access the coal seams in an active mine pit are used as backfill in the adjacent mine pit to begin the reclamation process. The dragline casts the spoil into the adjacent cut to backfill the pit. Dozers also are used to backfill spoil into the adjacent cut, while loaders and haul trucks are used to move material into backfill areas farther behind the active mining operation.

Backfilling is completed contemporaneously at the Trapper Mine with backfilling beginning in the pit as soon as safely possible after the mining equipment has completed coal removal and moved to an adjacent pit. After the pit has been backfilled and mining has progressed away from the mined-out pit, the backfill material is rough graded, using dozers, graders, or draglines, in preparation for reclamation. In most cases rough grading of the backfill begins within 30 days of placement, with a maximum of one pile of overburden and interburden material (referred to as a spoil pile) behind the active working area of the pit. The power to the dragline is typically supplied to the machine from the spoil pile side of the pit with power cables positioned on the ground behind the draglines. The rough grading of the piles is completed quickly to allow for ease of movement of the power cables supplying the dragline. Rough grading also reduces the potential for ponding of surface water on the steeply dipping slopes and promotes runoff to avoid the potential for water to promote landslides or inhibit operations.

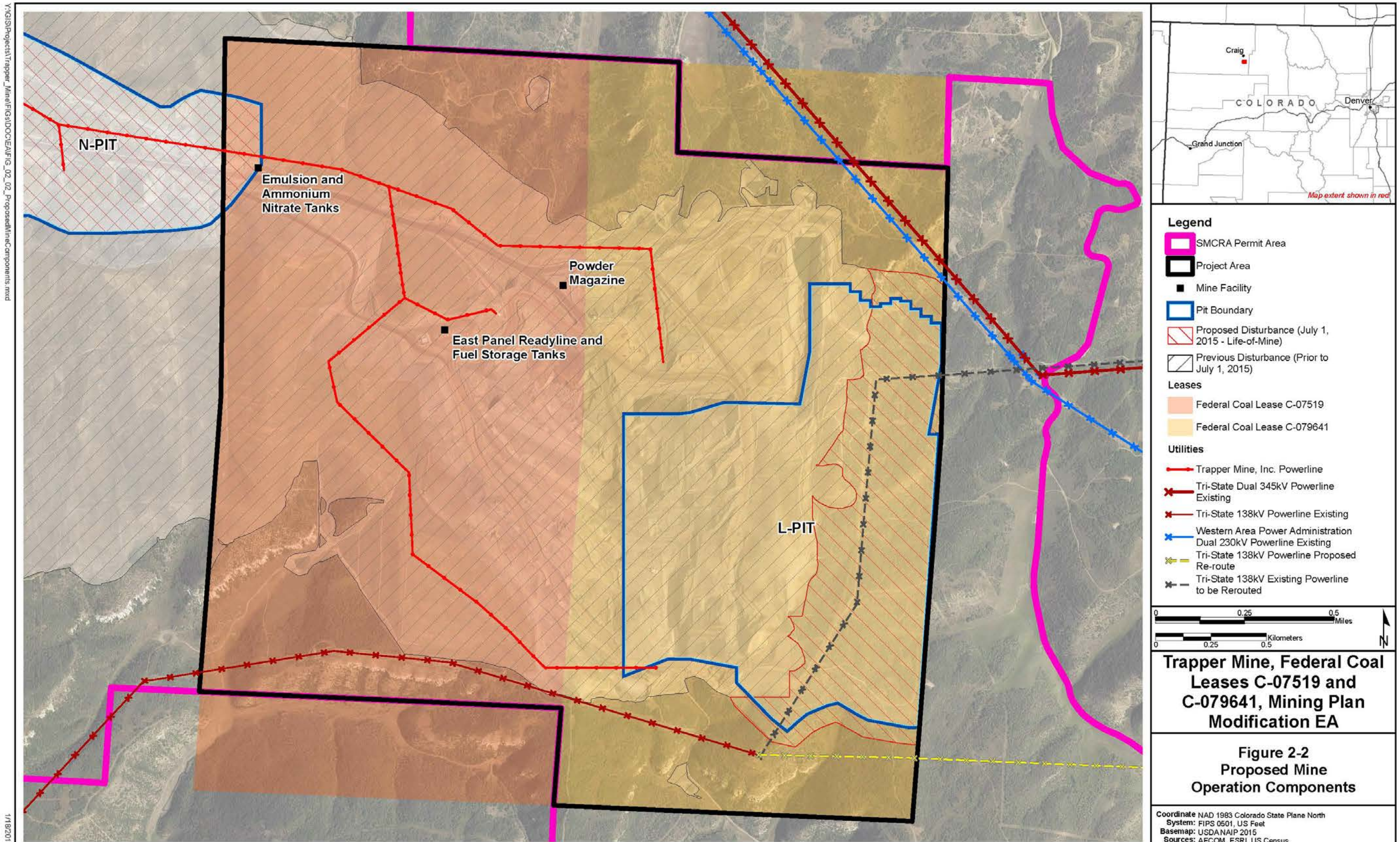

Figure 2-2
Proposed Mine
Operation Components

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After rough grading, final grading is conducted to blend the backfilled areas with the surrounding topography, create a reclaimed area in accordance with the CDRMS approved post-mining topography, and construct drainage patterns. The area is then prepared for topsoil placement and seeding.

The Trapper Mine's overall reclamation objectives are to restore the disturbed areas to the pre-mining uses of cropland or rangeland and wildlife habitat. To date, mining at the Trapper Mine has disturbed approximately 593 acres of cropland, and all of these areas have been reclaimed as cropland. No additional cropland disturbance or reclamation is planned within the SMCRA permit boundary. Approximately 3,925 acres of rangeland and wildlife habitat have been reclaimed since the start of mining. Reclamation of the remaining disturbed areas would be conducted to achieve the post-mining land uses of rangeland and wildlife habitat. For rangeland and wildlife habitat reclamation, the topsoil is placed on the graded overburden/interburden to a depth of 12 inches. Topsoil placement occurs in the summer and fall. Fertilizer is not used for rangeland/wildlife habitat reclamation as past experience has shown that the use of fertilizers promotes growth of more aggressive grasses and forbs while decreasing the overall plant community diversity. The prepared areas are then seeded with one of three rangeland seed mixes as approved by CDRMS (TMI 1981 et seq.). Mature shrub transplanting also can occur within the reclamation areas. Mature shrubs are transplanted using a front end loader or similar equipment. Revegetation is monitored until the vegetation establishment meets the approved standards in the PAP.

TMI is required to post a bond covering land within the SMCRA permit area where mining and reclamation operations occur. The bond is made payable to the State of Colorado and OSMRE and covers performance of all requirements contained in regulations, the PAP, and the reclamation plan. A bond must remain in place until reclamation is completed in accordance with the regulatory requirements and permit documents, and to the satisfaction of the regulatory authorities. The bond is based on the cost of having a third-party contractor complete the required reclamation work if for some reason TMI is unable to do so. Reclamation liabilities at the Trapper Mine, as calculated by CDRMS as part of the PR07 approval, are $23,016,528.92. *CDRMS holds a corporate surety bond in the amount of $23,400,000.00 to cover all reclamation liabilities at the Trapper Mine.*

There are three phases of bond release based on completion of certain portions of the reclamation plan. TMI can apply for Phase I bond release after completion of backfilling, regrading, and drainage establishment. Phase I bond release allows for release of approximately 60 percent of the reclamation bond for the area. TMI can apply for Phase II bond release once topsoil has been placed and vegetative cover has been established in accordance with the reclamation plan and associated regulatory standards. Phase II bond release also evaluates control of sediment in runoff outside of the reclaimed area to ensure compliance with the requirements. Phase II bond release allows for the release of up to an additional 25 percent of the reclamation bond, and in combination with the Phase I bond release allows for 85 percent of the bond to be released for that area. Phase III bond release occurs once all surface coal mining and reclamation activities have been completed in accordance with the requirements of the SMCRA, the Colorado regulations, and the PAP, and no fewer than 10 years have passed since the need for irrigation, fertilization, or significant revegetation. Revegetation success is determined by evaluating plant cover, plant production, woody plant density, and plant species diversity. After Phase III bond release, the area is 100 percent released from any bond liability. TMI has received approval for Phase I, Phase II, and Phase III bond releases for areas within the SMCRA permit boundary and the Project Area. **Figure 2-3** shows the areas of bond release within the Project Area and **Table 2-1** provides acreages for each phase of bond release within the Project Area**.**

Table 2-1 Summary of Phased Bond Release Acreages in the Project Area

Land Status	Approximate Acreage
Total Areas Reclaimed Within the Project Area	*494*
Areas Which Have Achieved Phase I Bond Release	*494*
Areas Which Have Achieved Phase II Bond Release	*267*
Areas Which Have Achieved Phase III Bond Release	178

Note that bond release is successive. Reclaimed land must achieve Phase I bond release before being eligible for Phase II and must achieve Phase II bond release before being eligible for Phase III. Each successive phase of bond release is a subset of the previous phase.

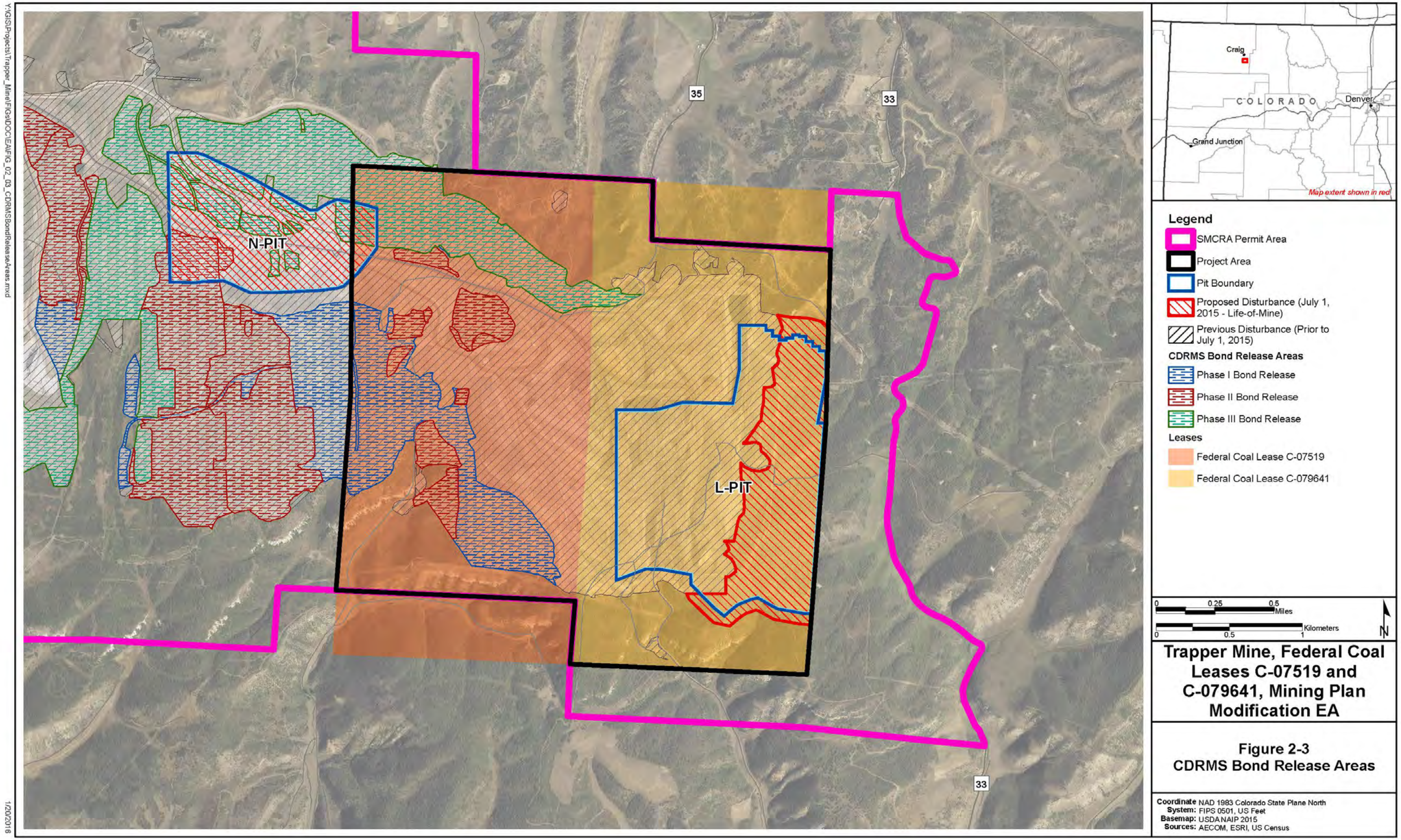
Equipment used at the Trapper Mine for mining, reclamation, and support of these activities includes the following:

Draglines	Water Trucks
Overburden/Parting Drills	Fuel and Lube Trucks
Track Dozers	35-ton Crane
Rubber-tired Dozers	Backhoes
Motor Graders	Cable Reel
Scrapers	Service Trucks
Hydraulic Excavators	Pickups/Sport Utility Vehicles
Front-end Loaders	Farm Tractors
Coal Drills	Tractor and 200-ton Lowboy Trailer
Haul Trucks (240-ton, 95-ton, 55-ton)	Compactor

The Trapper Mine operates 24 hours a day, seven days per week. The mine employs approximately 191 individuals (based on 2015 employee count) and operates on various schedules of 8-, 10-, or 12-hour shifts per day (TMI 2016).

2.3.1 Trapper Mine Support Facilities

Mining activities are supported by existing, permitted facilities located within the SMCRA permit boundary but outside the Project Area. The mine office, shop, and warehouse complex is located adjacent to the mine entrance approximately 2.5 miles from the Project Area. The mine office, shop, and warehouse complex includes most of the buildings and facilities needed to operate the mine, including the mine offices, truck shop, warehouse, storage yards, storage buildings, truck wash, electric shop, dragline repair shop, and fuel storage and refueling area for diesel and gasoline vehicles and other equipment. Other facilities outside of the Project Area and not located within the mine office, shop, and warehouse complex include the water pump house and water storage tanks. All of these facilities would be used to support the Proposed Action.


Y:\GIS\Projects\Trapper_Mine\FIGs\DOC\EA\FIG_02_03_CDRMSBondReleaseAreas.mxd
1/20/2016
N-PIT
L-PIT
35
33
33
Craig
COLORADO
Denver
Grand Junction
Map extent shown in red
Legend
SMCRA Permit Area
Project Area
Pit Boundary
Proposed Disturbance (July 1, 2015 - Life-of-Mine)
Previous Disturbance (Prior to July 1, 2015)
CDRMS Bond Release Areas
Phase I Bond Release
Phase II Bond Release
Phase III Bond Release
Leases
Federal Coal Lease C-07519
Federal Coal Lease C-079641
0 0.25 0.5 Miles
0 0.5 1 Kilometers
N
Trapper Mine, Federal Coal Leases C-07519 and C-079641, Mining Plan Modification EA
Figure 2-3
CDRMS Bond Release Areas
Coordinate System: NAD 1983 Colorado State Plane North FIPS 0501, US Feet
Basemap: USDA NAIP 2015
Sources: AECOM, ESRI, US Census

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2.4 Alternative A - Proposed Action

Under Alternative A, the Proposed Action, OSMRE would recommend and the ASLM would sign a new MPDD for coal mining and reclamation operations at the Trapper Mine within the Project Area through the life-of-mine, estimated to be approximately 2025 or later depending on coal delivery requirements. TMI would mine the coal at the current mining rates, which average approximately 2.3 mtpy with a maximum production rate of 2.6 mtpy and would use similar mining and reclamation methods as described in Section 2.3. The operations within the Project Area would disturb an additional 257 acres of undisturbed land and re-disturb approximately 11 acres of reclaimed land.

2.4.1 Proposed Mine Operation Components within the Project Area

The Proposed Action would consist of the following mine components and facilities located within the Project Area. Major facilities are shown on **Figure 2-2**:

- L Pit – Currently active open pit on Lease No. C-079641, projected to be mined 2015 through 2025.
- N Pit – Open pit partially located on Lease No. C-07519, projected to be mined near the end of the life-of-mine for the Project (currently estimated at 2023). This pit has not been approved by CDRMS at this time.
- TMI powerlines would provide power to facilities within the Project Area and to the draglines.
- East Panel Readyline and Fuel Storage Tanks area would provide plug-ins to warm diesel-powered equipment engines and fuel for the refueling of equipment.
- Support facilities necessary to conduct mining operations within the Project Area would include:
  - Haul roads used by haul trucks to transport coal to the Craig Station or move overburden and connect with in-pit roads and ramps;
  - Temporary light use ancillary roads;
  - Temporary in-pit ramps and roads;
  - Powder magazine used to store high explosives;
  - Emulsion and ammonium nitrate storage tanks for materials used in blasting;
  - Blasting equipment storage for keeping blasting equipment from freezing;
  - Temporary stockpile areas to store topsoil removed from disturbed areas for use in reclamation;
  - Temporary berms for control of water, material placement, or traffic;
  - Dewatering wells and associated waterlines;
  - Temporary construction staging areas;
  - Environmental monitoring stations for air and water monitoring; and
  - Sediment ponds and diversion ditches.

2.4.2 Existing and Proposed Disturbance

The Proposed Action would include mining from July 1, 2015, through the estimated life-of-mine for the Project Area (2025). Although mining operations are ongoing within the Project Area, all acreages for disturbance and reclamation used in this EA are based on the disturbance and reclamation status as of July 1, 2015. **Table 2-2** summarizes the total Project Area, approximate acres of previously disturbed area, approximate acreage of previously reclaimed areas, approximate acreage of new disturbance, and approximate acreage of areas currently reclaimed but planned for re-disturbance. The overall disturbed areas for the Proposed Action are shown in **Figure 2-1**.

Table 2-2 Summary of Disturbance in Project Area for Alternative A – Proposed Action

Land Status	Approximate Acreage
Current Disturbed Area as of July 1, 2015	1,053
Previously Disturbed and Reclaimed Area as of July 1, 2015	494
Proposed New Disturbance After July 1, 2015	257 [1]
Not Proposed for Disturbance	*619*
Total Project Area	2,423

[1] In addition, 11 acres of reclaimed area is planned for re-disturbance as part of the Project.

2.4.3 Mining Operations

Mining operations associated with the Proposed Action would continue to be conducted in a similar manner as described for existing operations in Section 2.3. Vegetation would be removed in new disturbance areas followed by topsoil removal, blasting of the overburden, overburden/interburden and coal removal, pit backfilling, and reclamation.

As part of the Proposed Action, coal would continue to be mined in the L Pit within the Project Area from July 1, 2015, to approximately the year 2025 and in the portion of the N Pit located partially within the Project Area beginning in approximately the year 2023 (**Figure 2-2**). TMI proposes to continue mining in the Project Area using a combination of dragline, dozer, and truck and loader operations to remove overburden and recover coal. Some limited highwall mining also could occur.

The L Pit is where current mining operations are occurring. Ongoing mining in the L Pit, through completion of the EA, is being conducted in accordance with the Joint Proposed Remedy, which is described in Section 1.2.2.

The L Pit is designed and operated as both a strike-line truck and loader pit and a dip-line dragline pit, depending on field conditions. The L Pit currently is and would be mined using a combination of truck and loader, dozer, and dragline stripping as described in Section 2.3. Coal is currently and would continue to be removed using a combination of loaders and trucks. Highwall mining also could be used in the endwalls or highwalls of the L Pit if further geologic and geotechnical studies demonstrate feasibility, and the timing of the stripping operations allows access (TMI 1981 et seq.).

TMI also proposes to mine the N Pit located partially within the Project Area over the life of the mine. Mining in the N Pit within the Project Area would not begin until near the end of the life-of-mine plan estimated to be in 2023, although mining of private coal within the N Pit outside of the Project Area could begin earlier. Mining previously has occurred in the N Pit area and some of that previous disturbance has been reclaimed. However, mining only recovered the coal seams closer to the surface; the “H” and “I” seams. The Proposed Action would initiate re-mining in this area to recover the coal from the deeper coal seams in the N Pit, specifically the “L,” “M,” and “Q” seams. Mining of these coal seams is not currently approved by CDRMS. Approval would be required by CDRMS prior to initiating any disturbance in the N Pit area.

The N Pit area has steep grades, weak formations, wet ground, historical spoils, and a high stripping ratio. Due to these conditions it is possible that highwall mining could be the preferred mining method in some areas. However, all or portions of the N Pit also would be mined using the standard combination of dragline, dozer, and truck and loader equipment as described for the L Pit in Section 2.3.

Table 2-3 provides additional information on the L and N Pit mine pit areas and total tonnage.

Table 2-3 Proposed Project Area Mine Plan

Mine Pit	Total Pit Area* in Acres	Estimated Federal Coal Tons**	Estimated Mining Years
L Pit	517	19,003,900	2015-2025
N Pit	17	130,800	2023
Total	**534**	**19,134,700**	**2015-2025**

* From July 1, 2015, through life-of-mine (estimated 2025).

** TMI 2015.

2.4.4 Project Environmental Protection and Mitigation Features

The surface mining permitting process under the CDRMS coal regulatory program requires applicants to incorporate design features into their mining proposals to protect or minimize impacts to environmental resources (CDRMS 1980). Each PAP submitted to CDRMS for a new or revised mining permit is required to contain resource-specific protection and mitigation plans. The resource-specific plans describe the design features for reducing or eliminating the potential impacts to various resources or how those resources would be restored to approved post-mining conditions after mining is complete. CDRMS reviews the PAP, which includes the required resource-specific plans, design features, and associated performance standards. 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.

Section 4 of the PAP describes the design, operation, and reclamation features to reduce or eliminate potential impacts to environmental resources. **Table 2-4** contains a summary of those features with a more detailed description included in the PAP (TMI 1981 et seq.).

Table 2-4 Summary of Environmental Commitments from Trapper Mining Inc. PAP

Resource Area	Measure
Topography	Restore the area to approved post-mining topography. Grade backfilled mining areas to establish a stable post-mine topography that blends into the undisturbed areas outside the mining limits.
Air Quality	Water roads and apply chemical dust suppressants as necessary to control fugitive dust emissions. Operate in compliance with the CDPHE APCD Construction Permit (11MF253-1). Seed long-term topsoil stockpiles.
Water Resources	Route all runoff from disturbed areas through one or more sediment ponds. Construct new sedimentation structures and diversion ditches prior to topsoil removal to control runoff, avoid erosion and an increased contribution of sediment load to runoff, and protect surface water and groundwater quality. Maintain temporary sediment ponds until vegetative establishment is complete and acceptable runoff water quality is achieved. Monitor performance of diversion ditches and sediment control structures and maintain or upgrade as needed. Control and monitor the quantity and quality of any discharges from the permit area in compliance with the Colorado Discharge Permit System (CDPS) Permit Number CO-0032115 issued by the CDPHE under the National Pollutant Discharge Elimination System Program.

Table 2-4 Summary of Environmental Commitments from Trapper Mining Inc. PAP

Resource Area	Measure
	Revegetate permanent drainage ditches unless CDRMS approves rip rap as a channel lining. Seed disturbance related to sediment pond construction, including embankments and surrounding areas, after the pond construction is completed. Design sediment ponds to contain the water and settleable sediment load from a 10-year, 24-hour storm event. Construct secondary sediment controls in the form of dozer basins to provide secondary sediment controls for precipitation and snowmelt events in disturbed areas of the mine site. Size haul road culverts to maintain proper drainage during high snowmelt or other exceptional runoff events.
Vegetation	Live transplant shrubs in accordance with approved permit commitments. Revegetate to achieve the approved post-mining land uses. Eliminate livestock grazing during vegetation establishment. Once vegetation is established, manage livestock usage to protect the established vegetative cover. Evaluate revegetation success in accordance with the standards approved by the CDRMS.
Fish and Wildlife	Re-establish appropriate and suitable forage and cover on reclaimed areas. Construct permanent stock and wildlife watering ponds. Keep soil disturbance to a minimum to reduce destruction of vegetation and food species used by wildlife. Take administrative actions for any employee found harassing wildlife. Manage livestock grazing to ensure that adequate forage is left for wildlife use and that the range is not over used. Control pesticide and herbicide use to protect livestock and wildlife. Construct powerlines to Rural Electric Association Bulletin 6140, Powerline Contacts by Eagles and Other Large Birds, standards. Limit vehicle speeds in the mine area to reduce the likelihood of collisions with wildlife. Provide topographic relief for wildlife habitat.
Threatened and Endangered Species	Continue to implement measures required as part of the Endangered Fish Recovery Agreement with USFWS.
Cultural Resources	Perform pre-disturbance field surveys. If an unidentified cultural or historical resource is discovered within or adjacent to the Project Area, halt activities that may damage the resource and report the findings to the responsible regulatory agency. Complete required mitigation for cultural and historic resources.
Visual Resources	Restore disturbed areas to the approved post-mining topography.
Soils	Manage topsoil resources to minimize the negative effects of salvaging, stockpiling, and replacing soils to the extent practicable. Live-handle topsoil where possible. Salvage the A and upper B horizon soils, where practical, for use in reclamation. Restrict topsoil salvage to dry conditions where possible. Restrict topsoil salvage to the months of May through October. Locate topsoil stockpiles to avoid erosion from wind and water and additional compaction or contamination. Regrade topsoil stockpiles with outside slopes no steeper than 3H:1V and protect topsoil stockpiles by revegetating as soon as conditions allow. Clearly label topsoil stockpiles.

Table 2-4 Summary of Environmental Commitments from Trapper Mining Inc. PAP

Resource Area	Measure
	Control weeds on topsoil stockpiles by monitoring and treating with an herbicide as needed. If soil compaction occurs after topsoil replacement, rip the soil with a dozer to minimize compaction, promote stability and assist in revegetation. Leave reapplied topsoil in a rough condition to help control wind and water erosion prior to seeding. Monitor topsoil removal and maintain replacement balances to ensure adequate topsoil is available for reclamation.
Post-mining Land Use	Reclaim affected areas to land uses as high as or higher than those in effect prior to mining. Establish vegetation to support livestock grazing. Establish adequate forage and cover to support year-round wildlife usage. Establish permanent stock and wildlife watering ponds. Establish the post-mining hydrologic conditions in accordance with the approved hydrologic reclamation plan.

2.5 Alternative B – Disapproval of Mining Plan by ASLM

Under this alternative, OSMRE would recommend, and the ASLM would sign a MPDD that disapproves of continued mining operations at the Trapper Mine. Once the ASLM decision is issued, *TMI would immediately terminate the current mining operations in the Project Area and begin final reclamation. Under this alternative, OSMRE has assumed that mining operations at the Trapper Mine would cease by April 30, 2016. As of that date, an additional 1.75 million tons of coal would be mined within the Project Area but 17.35 million tons would not be mined.* Mining could occur in other areas within the SMCRA permit boundary, but subject to judicial review of the ASLM's decision, no further mining would occur in the areas covered by the Project Area, and no additional coal removal would occur from Federal Coal Leases C-07519 and
C-079641.

Once operations have ceased, TMI would start reclamation of the existing disturbed areas within the Project Area. Reclamation would proceed in accordance with the approved reclamation plan contained within the SMCRA Permit as generally described in Section 2.3. Reclamation would be expected to take approximately three to five years to complete backfilling, grading, and drainage reestablishment; topsoil replacement; and seeding. Vegetation establishment and Phase III bond release for the Project Area could take an additional 10 to 15 years.

Coal reserves identified in areas outside the Project Area in the N Pit and I Pit are shown on **Figure 2-4**. The N Pit has been previously mined for recovery of the "H" and "I" coal seams, and future mining would recover the deeper coal seams (the "L," "M," and "Q" seams). The 11-acre portion of the N Pit within Federal Coal Lease C-07519 would not be mined, but the area of the N Pit outside of the lease would be mined. The I Pit has not been previously disturbed. The N Pit west of Federal Coal Lease C-07519 and the I Pit are located on private and state lands with state coal. The coal expected to be mined from these pits would be approximately 4.5 million tons. The mining rate for these pits would potentially be reduced from the current average mining rate of 2.3 mtpy, due to equipment congestion in these smaller mine areas. Although detailed plans have not been developed for mining these areas, for the purposes of this analysis a mining rate of approximately 1.5 mtpy is used. The current identified reserves would be mined within three to four years of the decision by the ASLM to not recommend approval of the mining within Federal Coal Leases C-07519 and C-079641. This would not preclude the possibility that additional coal reserves could be identified within the SMCRA permit boundary.

2.6 Alternative C – No Action Alternative

Under this alternative, OSMRE would not develop a MPDD and the ASLM would not issue a decision based on the revised EA document. TMI would continue to operate under the 2009 Approval signed November 27, 2009, by the ASLM. Because of the deficiencies raised in the prior NEPA process by the District Court in *WildEarth Guardians v. U.S. Office of Surface Mining Reclamation and Enforcement et al.* 104 F. Supp. 3d 1208, (D. Colo. 2015), it is reasonably possible that, under this alternative, the existing MPDD would be vacated based upon a future court order. The District Court's decision is the subject of an appeal by the Intervenors to the U.S. Court of Appeals for the 10th Circuit (Case Nos. 15-1186 and 1136) and may be reversed. If the prior EA analysis and the existing MPDD are vacated, operations at Trapper Mine would cease immediately and the effects would be equivalent to Alternative B outlined above, although TMI could continue to mine until the 2009 Approval is vacated by a court. The coal tonnage removed and the timing for the cessation of mining could vary from that outlined for Alternative B.

If the 2009 EA and the associated 2009 Approval are not vacated by a court, TMI would continue to mine as outlined in Section 2.1 under Alternative A, the Proposed Action, for the life of mining within the Project Area.

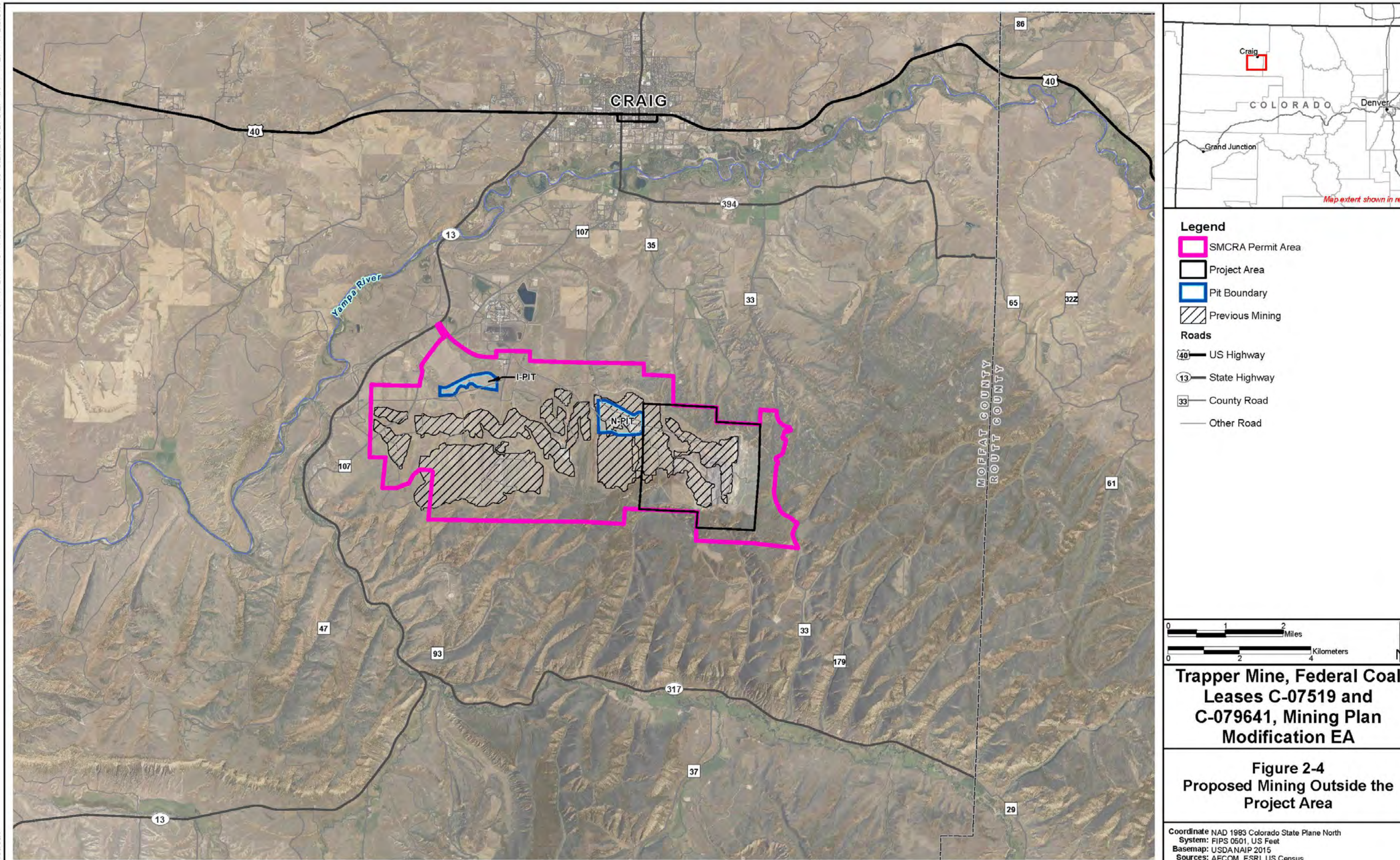
2.7 Alternatives Considered but Eliminated from Further Study

NEPA requires that alternatives to the Proposed Action be rigorously explored and objectively evaluated and that the NEPA document provide a discussion of alternatives eliminated along with the reasons for their elimination (40 CFR 1502.14). Alternatives to the Proposed Action must meet the Purpose and Need for the Project, and offer significantly lower or fewer impacts to the environment than the Proposed Action. An alternative may be eliminated from detailed study for a number of reasons, including:

- It does not meet the Project Purpose and Need;
- It is technically or economically infeasible;
- It is inconsistent with the basic policy objectives for the management of the area (such as, not in conformance with land use plans);
- Its implementation is remote or speculative;
- It is substantially similar in design to an alternative that is analyzed; or
- It would have substantially similar effects to an alternative that is analyzed.

2.7.1 Underground Mining Alternative

An alternative to mine the federal coal within the Project Area using underground mining methods was suggested during the public outreach and was evaluated and eliminated from detailed study for several reasons, including: 1) CDRMS has approved a surface mining permit for this project using surface mining techniques; and underground mining is inconsistent with the approved permit; 2) underground mining is not consistent with the Purpose and Need for this EA; and 3) the percentage of coal recovered through underground mining methods would be less than the maximum economic recovery using surface mining methods and inconsistent with the Federal Coal Lease terms and the R2P2.



Trapper Mine, Federal Coal Leases C-07519 and C-079641, Mining Plan Modification EA

Figure 2-4
Proposed Mining Outside the Project Area

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This alternative also would be economically infeasible. The facilities and equipment needed for underground mining are different from surface mining. Because the infrastructure for underground mining is not in place at the Trapper Mine, new infrastructure for underground mining would need to be constructed. The capital expenditure to develop an underground mine would be prohibitive. In addition, all new surface facilities would need to be constructed, including, but not limited to, conveyors, coal stockpiles, a wash plant, one or more processing waste piles, and maintenance and support facilities. In addition, all new underground mining equipment would need to be purchased, such as, but not limited to, a long wall mining system, conveyor systems, drives and power stations, vehicles for transporting workers and supplies, several continuous miners, shuttle cars, large and small ventilation fans, and roof bolters.

The coal seams currently mined by surface methods would not all be appropriate for recovery using underground mining. Many of the seams split or have partings making them uneconomic for underground mining. Recovery using underground mining methods is estimated by TMI to be approximately 35 percent of the 19.1 million tons proposed for recovery through surface mining in this EA (Hinkemeyer 2015).

In addition, approval by CDRMS of an application for a PR or for a new mining permit would be required to authorize underground mining. The process for TMI to design and engineer a new underground mine and for CDRMS to process a permit application or revision would take a number of years. The extended time for permitting and design add to the underground mining alternative as an economically unreasonable alternative to consider.

In summary, this alternative was not brought forward for analysis because underground mining would not respond to the Purpose and Need for this action, is not in conformance with the maximum economic recovery requirements of the federal coal leases and the R2P2, and, the economic burden to shift to underground mining would be prohibitive.

2.7.2 Air Quality Mitigation Alternatives

Two alternatives were evaluated to reduce greenhouse gas (GHG) emissions related to mining at the Trapper Mine. These two alternatives were suggested as part of the public outreach and are described below.

The first alternative considered a reduction in coal production from the Trapper Mine, which would reduce Trapper Mine's contribution of related emissions at the Craig Station from the burning of Trapper Mine coal. At the maximum permitted production rate of 2.6 mtpy as described in the Proposed Action, Trapper Mine would provide approximately 54 percent of the total coal needed to run the Craig Station. If mining operations at the Trapper Mine were reduced, it is likely the Craig Station would need to seek coal from other sources to meet the requirements to operate. Other sources would be more distant than the Trapper Mine and indirect emissions as a result of transport of that coal by truck or train to the Craig Station would increase while actual Craig Station emissions from burning of the coal would remain similar to current emissions. In addition, while the emissions from mining at the Trapper Mine would be reduced, it is expected that emissions from mining at the alternate coal source would increase if their production increased in order to meet the Craig Station demand. While the coal coming from the Trapper Mine is crushed at the Craig Station, it is likely that any coal transported from more distant sources would require crushing prior to transport, potentially resulting in increased emissions at that mine and during transport. Under this alternative, the Craig Station also might maintain a larger coal stockpile to ensure coal supply into the plant in the event of a delay in shipment, which also could increase air emissions at that location.

Moreover, the effects of a reduced mining rate at the Trapper Mine would extend the environmental effects of the mining operation and the air emissions from mining equipment over a longer period of time to recover the coal within the Project Area. As currently estimated, the emissions from mining operations will cease from the Project Area in 2025. If a reduced mining rate at the Trapper Mine is implemented, the emissions from active mining within the Project Area could be extended for several years depending on the rate of reduction. The reduced mining rate would change Project economics by decreasing both costs and revenues and would require a smaller workforce resulting in layoffs and associated negative economic impacts for the region. In addition, TMI would not be in compliance with the terms of their existing contracts with the owners of the Craig Station to supply the required amount of coal.

OSMRE has determined that a reduced mining rate alternative would *not meet the Project purpose and need.*

The second alternative evaluated the potential for reduced air emissions at the mine by changing or modifying mining related equipment to equipment which would produce lower air emissions. This equipment replacement would reduce the emissions related to fuel combustion but would not change the emissions related to particulate matter. Trapper Mine is a relatively small contributor of the emissions related to engine combustion (primarily carbon dioxide [CO_2] and nitrogen oxides [NO_X]) in the region. The Craig Station, Hayden Station, and oil and gas operations contribute the majority of these pollutants to the regional air quality.

The cost to make the switch to equipment powered by a different fuel (such as natural gas or solar powered equipment) for the remaining 10-year life of the mine in the Project Area would be prohibitive for the minimal benefit to the regional air quality. To replace every piece of equipment in TMI's current fleet with newer model equipment is estimated to cost approximately $84 million. This $84 million does not take into account upgraded equipment that would use a different fuel. As a fuel alternative, natural gas engines are more expensive, and the storage and transportation of natural gas is more complex than diesel. In addition, the use of natural gas powered engines in mining equipment is relatively new and some types of equipment would not be available for replacement with natural gas powered engines. The use of solar power to run large equipment has not been tested and is not considered technologically feasible at this time. Similarly, retrofitting existing equipment with additional emissions control devices would be expensive with limited effect on regional air emissions. In addition, there is an environmental impact associated with manufacturing new equipment including, the potential environmental impacts and associated emissions created by mining operations to obtain the required metals and then the emissions that result from the manufacturing processes. It also is likely that the current equipment would be sold to a third party and may or may not continue to be used and generate emissions.

OSMRE has not brought forward this alternative for full analysis because natural gas and solar powered engine technology and retrofitting of existing equipment is not economically or technically feasible for all equipment at the Trapper Mine.

3.0 Affected Environment[1]

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 are 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 significant direct, indirect, or cumulative impact, or where analysis is necessary to determine the significance of the impacts. **Table 3-1** lists the resources considered for this EA and the determination as to whether the resource required additional analysis.

Table 3-1 Resources and Determination of Need for Further Analysis

Determination*	Resource	Rationale for Determination
PI	Topography	See discussion below.
PI	Air Quality	See discussion below.
PI	Climate Change	See discussion below.
PI	Geology and Minerals	See discussion below.
PI	Surface Water and Groundwater Resources	See discussion below.
PI	Soils	See discussion below.
PI	Vegetation	See discussion below.
PI	Wetlands and Riparian Zones	See discussion below.
PI	Fish and Wildlife Resources	See discussion below.
PI	Special Status Species	See discussion below.
PI	Cultural and Historic Resources	See discussion below.
PI	American Indian Concerns	See discussion below.
PI	Socioeconomics	See discussion below.
NI	Environmental Justice	See discussion below.
PI	Visual Resources	See discussion below.
NI	Recreation	See discussion below.
PI	Paleontology	See discussion below.
PI	Access and Transportation	See discussion below.
PI	Solid Waste	See discussion below.
PI	Noise	See discussion below.
NI	Livestock Grazing	See discussion below.
NP	Prime Farmlands	See discussion below.
NP	Alluvial Valley Floors	See discussion below.
NP	Floodplains	No Federal Emergency Management Agency-designated floodplains are located within the Project Area.

[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.

Table 3-1 Resources and Determination of Need for Further Analysis

Determination*	Resource	Rationale for Determination
NP	Wild Horses	No Herd Management Areas are located within or near the Project Area.
NP	Wildfire Management	No public lands are located within or adjacent to the Project Area.
NP	Forest Management	No public lands managed for commercial timber are located within or adjacent to the Project Area.
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 or Scenic Rivers are located within or near the Project Area.
NP	Inventoried Roadless Areas	No inventoried roadless areas are located within or near the Project Area.
NP	Wilderness Areas	No Wilderness Areas or lands that meet the criteria for wilderness characteristics are located within or near the Project Area.
NP	Scenic Byways	No scenic byways are located within or near the Project Area.
NP	Realty Authorizations	No public lands that could have realty authorizations are located within or adjacent to the Project Area.
NP	Special use Authorizations	No public lands that could have special-use authorizations are located within or adjacent to the Project Area.

* NP = not present in the Project Area; NI = present but not affected to a degree that detailed analysis is required; and PI = present with the potential for impact; and analyzed in this EA.

3.1 General Setting

The Project Area is located approximately six miles (9.7 km) south of the City of Craig, Colorado, in Moffat County (**Figure 1-1**). The site lies along the north slope of the Williams Fork Mountains. Nearby communities include the cities of Craig and Hamilton.

The climate is semi-arid shrub steppe with strong seasonal variations. The mean annual precipitation is approximately 17.25 inches (43.8 centimeters [cm]) as measured at the weather station adjacent to the Trapper Mine office west of the Project Area. Between 33 and 50 percent of the precipitation is in the form of snowfall. Snowmelt runoff is the principal source of water for stream flows in northwest Colorado. The growing season is approximately 77 days.

Figure 2-1 depicts the Project Area and the SMCRA permit boundary. The existing disturbance as of July 1, 2015, and the future disturbance from July 1, 2015, through the life of mine within the Project Area also are shown on **Figure 2-1**. The Project Area is the focus of the Affected Environment for this EA. However, several resource discussions include a larger area, such as the SMCRA permit boundary or the region, in order to provide context for the resource.

3.2 Topography

The Trapper Mine is located along the northern slope of the Williams Fork Mountains, a 25-mile-long (40-km-long) west-northwest trending range that forms a long ridge with elevations ranging between 7,400 and 7,800 feet above mean sea level (amsl) (2,255 to 2,377 meters amsl). The Williams Fork Mountains form the drainage divide between the Williams Fork and Yampa rivers. The Yampa River flows generally east to west approximately 4.5 miles (7.2 km) north of the Project Area. The Williams Fork River flows into the Yampa River several miles west of the Project Area.

Elevations in the Project Area range from approximately 6,500 to 7,800 feet amsl (1,981 to 2,377 meters amsl). See Map M3 of the PAP for the pre-mining topography. The north slope of the Williams Fork Mountains drops at grades up to 15 percent near the crest and flattens out to an approximate 2 percent grade closer to the Yampa River.

3.3 Air and Climate Resources

3.3.1 Airshed Boundary

The airshed boundary was defined using a topographic/airshed approach. An assessment was conducted to determine the reasonable airshed where regional air quality impacts could occur. Boundaries were defined by topographic features and resulted in an area covering approximately 4,000 square miles (12,360 square km) (**Figure 3-1**).

The study area is identical to the study area defined for the Colowyo South Taylor/Lower Wilson Permit Expansion Area EA (OSMRE 2015). The airshed boundary covers southeastern sections of Moffat County, southwestern sections of Routt County, portions of northeastern Rio Blanco County, and a small section in extreme northern Garfield County. The Trapper Mine lies almost in the center of the airshed boundary.

The airshed boundary is presently designated as attainment or unclassified for all criteria air pollutants. Information on the measured air pollutant concentrations representative of the study area is included later in this section. As of October 2015, the only designated non-attainment area in Colorado is on the Colorado Front range for ozone (O_3).

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 prevalent with strong diurnal and seasonal temperature variations. The flow of Pacific air dominates the climate and 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 creates a large rain shadow effect over Nevada, Utah, and western Colorado.

The predominant air mass over the Rocky Mountain region during the winter season is continental polar with cold, dry air during storm-free periods. Storm systems that result in fine, light, powdery snow may become established during winter as the region lies within the mean winter storm track. During the summer, the air masses are generally maritime polar. The region is usually south of the main storm track in the summer; however, localized thundershowers and thunderstorms occur primarily during the afternoon if a moisture supply is available either locally or in the air mass (BLM 2006). Summertime thunderstorms have the potential for heavy rains that may cause flash flooding during extreme events.

3.3.3 Local Climate and Meteorology

An on-site meteorological monitoring station has existed at Trapper Mine since March 2015 (Station ID #5022). This monitoring station is equipped with a 10-meter (32.8-foot) tower that measures temperature, wind speed and direction, relative humidity, and solar radiation. The temperature and humidity measurements are collected at the 2-meter (6.6-foot) level. The Trapper Mine tower also collects data for barometric pressure, peak wind speed, temperature differences between the 10- and 2-meter levels ("delta temperature"), and standard deviation of wind direction (sigma-theta), which is computed with the on-site data logger. The monitoring site location is within the Trapper Mine at latitude/longitude coordinates of 40.4309°N (north) and -107.5322°W (west).

Additional data have been collected near the Trapper Mine at two locations. Trapper Mine personnel operate a National Weather Service Cooperative Station near the mine's administrative office (Station Craig 4SW, ID #051932) where temperature and precipitation data are collected. The latitude/longitude coordinates for Craig 4SW are 40.4505°N and -107.5894°W. Additional temperature data are collected at the Craig-Moffat County Airport (Station ID 24046), located at latitude/longitude coordinates of 40.4930°N, -107.5239°W. The Craig-Moffat County Airport elevation is approximately 6,191 feet amsl (1,887 meters amsl). **Table 3-2** summarizes the temperature and precipitation data collected from all three monitoring stations referenced above. A wind rose for the Trapper Mine on-site monitoring program for the period March 11 through December 10, 2015, is provided as **Figure 3-2**.

The warmest temperatures occur in July, with the mean temperature from the Craig-Moffat County Airport measuring 68.6 degrees Fahrenheit (°F). The coldest temperatures occur in January, with the mean temperature at the Craig-Moffat County Airport measuring 13.9°F.

Annual precipitation amounts averaged over the reporting period (2005 to 2014) ranged from 13.8 inches (35.1 cm) at the Craig-Moffat County Airport to 17.25 inches (43.8 cm) at the Craig 4SW, located at the Trapper Mine administrative office. The Craig 4SW monitoring station is located at a higher elevation, which explains the difference in the measured precipitation totals. September is the wettest month on average and February is the driest month on average.

The wind rose at the Trapper Mine shows a large dominance of winds from the south through southwest. Winds are from the south through southwest nearly 50 percent of the observed hours for the monitoring period (March 10, 2015, through December 10, 2015). Winds from the northeast quadrant occur with the lowest frequency. The majority of measured wind velocities are less than seven meters per second (roughly 15 miles per hour).

3.3.4 Regulatory Requirements

3.3.4.1 National Ambient Air Quality Standards

The regulatory framework for air quality includes both federal and state rules, regulations, and standards promulgated by the U.S. Environmental Protection Agency (USEPA) and implemented by the CDPHE. The CAA established the National Ambient Air Quality Standards (NAAQS) for seven criteria pollutants. The criteria pollutants are listed in **Table 3-3** and include carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), ozone (O_3), particulate matter 10 microns or less in diameter (PM_{10}), particulate matter 2.5 microns or less in diameter ($PM_{2.5}$), and sulfur dioxide (SO_2). The USEPA Administrator recently lowered the O_3 NAAQS from 75 to 70 parts per billion (ppb), as published in the Federal Register (FR) on October 26, 2015.

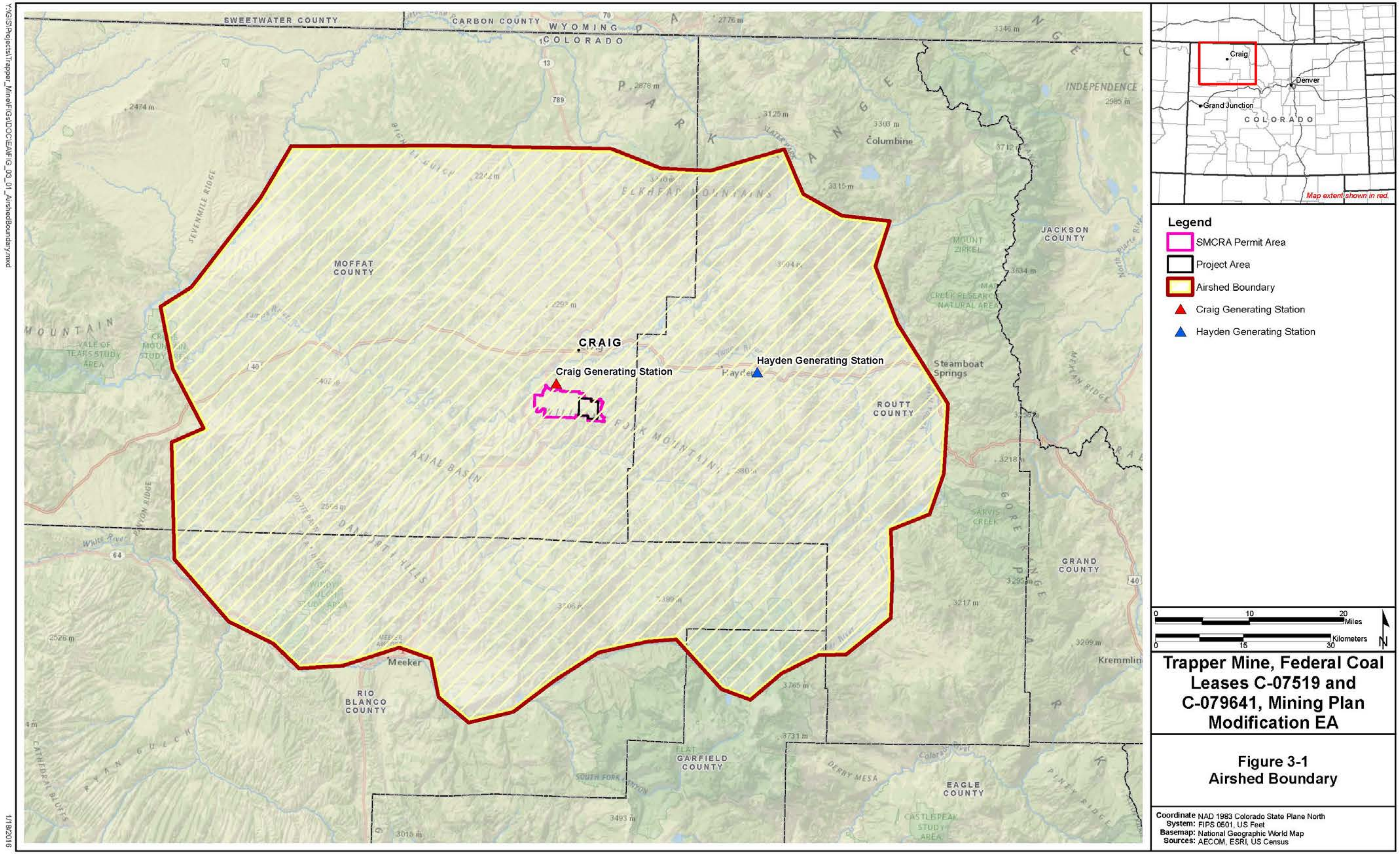

Figure 3-1
Airshed Boundary

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Table 3-2 Monthly Temperature and Precipitation Statistics: Craig, Colorado, and Vicinity Period of Record: 2005-2014, except where noted

Temperature (°F)

Station	Station Number		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Trapper Mine[1]	5022	Maximum	ND	ND	65.5	66.4	74.0	87.0	84.4	85.1	78.4	76.8	61.5	ND
		Minimum	ND	ND	24.3	19.2	25.7	45.5	49.8	42.1	40.5	28.2	5.0	ND
		Average	ND	ND	45.0	42.3	47.0	66.2	65.3	66.7	61.3	50.9	30.6	ND
Craig 4SW[2]	51932	Maximum	30.1	34.4	46.6	55.3	65.8	77.9	86.4	83.2	74.4	59.6	46.7	31.1
		Minimum	6.1	11.0	20.0	26.7	36.1	43.7	51.6	49.3	40.3	30.2	19.7	9.1
		Average	18.1	22.7	33.3	41.0	51.0	60.8	69.0	66.3	57.4	44.9	33.2	20.1
Craig-Moffat County Airport[2]	24046	Maximum	29.1	34.3	46.8	57.0	67.8	80.5	88.6	88.6	76.2	60.6	47.1	30.6
		Minimum	1.2	7.8	19.1	26.4	33.9	40.1	47.8	47.8	37.2	27.7	17.1	5.6
		Average	15.2	21.0	32.9	41.7	50.9	60.4	68.2	68.2	56.7	44.1	32.1	18.0

Precipitation (inches)

Station	Station Number		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Craig 4SW[2]	51932	Rainfall	1.23	0.97	1.44	1.80	1.71	1.10	0.91	1.36	2.02	1.85	1.03	1.83	17.25
		Snowfall	11.03	8.68	8.58	6.54	1.10	0.02	0.00	0.00	0.00	2.52	6.20	15.99	60.66
Craig-Moffat County Airport[2]	24046	Rainfall	0.84	0.61	0.99	1.40	1.47	1.13	0.97	0.97	1.91	1.49	0.92	1.19	13.89
		Snowfall	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

[1] Data was gathered on-site from the Trapper Mine. The Trapper Mine on-site data collection started in March 2015 and a complete one-year data set was not available at the time the EA was prepared.

[2] Data were gathered from the National Climate Data Center from January 2005 through December 2014, www.ncdc.noaa.gov/cdo-wed/datasets, except for Craig 4SW precipitation data which were taken from Trapper Mine records. The Craig 4SW Station is located adjacent to the Trapper Mine administrative office building and is operated by Trapper Mine personnel.

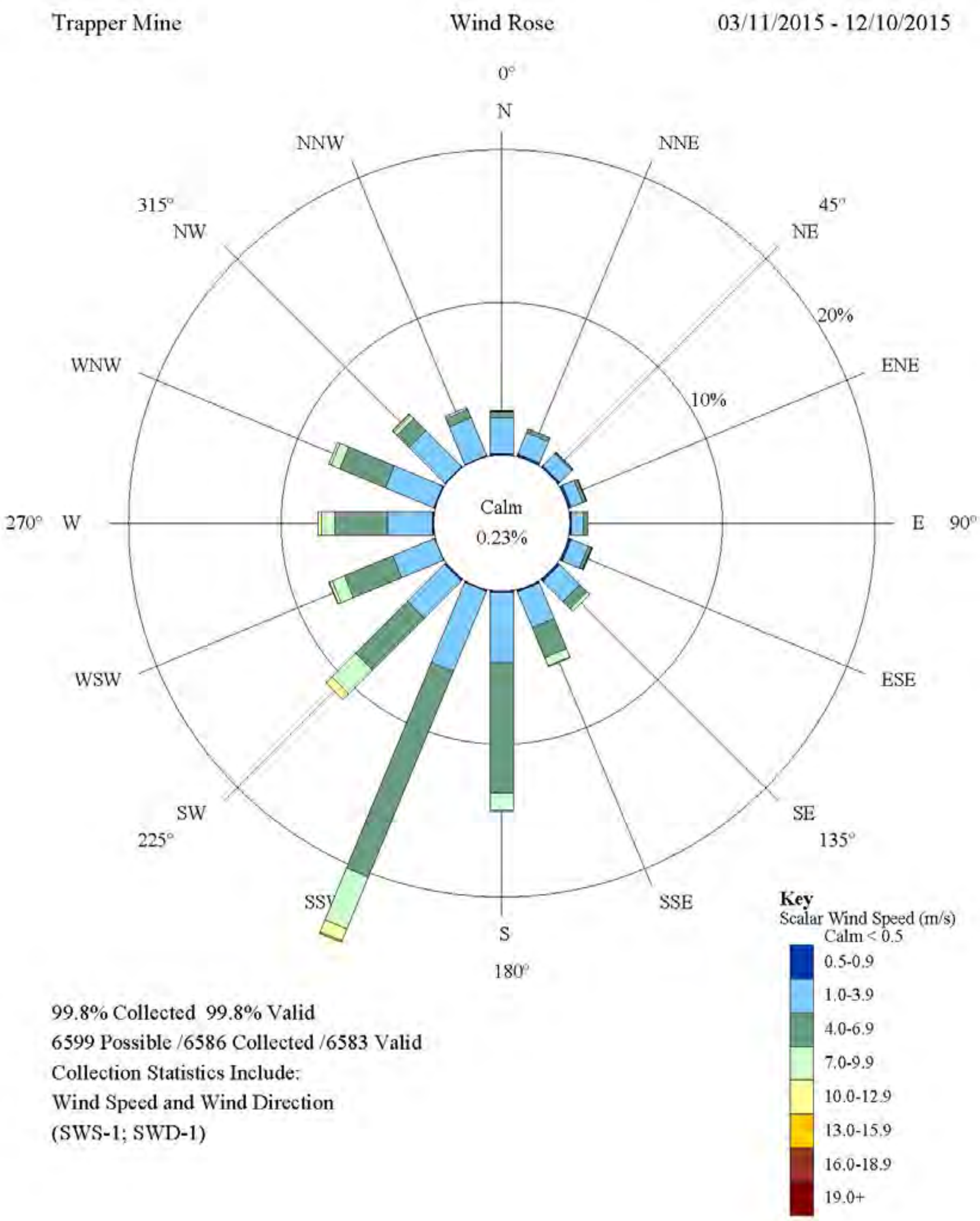

Figure 3-2 Trapper Mine Wind Rose 3/10/2015 - 12/10/2015

Table 3-3 National Ambient Air Quality Primary Standards

Pollutant		Average Time	National Standard	*Primary or Secondary Standard*	Form
CO		8-hour	9 ppm	*Primary*	Not to be exceeded more than once per year
		1-hour	35 ppm	*Primary*	
Lead		Rolling 3-month average	0.15 μg/m^3	*Primary & Secondary*	Not to be exceeded
NO_2		1-hour	100 ppb	*Primary*	98th percentile of the 1-hour daily maximum concentration, averaged over three years
		Annual	53 ppb	*Primary & Secondary*	Annual mean
O_3		8-hour	70 ppb	*Primary & Secondary*	Annual fourth-highest daily maximum 8-hour concentration, averaged over three years. USEPA announced a revised O_3 standard on October 26, 2015
Particle Pollution	$PM_{2.5}$	Annual	12 μg/m^3	*Primary*	Annual mean, averaged over three years
		Annual	*15 μg/m^3*	*Secondary*	*Annual mean averaged over three years*
		24-hour	35 μg/m^3	*Primary & Secondary*	98th percentile, averaged over three years
	PM_{10}	24-hour	150 μg/m^3	*Primary & Secondary*	Not to be exceeded more than once per year on average over three years
SO_2		1-hour	75 ppb	*Primary*	99th percentile of 1-hour daily maximum concentrations, averaged over three years
		3-hour	*0.5ppm*	*Secondary*	Not to be exceeded more than once per year

μg/m^3 = micrograms per cubic meter of air.

ppm = parts per million.

Pursuant to the CAA, the USEPA 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 airshed boundary (**Figure 3-1**) lies in the Western Slope Air Pollution Control Region as designated by the State of Colorado. USEPA designates whole or partial counties as attainment, unclassifiable, non-attainment, or maintenance for each criteria air pollutant. AQCRs classified as in attainment, are areas in which no pollutant has exceeded the NAAQS. Regions may be designated as unclassifiable if there is not sufficient ambient monitoring data from which to formally classify the area. However, in such cases, the unclassifiable region is still treated as being in attainment. A non-attainment classification represents an area in which one or more pollutants have exceeded the NAAQS. The maintenance designation is used when an area was formerly designated as non-attainment, but monitored pollutant levels have been reduced such that the area now attains the NAAQS. Moffat County and surrounding areas have been designated as attainment or unclassifiable for all criteria pollutants based on monitoring results that were below the applicable NAAQS.

Colorado state air quality standards are identical to the NAAQS, except that Colorado has a state-only standard for SO_2 equal to 0.267 ppm on a 3-hour average not to be exceeded more than once in any

12-month period. However, the 1-hour average SO_2 NAAQS (75 ppb or 0.075 ppm) is the more restrictive standard. Compliance with the 1-hour SO_2 NAAQS assures compliance with the State of Colorado 3-hour SO_2 standard.

3.3.4.2 Prevention of Significant Deterioration

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). Designated Class I PSD areas include national parks and wilderness areas in existence as of 1977 and exceeding a certain size. Allowable increments of increased pollution in these Class I areas are very small. Class II areas include all attainment and not classifiable areas not otherwise designated as Class I. Allowable increments of increased pollution in Class II areas are modest. Class III areas may be designated by states where industrial development is anticipated, but at the time of this writing, no Class III areas are designated in Colorado or elsewhere.

The region surrounding the Trapper Mine is listed as a Class II area. Nearby Class I areas are the Flat Top Wilderness (approximately 25 linear miles [40 km] from the Project Area) and the Mount Zirkel Wilderness (approximately 35 linear miles [56 km] from the Project Area). Dinosaur National Monument (approximately 70 linear miles [113 km] from the Project Area), is officially designated as Class II, but Colorado's state regulations treat this area as equivalent to a Class I area with regard to SO_2 concentrations. The designated PSD increment for each class is listed in **Table 3-4**.

Table 3-4 Prevention of Significant Deterioration Increments

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

[1] Increment represents the maximum allowable increase in concentration above the baseline concentration established by 40 CFR 52.21.

3.3.4.3 Title V Operating Permits

The CAA Amendments of 1990 introduced a new facility-wide Federal Operating Permit program, also known as Title V permits. Title V permits are required for facilities with the potential to emit more than 100 tons per year (tpy) of a regulated pollutant, 10 tpy of any single hazardous air pollutant (HAP), or 25 tpy of any combination of HAPs. Fugitive emissions count toward the major source applicability under Title V only for specifically listed emission source categories.

At Trapper Mine, the potential to emit (not counting fugitive emissions) is below the emissions threshold requiring a Title V Operating Permit. However, Title V operating permit requirements are typically applicable for the locations of final coal combustion and the Craig Station has been issued a Title V permit (Permit Number 960PMF155, issued May 1, 2005).

3.3.4.4 Emission Standards at Coal Combustion Sources

The CAA enacted the New Source Performance Standards (NSPS) and National Emissions Standards for Hazardous Air Pollutants for specific types of equipment located at new or modified stationary pollutant sources. NSPS regulations limit emissions from new, modified, or reconstructed emission units under the regulated source categories. Stationary sources typically meet the NSPS limits by installing modern equipment and/or adding air pollution control equipment. Specific to this EA, NSPS emissions standards apply to combustion of coal at the Craig Station. Other NSPS standards also may apply at the Craig Station related to coal processing (i.e., crushing and screening).

Beginning in 2011, the Craig Station and other electricity generating facilities became subject to new emission standards to reduce mercury and other toxic air pollution from coal and oil combustion at electric generating units (EGUs). 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 established HAP standards for new and existing coal- and oil-fired EGUs with a capacity of 25 MW or greater. All regulated EGUs are considered major sources under the final rule. While new sources must meet the standards at start-up of operations, existing sources generally have up to four years to comply with the Mercury and Air Toxics Standards (MATS). The emissions limits associated with the MATS rule are presented in **Table 3-5**. The Craig Station has already attained compliance with MATS for Units 1 and 2 and Unit 3 is scheduled to attain compliance by the end of 2015.

Table 3-5 MATS Emission Requirements[1]

		EGU Subcategory	Mercury Emission Limit (lb/GWh)
Coal- and Oil-Fired Units	Existing	Regular Coal	0.013
		Designed for Low Rank Coal[2]	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

1 The Supreme Court recently held that the USEPA did not properly consider the costs of the MATS rule. See *Michigan v. USEPA*, 192 L. Ed. 2d 674 (June 29, 2015). The consequences of this decision are still being assessed by USEPA and the lower courts. For purposes of the Trapper Mine EA, the analysis includes the 2011 MATS rule because the Craig Station has already complied with those standards.

2 Most of these units burn lignite coal.

lb/GWh = pounds of pollutant per gigawatt hour – electric output.

Source: USEPA February 16, 2012.

3.3.4.5 Visibility and Regional Haze

Visibility impacts are managed under a State Implementation Plan (SIP) for the reduction of Regional Haze (CDPHE 2014a). This regulation is intended to reduce the visibility impacts from existing facilities. The national visibility goal under the regional haze program is to return visibility to "natural conditions" (i.e., conditions present in the absence of anthropogenic air pollution) by 2064. The initial step in reducing visibility impairing emissions at EGUs is known as Best Available Retrofit Technology (BART).

The Craig Station has two units that are eligible for BART: Units 1 and 2. Under the Colorado Regional Haze SIP, Units 1 and 2 are required to meet emissions limits for NO_X that are based on the installation of a Selective Catalytic Reduction (SCR) to reduce NO_X emissions. The Craig Station is having SCR installed on Unit 1 by August 31, 2021, and on Unit 2 by January 31, 2018. These are the deadlines for BART controls per Colorado and USEPA regulations. The existing wet limestone scrubbers on Units 1 and 2 already meet the SO_2 emission limits in the Regional Haze SIP. According to modeling conducted as part of the BART analysis, the SCR NO_X emission controls will improve visibility in nearby Class 1 areas by 1.01 deciview (dv) at Unit 1 and by 0.98 dv at Unit 2. A deciview is a unit of measure for visibility and generally represents the change in light extinction that would be minimally perceptible to a normal human observer. Unit 3 at the Craig Station will have a Selective Non-Catalytic Reduction (SNCR) emission controls installed to reduce NO_X emissions. Modeling predicts these emission reductions will improve visibility in nearby Class I areas by 0.32 dv. The SNCR technology is new and must be installed on Unit 3 by December 31, 2017, per Colorado and USEPA regulations. Unit 3 already employs a spray dryer absorber to control SO_2 emissions, which meets the applicable emission limits in the Regional Haze SIP.

3.3.5 Regional Air Quality

The airshed boundary is currently classified as attainment or unclassified for all criteria pollutants. Monitoring of criteria pollutants in the region is generally performed near population centers or other locations of specific interest. Per USEPA guidelines, ambient monitoring is not required where pollutant concentrations are less than 60 percent of the NAAQS. As a result, the data described in this section are regionally representative, but are often from monitoring performed at some distance from the Project Area.

Table 3-6 summarizes the regional air quality data for northwestern Colorado as provided by CDPHE for Calendar Year 2014. For this EA, data are reported where the site is regionally representative of air quality conditions and located within the airshed boundary (**Figure 3-1**). If no monitoring data have been collected for a particular pollutant within the airshed boundary, a representative monitoring suite or sites from outside the study area were selected. Monitoring data collected where measurements are influenced by local industrial emission sources were omitted as such measurements are specific to the monitoring location and would not be generally representative of current conditions within the airshed boundary. Based on the reported data, all measured pollutant concentrations are below the applicable NAAQS. The measured O_3 concentrations listed in **Table 3-6** also are below the new 70 ppb NAAQS standard adopted by the USEPA in October 2015.

Table 3-6 Regional Air Quality

Monitor Location	Active Since	Monitoring Agency	Annual Samples	Elevation (feet)	Highest Measured Concentration During 2014		
					1-hour	8-hour	24-hour
PM_{10} (µg/m^3)							
Rifle	2005	CDPHE	120	5,340	NA	NA	47
Parachute High School	2001	CDPHE	119	5,100	NA	NA	39
Steamboat Springs	1987	CDPHE	346	6,740	NA	NA	84

Table 3-6 Regional Air Quality

Monitor Location	Active Since	Monitoring Agency	Annual Samples	Elevation (feet)	Highest Measured Concentration During 2014		
					1-hour	8-hour	24-hour
$PM_{2.5}$ (ppb)							
Rangely	2011	BLM	325	5,430	NA	NA	17.8
NO_2 (ppb)							
Rangely	2011	BLM	8,592	5,430	19.6	NA	NA
Meeker	2011	BLM	8,584	6,540	6.1	NA	NA
SO_2 (ppb)							
Walden- Colorado Chandler Ranch	2012	USFS	4,452	7,930	1	NA	0.5
Williams Willow Creek	2012	Private	Hourly	*6,400*	1 (2012)	NA	1 (2012)
CO (ppm)							
Walden – Colorado, Chandler Ranch	2013	USFS	4,330	7,930	0.3	0.3	NA
O_3							
Rifle	2009	CDPHE	192 days	5,380	NA	0.062	NA
Meeker	2010	BLM	206 days	6,540	NA	*0.063*	NA
Rangely	2011	BLM	203 days	5,430	NA	*0.066*	NA
Lay Peak	2012	CDPHE	212 days	6,240	NA	0.067	NA

NA = not applicable; no air quality standard exists for the pollutant and averaging time.

USFS – U.S. Forest Service

3.3.5.1 Particulate Matter (PM_{10}/$PM_{2.5}$)

Representative PM_{10} measurements have been collected at three monitoring locations in northwest Colorado; one in Rifle, one in Steamboat Springs, and one in Parachute. Data from 2014 also are available for Grand Junction but are not included here as the other data are more representative of the EA airshed boundary. The highest 24-hour concentration for Parachute measured during 2014 was 39 $\mu g/m^3$, the highest 24-hour concentration for Rifle was 47 $\mu g/m^3$, and the highest 24-hour concentration for Steamboat Springs was 84 $\mu g/m^3$.

Representative $PM_{2.5}$ measurements were collected during 2014 at Rangely, Colorado. The maximum 24-hour average $PM_{2.5}$ concentration from this site was 17.8 $\mu g/m^3$.

All measured values are currently below the NAAQS (PM_{10} = 150 $\mu g/m^3$, $PM_{2.5}$ = 35 $\mu g/m^3$). The reported concentrations in **Table 3-6** are conservative with respect to the NAAQS. The table lists the maximum measured concentration during 2014, and NAAQS compliance is assessed using the second-highest 24-hour average concentration for PM_{10} and the three-year average of the 98th percentile 24-hour average concentration for $PM_{2.5}$*. In a complete one-year data set (365 samples),* the 98th percentile concentration is the 8th highest daily value.

3.3.5.2 Nitrogen Dioxide (NO_2)

The nearest representative NO_2 data for the airshed boundary were collected at the U.S. Department of Agriculture (USDA) Upper Colorado Environmental Plant Center in Meeker Colorado. The maximum hourly NO_2 measured at the site during 2014 was 6.1 ppb. *NO_2 data are also reported for Rangely,* *where the measured concentration was 19.6 ppb; however, the Rangely monitoring site lies outside the defined Trapper EA airshed boundary.* For comparison, the 1-hour NO_2 NAAQS of 100 ppb is calculated as the three-year average of the 98th percentile maximum daily 1-hour concentration. *In a complete one-year data set (365 samples),* the 98th percentile concentration is the 8th highest daily value.

Near the Trapper Mine, local NO_2 concentrations are most likely linked to emissions from the Craig Station. NO_X emissions at Craig Station occur from coal combustion at the power plant boilers. As referenced in Section 3.3.4.5, improved NO_X emission controls are being installed at the Craig Station per the Colorado Regional Haze SIP. As a result, a future reduction in NO_X emission levels from the Craig Station is anticipated.

3.3.5.3 Sulfur Dioxide (SO_2)

The nearest representative SO_2 data for the airshed boundary were collected at Chandler Ranch, near Walden, Colorado and also at a private monitoring site near the Williams Willow Creek Plant in Rio Blanco County, Colorado. The maximum hourly SO_2 measured at Chandler Ranch during 2014 was at or below 1 ppb. Williams Willow Creek also recorded a maximum 1-hour SO_2 concentration at or below 1 ppb, but this monitor only operated during 2012. For comparison, the 1-hour SO_2 NAAQS is 75 ppb, calculated as the three-year average of the 99th percentile maximum daily 1-hour concentration. *In a complete one-year data set (365 samples),* the 99th percentile concentration is the 4th highest daily value.

Near the Trapper Mine, local SO_2 concentrations are most likely linked to emissions from the Craig Station. SO_2 emissions at Craig Station occur from coal combustion at the power plant boilers. As referenced in Section 3.3.4.5, the Craig Station already controls SO_2 emissions using either a wet scrubber (Units 1 and 2) or a spray dryer absorber (Unit 3).

3.3.5.4 Carbon Monoxide (CO)

The nearest representative CO monitoring data for the airshed boundary were collected at Chandler Ranch, near Walden. CO is predominantly an urban air pollutant, generally associated with combustion emissions from motor vehicles.

The measured concentrations were very low, which is characteristic of a remote location located away from urban emission sources. The maximum CO measured at Chandler Ranch during 2014 was 0.3 ppm for both the maximum 1-hour and 8-hour concentrations. For comparison, the CO NAAQS is 35 ppm for the 1-hour average and 9 ppm for the 8-hour average.

3.3.5.5 Ozone (O_3)

Representative O_3 measurements in northwest Colorado are collected at several locations: Rifle, Rangely, Meeker, and Lay Peak (west of Craig near Maybell). The monitoring at Rifle, Rangely, and Meeker are seasonal monitors, where the Lay Peak monitor has operated continuously since 2012.

All of the monitors show similar *annual* O_3 levels, with the peak 8-hour average concentrations during 2014 in the range of 62 to 67 ppb. By comparison, the O_3 NAAQS is 70 ppb, measured as the three-year average of the 4th highest daily maximum 8-hour average concentration. The measured O_3 are currently under the new O_3 NAAQS based on the 2014 monitoring data provided above. *However, a formal determination of compliance with the new O_3 NAAQS requires at least three years of data.*

3.3.6 Industrial Source Emissions Inventory

The airshed boundary is generally rural with anthropogenic emission sources dominated by mining, power generation, oil and gas production, and aggregate (sand and gravel) processing. The CDPHE requires permits for all new and/or modified sources of air quality emissions. The air quality permit program dates back to about 1970. Only non-major sources in existence prior to the initial adoption of the Colorado Air Quality Control Commission Regulation 3, Stationary Source Permitting and Air Pollutant Emission Notice (APEN) Requirements, would be exempt from the permit requirements.

Trapper Mine operates pursuant to an air quality permit issued by CDPHE. Regulated emissions in Trapper Mine's permit include particulate matter associated with mining operations (i.e., drilling, blasting, coal and overburden excavation and handling, etc.), coal hauling to the Craig Station, and emissions associated with placement of CCRs within the mine site. Gaseous emissions associated with blasting also are regulated. Trapper Mine's air quality permit was most recently issued in 2009 and has no set expiration date. This permit would be modified as needed to address future changes in mining operations and/or changes in air pollution regulatory requirements.

Certain activities are exempt from CDPHE stationary source permit requirements. Emission source, such as dust from most paved and unpaved public roads, most agricultural operations, recreational activities, and emissions from mobile sources (e.g., automobiles, trucks, etc.,) do not require stationary source permits. However, these sources may still be regulated by CDPHE as they have the capacity to impact regional air quality. Any impact associated with emissions from these sources would be reflected in the regional air quality data described in the previous section.

Two existing coal-fired EGUs are currently operating in the airshed boundary. The Craig Station is located adjacent to the Trapper Mine and is operated by Tri-State Generation and Transmission Association Inc. The Craig Station consists of three coal-fired steam driven EGUs (Units 1, 2, and 3) with a net electric generating capacity of 1,264 MW.

The other local EGU is the Hayden Station owned and operated by the Public Service Company of Colorado, located approximately 16 miles (25.7 km) from Craig and four miles (6.4 km) east of Hayden (21 miles [33.8 km] from the Craig Station). It consists of two coal-fired steam-driven EGUs (Units 1 and 2). Hayden Station Units 1 and 2 have a combined rating of 446 MW.

Actual emissions data for both the Craig Station and Hayden Station are listed in **Table 3-7**.

Table 3-7 Craig Station and Hayden Station: Reported Actual Emissions (2014)

EGU	2014 APENs Annual Actual Pollutant Emissions (tpy)						
	PM_{10}	$PM_{2.5}$	CO	NO_2	SO_2	VOC	HAPs
Craig	134.6	84.1	1669.3	13379.3	3763.3	58.0	52.26
Hayden	148.3	67.5	385.1	6483.6	2330.7	49.2	15.08

VOC = volatile organic compound.

3.3.7 Greenhouse Gas Emissions and Climate Change

The primary natural and synthetic GHGs in the Earth's atmosphere are water vapor, CO_2, methane (CH_4), nitrous oxide (N_2O), 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.

CO_2 emissions occur from the combustion of fossil fuels (i.e., oil, natural gas, and coal) by industry and in the transportation sector, and as a result of other chemical reactions (e.g., the manufacture of cement). CH_4 emissions occur from livestock and other agricultural practices and also from the decay of organic waste placed in municipal solid waste landfills. CH_4 also is emitted during the production and transport of coal, natural gas, and oil. The largest natural source of CH_4 is wetlands where bacteria decompose organic matter in the absence of oxygen. Other natural CH_4 sources include termites, oceans, sediment, volcanoes, and wildfires. N_2O is emitted during agricultural and industrial activities, as well as during combustion of fossil fuels and solid waste. Fluorinated gases, while not abundant in the atmosphere, are powerful GHGs that are emitted from a variety of industrial processes and are often used as substitutes for O_3-depleting substances (e.g., chlorofluorocarbons, hydrochlorofluorocarbons, and halons).

NAAQS do not exist for GHGs. In its Endangerment and Cause or Contribute Findings for Greenhouse Gases under CAA Section 202(a) (FR EPA-HQ-OAR-2009-0171), USEPA determined that GHGs are air pollutants subject to regulation under the CAA. USEPA acted on its understanding that GHG pollutants have long-term impacts on the climate because of their increasing concentrations in the earth's atmosphere, which has been tied to industrialization and the burning of fossil fuels. GHGs can be produced from the direct process of coal mining and from the combustion of mined coal. The amount of GHG emissions associated with these processes varies depending on the mining technique used (i.e., surface versus underground mining) and combustion technologies employed.

USEPA has regulated six key GHGs: CO_2, CH_4, N_2O, hydrofluorocarbons (HFC), perfluorocarbons (PFC), and sulfur hexafluoride (SF_6). Because CO_2 is the most prevalent of the regulated GHGs, the USEPA references the impact of GHG emissions in terms of their equivalence to CO_2 or carbon dioxide equivalent (CO_2e). In addition to the USEPA estimates, the International Energy Agency estimated global emissions to be 29,000 million metric tons (MMT) CO_2e in 2008. On a regional scale, CDPHE (2014) estimated the total 2010 (Calendar Year) GHG emissions to be 130 MMT CO_2e for the State of Colorado.

The USEPA 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, and 71). Under the USEPA'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 such as the Trapper Mine.

The USEPA Tailoring Rule was, in part, struck down by a 2014 Supreme Court decision. Based on the Supreme Court decision, a facility would be subject to PSD permitting for GHGs only if it has the potential to emit GHGs in excess of 100,000 tpy of CO_2e and also if the facility exceeded the PSD major source threshold for one or more criteria pollutants. For existing facilities this review would take place during any subsequent modifications to the facility that would trigger PSD review. Based on emission estimates for the Trapper Mine, no GHG reporting or permitting would currently apply to the mine given that the mine is not a major source for non-GHG pollutants. However, GHG emissions reporting does apply to the Craig Station and future GHG permitting could apply for future modifications (if any). The USEPA also has recently adopted regulations for GHG emissions from new and existing fossil fuel-fired EGUs (the USEPA Clean Power Plan), although the new USEPA regulations have been challenged in court.

The USEPA 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.). With so many GHG emission sources, from cattle to vehicles to electric power generators, no single source represents a significant percentage of national emissions.

Table 3-8 shows GHG emissions by economic sector as reported during 1995, 2000, and 2007 in units of CO_2e (USEPA 2015). Compared to 2000, the 2007 U.S. GHG emissions decreased slightly. The contribution of each major economic sector to the GHG emissions total also is shown. Note that for CO_2, "Land Use, Land-Use Change, and Forestry" represents a sink rather than a source, and is therefore presented in parentheses.

Table 3-8 U.S. Greenhouse Gas Emissions Allocated to Economic Sectors

Implied Sectors	1995 (MMT CO_2e)	2000 (MMT CO_2e)	2007 (MMT CO_2e)
Electric Power Industry	1,989.0	2,329.3	2,445.1
Transportation	1,685.2	1,919.7	1,995.2
Industry	1,524.5	1,467.5	1,386.3
Agriculture	453.7	470.2	502.8
Commercial	401.0	388.2	407.6
Residential	368.8	386.0	355.3
U.S. Territories	41.1	47.3	57.7
Total Emissions	6,463.3	7,008.2	7,150.1
Land Use, Land-Use Change, and Forestry (Sink)	(851.0)	(717.5)	(1,062.6)
Net Emissions (Sources and Sinks)	**5,612.3**	**6,290.7**	**6,087.5**

Table 3-9 (USEPA 2015) shows total U.S. GHG emissions reported for 1995, 2000, and 2007 for each major GHG contributor (CO_2, CH_4, N_2O, etc.). This table also shows the largest emissions/sinks for each gas/source.

Table 3-9 U.S. Greenhouse Gas Emissions and Sinks

Gas/Source	1995 (MMT CO_2e)	2000 (MMT CO_2e)	2007 (MMT CO_2e)
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
Land Use, Land-Use Change, and Forestry (Sink)	(851.0)	(717.5)	(1,062.6)
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

Table 3-9 U.S. Greenhouse Gas Emissions and Sinks

Gas/Source	1995 (MMT CO_2e)	2000 (MMT CO_2e)	2007 (MMT CO_2e)
HFCs, PFCs, and SF_6	***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**
Net Emissions (Sources and Sinks)	**5,612.3**	**6,290.7**	**6,087.5**

Secondary GHGs do not have a direct atmospheric warming effect, but indirectly affect terrestrial radiation absorption by influencing the formation and destruction of tropospheric and stratospheric O_3, 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.

National SO_2 emissions across the U.S. are listed in **Table 3-10**. SO_2 emission levels have decreased since 1995, primarily due to increased emission controls for SO_2, including the increased use of low sulfur coal from mines in the western states.

Table 3-10 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

3.3.8 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 (e.g., diesel trucks and locomotives). Black carbon is a likely by-product that would be emitted from haul trucks and other diesel-powered equipment used during coal mining operations. Black carbon is an unregulated pollutant; however, the USEPA does regulate diesel fuel quality, such that in recent years diesel fuel quality has been improved by placing maximum limits on fuel sulfur content.

Black carbon emissions also can be associated with coal combustion. Black carbon from coal combustion is linked with visibility impairment and regional haze because black carbon is the most strongly light-absorbing component of particulate matter. However, measurements for visibility impairment typically show other atmospheric pollutants such as sulfate, nitrates, and organics are larger contributors to visibility impairment compared to black carbon.

3.4 Geology and Minerals

3.4.1 Geology

The Trapper Mine is located in the Yampa coal field that is composed of coal-bearing rocks that are Upper Cretaceous in age. The coal-bearing rocks mainly outcrop south of the Yampa River in northwest Colorado. The Yampa coal field extends east to west about 50 miles (80.5 km) and is about 40 miles (64.4 km) north to south.

The surface bedrock in the Trapper Mine Project Area is mainly the Upper Cretaceous Williams Fork Formation, which is part of the Mesaverde Group, a regional unit that contains a large coal resource in northwest Colorado (Brownfield and Johnson 2008). The Williams Fork Formation consists of interbedded sandstones, siltstones, shale, and coals and crops out along a six-mile-wide (9.7-km) belt that extends along the entire length of the Williams Fork Mountains (Tweto 1976). The Williams Fork Formation is underlain by the Illes Formation, also part of the Mesaverde Group. The Illes Formation is lithologically similar to the Williams Fork Formation consisting of sandstones, mudstones, carbonaceous shale, and coal (Brownfield and Johnson 2008). The Lewis Shale, which is stratigraphically higher than the Mesaverde Group, outcrops in the northern extremity of the SMCRA permit area. The Lewis Shale also is Upper Cretaceous in age and is composed of uniform dark-gray marine shale, but also contains thin sandstones (Johnson 1987; Tweto 1976). Surficial deposits consist of alluvium, residuum derived from the Williams Fork Formation and the Lewis Shale, and landslide deposits (Madole 1989). Quaternary alluvial deposits composed of sand, silt, clay, and gravel are present in the stream drainages in the permit area and surrounding areas, but alluvium is thickest in the Yampa River and Williams Fork River valleys (CDRMS 2013). Residuum is composed of sand, silt, clay, gravel, and boulders derived from the underlying bedrock.

The landslide deposits that are part of the surficial deposits are either rotational slides or earthflows and involve the Williams Fork Formation (Madole 1989). A major landslide occurred at the mine in October 2006 (CDRMS 2013). Prior to the slide, there was heavy precipitation that facilitated the movement of an estimated 35 million cubic yards of material with original in-place dimensions of 250 acres and 100 feet (30.5 meters) deep (Buchsbaum 2011). The material was largely contained in an active pit, but the slide made it necessary for the mine to alter its mine plan.

Structurally, the mine is bounded on the west, north, and northeast by three major folds. From west to east, the Williams Fork Anticline, Big Bottom Syncline, and Breeze Mountain or Buck Peak Anticline (Brownfield and Johnson 2008). At the mine, the beds of the Williams Fork Formation dip generally to the north at an altitude of 14 to 16 degrees. The Project Area lies on the south flank of the Sand Wash Basin, a structural basin which is the southeast extension of the Greater Green River Basin (Horn and Richardson 1959; TMI 1981 et seq.).

The region is not very seismically active. From 1979 to 2014, there were 48 earthquake events greater than 1.0 magnitude within a 60-mile (96.6-km) radius of the mine, with no events with a magnitude greater than 4.3 (U.S. Geological Survey [USGS] 2015). No major faults have been found in the permit area (CDRMS 2013). A large unnamed down-to-the-north normal fault lies about two miles (3.2 km) south of the SMCRA permit area in T9N, R90W (Brownfield and Johnson 2008; Tweto 1976). The fault as mapped by Tweto (1976) is about four miles (6.4 km) long and is not classified as active. No active faults have been identified in the area (USGS and Colorado Geological Survey 2006). There is a low probability of strong ground motion if a maximum credible earthquake were to occur in the vicinity. Horizontal ground motions are expected to be 18 to 20 percent of the acceleration gravity with a 2 percent probability of exceedance in 50 years (Petersen et al. 2015).

3.4.2 Mineral Resources

Coal has been mined in the Yampa coal field since 1864, and 192 surface and underground mines have been identified (Johnson et al. 2000). The cumulative production from the Yampa coal field to 2014 is estimated to be almost 600 million tons (Carroll 2004; CDRMS 2015). In the Project Area, the Williams

Fork Formation consists of three members: the lower Williams Fork, Twentymile Sandstone, and upper Williams Fork (CDRMS 2013). The upper Williams Fork member contains the coals that are mined at the Trapper Mine and are designated (from lowest to highest): R, Q, M, L, K, I, and H. Historical development began in 1954, and modern coal production began in 1977. Annual production has varied from 1.5 to about 2.5 mtpy (Colorado Mining Association 2015; TMI 2015). Total cumulative production over the entire life of the mine is expected to be 74 million tons (CDRMS 2013). The coal seams that are mined at the Trapper Mine have consisted of a mixture of subbituminous A, B, and C, and high-volatile bituminous C coals. Average, as-received, values of ash yield are 7.05 percent and sulfur content is 0.40 percent, with a heat value of 9,931 British thermal units per pound (Johnson et al. 2000).

Other important mineral resources in the vicinity of the Trapper Mine Project Area are oil and gas. To the north of the mine are the Craig and Buck Peak fields and to south are the Williams Fork and Horse Gulch fields (Colorado Oil and Gas Conservation Commission [COGCC] 2015). The oil and gas production comes from mostly upper and lower Cretaceous units, but the Williams Fork field also produces from Jurassic, Triassic, and Permian formations. In 2011, oil and gas production was established just outside of the mine permit boundary in the east half of Section 30, T6N, R90W. Two wells have cumulatively produced approximately 43,000 barrels of oil, 92 million cubic feet of gas, and 420 barrels of water from a nominal depth interval of 6,700 to 8,100 feet (2,042 to 2,469 meters) (true vertical depth) in the Niobrara Formation.

There are numerous gravel pits located in the alluvium of the Yampa River and other local drainages (Guilinger and Keller 2002). Stone also is quarried in the area. No other important mineral resources were identified in the vicinity of the Project Area.

3.5 Water Resources

3.5.1 Surface Water

The Project Area is located in the Upper Yampa River watershed, which is part of the Upper Colorado River Basin (USGS 2015). The Yampa River is the principal drainage within the watershed. It flows north from its headwaters in the Gore Range before making a westerly turn at Steamboat Springs, Colorado. Downstream of Craig, the Yampa River is joined by the Williams Fork River, one of its major tributaries. The Williams Fork Mountains form the drainage divide between the Yampa River to the north and the Williams Fork River to the south.

TMI has extensive monitoring data for surface water quantity and quality within and adjacent to the SMCRA permit boundary. The following discussion provides a general understanding of surface water resources in the vicinity of the Project Area and within and adjacent to the broader SMCRA permit boundary.

Because the SMCRA permit boundary is located primarily on the north side of the Williams Fork Mountains, most of the smaller drainages within the boundary flow north and west to the Yampa River. These drainages include Buzzard Gulch, Coyote Gulch, No Name Gulch, Johnson Gulch, Pyeatt Gulch, Grouse Gulch, Sage Gulch, Oak Gulch, Flume Gulch, and Deacon Gulch. A small portion of the SMCRA permit area is located south of the Yampa-Williams Fork drainage divide and drains to the Williams Fork River. Tributaries to the Williams Fork within the SMCRA permit boundary include Ute Gulch, Castor Gulch, Horse Gulch, and Deal Gulch. Of these drainages, only Pyeatt, Sage, Oak, Flume, Deacon, Horse, and Deal Gulches cross the Project Area (**Figure 3-3**).

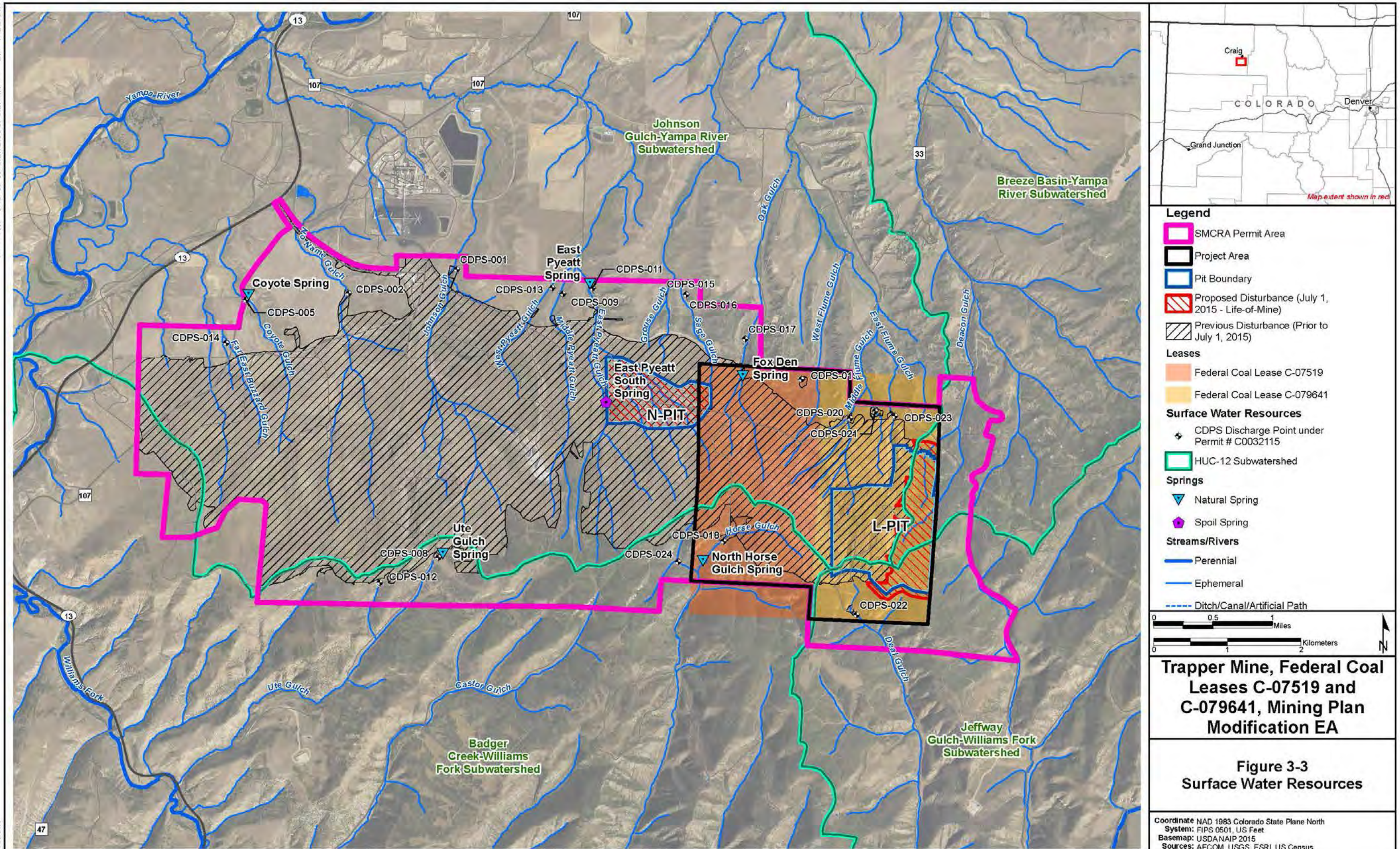

Figure 3-3
Surface Water Resources

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Surface water morphology in the area is influenced by the lithology and orientation of the underlying bedrock. The mine is located on the south limb of the Big Bottom syncline. Geologic formations within the syncline are dipping to the north at approximately the same angle as the topographic gradient. As a result, the Williams Fork Formation is present near the ground surface for long stretches, and surface water drainages continuously flow across the same geologic material. The resulting drainage pattern is dendritic, with broad swales in the upland areas that transition to broad valleys 50 to 100 feet (15.2 to 30.5 meters) deep (TMI 1981 et seq.). On the south side of the Williams Fork Mountains, the overall slope of the land surface is much steeper, with outcrops of resistant sandstone forming cliff faces in some areas. The steep slopes and bedrock control of channels produce a trellis drainage pattern.

The drainages north of the Williams Fork Mountains typically exhibit stream gradients ranging from 0.088 to 0.11 feet/foot (TMI 1981 et seq.). Profile views of the stream channels reveal that the stream gradient is typically higher in the upstream reaches and flattens out in the downstream direction. This geometry is a sign of the relative youth of the drainage system. The streams have continuously lowering gradients through incision in their upper reaches. This is occurring in both alluvial and non-alluvial geologic material. The stream incisions likely progress upstream during the annual spring runoff, which may initiate some natural gullying on the side slopes adjacent to the channels as the base level of the slopes is lowered. Erosion scars created by this head-cutting are naturally re-vegetated throughout the year (TMI 1981 et seq.).

The Project Area drainages are uniformly classified as ephemeral streams. Stream flow occurs mainly in response to spring snowmelt, summer thunderstorms, seeps originating in the upper bedrock aquifers, and groundwater discharge during periods of high precipitation. Annual runoff from the Trapper Mine has been estimated at approximately 1 inch per unit area (TMI 1981 et seq.). Based on this estimate, the Trapper Mine SMCRA permit area contributes approximately 730 acre-feet of runoff to the Yampa River and 200 acre-feet of runoff to the Williams Fork River each year (AECOM 2015).

Surface water flow is highly seasonal in the area, even for perennial drainages like the Yampa River and Williams Fork River. Previous investigations have documented that approximately 65 percent of annual flow in the Yampa Valley occurs in May and June, with up to 85 percent occurring from April to July (Steele et al. 1979). Baseflow throughout the remainder of the year is supplied mainly from groundwater discharge.

Stream flows in the ephemeral drainages within the SMCRA permit area also are highly variable. TMI collected baseline flow data for the SMCRA permit area in the late 1970s and early 1980s. The most complete baseline dataset available is for CDPS Site 002 on No Name Gulch located west of the Project Area. The flow data for this site, plotted on **Figure 3-4** below, shows that No Name Gulch is dry for the majority of the year. Brief pulses of sustained flow occurred in March 1979, August 1979, February 1980, and April 1980. These data reinforce the notion that flow in Project Area drainages mainly occurs in response to spring snowmelt and occasional summer thunderstorms.

Mine records indicate that from approximately 1981 to 1986, perennial flow occurred in East Pyeatt Gulch outside of the Project Area but within the SMCRA permit boundary and in Middle Flume Gulch (referred to as the East Middle Flume Gulch in the baseline water quality discussion in the TMI PAP) which drains the Project Area. This period of sustained flow was attributed to groundwater discharge from alluvium and seep flow originating from bedrock aquifers (TMI 1981 et seq.). TMI used streamflow hydrographs collected during this time frame to estimate the baseflow and runoff contributions in each stream. The average flow rate at East Pyeatt Gulch was approximately 0.36 cubic feet per second (cfs), with about 75 percent of the flow originating from groundwater discharge and 25 percent derived from runoff. At Middle Flume Gulch, contributions from baseflow and runoff were found to be approximately equal, and amounted to an average total flow rate of 0.16 cfs (TMI 1981 et seq.).

Local seeps and springs resulting from groundwater discharge also may contribute to surface water flows in the Project Area. TMI initiated a detailed survey of spring locations within the SMCRA permit boundary in 1997. This survey identified a number of natural springs that existed prior to mining, including Coyote Spring, East Pyeatt Spring, Fox Den Spring, Ute Gulch Spring, and North Horse Gulch Spring (**Figure 3-3**). The 1997 survey also identified several spoil springs within or adjacent to mined and backfilled areas. These spoil springs are not naturally occurring but likely formed as a result of mining activity. East Pyeatt South Spring is the only spoil spring that is currently monitored at the mine (**Figure 3-3**). Other spoil springs that were monitored historically were removed from the monitoring program when the area where the springs are located was included as part of the Phase III bond release (TMI 1981 et seq.). Bond release has resulted in discontinuing monitoring at some CDPS outfall locations, including sites 003 (East Buzzard Gulch), 006 (West Buzzard Gulch), and 010 (Elk Gulch). These outfalls were removed from the Trapper Mine's CDPS permit following Phase III bond releases.

Flow measurements for the natural springs are available dating back to the 1990s. The spring flows vary depending on the time of year and the amount of precipitation that has fallen compared to historical averages. Coyote Spring is the only natural spring that appears to be perennial. Based on records dating back to 1992, flow rates at this spring have ranged from a low of 0.02 gallons per minute (gpm) in May 2003 to a high of 16 gpm in May 1999. Flow rates at the other natural springs have ranged from a low of 0 to highs of 130 gpm, 10 gpm, 25 gpm, and 11 gpm for East Pyeatt, Fox Den, North Horse Gulch, and Ute Gulch springs, respectively. At the spoil spring known as East Pyeatt South, flow rates have been measured semi-annually since 2005. During that time the lowest recorded flow was approximately 2 gpm in September 2006, and the highest recorded flow was 75 gpm in June 2011 (Hydro-Engineering 2015).

From 1974 to 1977, baseline water quality samples were collected from surface water monitoring locations in the Project Area vicinity. Since most streams within the SMCRA permit boundary were not disturbed at the onset of mining, much of the water quality data from the late 1970s and early 1980s also reflects baseline conditions (TMI 1981 et seq.). Several of the baseline sampling locations were later converted to sampling points under TMI's CDPS permit, including S1 (CDPS Site 020), S3 (CDPS Site 011), S5 (CDPS Site 002), and S11 (CDPS Site 005). The CDPS sampling locations are shown on **Figure 3-3**.

Water quality data from TMI's baseline monitoring program indicate that ephemeral streams in the SMCRA permit area generally have poorer water quality than the perennial streams they flow into. For example, at the USGS station on the Yampa River below Craig, the average total dissolved solids (TDS) concentration during the early 1980s was 202 milligrams per liter (mg/L). The average TDS concentration at the mouth of the Williams Fork was 261 mg/L during the same timeframe (Maura 1982). In contrast, baseline data from drainages within the mine permit boundary had average TDS values ranging from 1,180 mg/L at Middle Flume Gulch (CDPS Site 020) to 2,070 mg/L at East Pyeatt Gulch (CDPS Site 011). The TDS concentration was even higher at a downstream location on Flume Gulch, with an average value of 3,540 mg/L (TMI 1981 et seq.). These measurements are comparable to an independent water quality study conducted by the USGS, which found an average TDS downstream in Flume Gulch of 3,790 mg/L (Maura 1982). The difference in water quality between large perennial streams like the Yampa River and smaller ephemeral drainages is due to differences in flow volume and input sources for each type of stream. The perennial streams receive a much larger volume of low-TDS snowmelt runoff that effectively dilutes higher TDS inflows derived from smaller tributaries and groundwater discharge.

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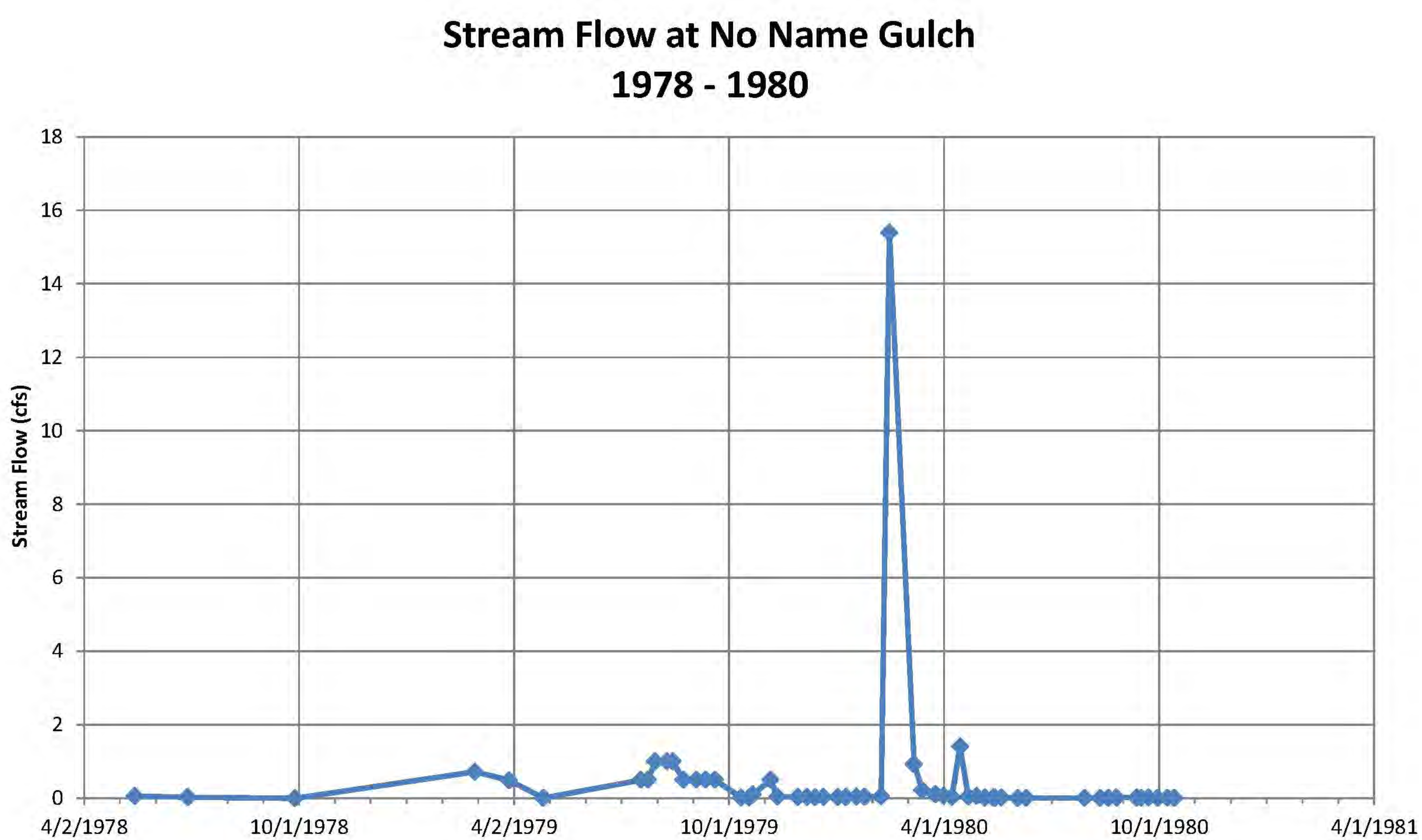

Trapper Mine, Federal Coal Leases C-07519 and C-079641, Mining Plan Modification EA

**Figure 3-4
Stream Flow at
No Name Gulch**

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The segment of the Yampa River from Elkhead Creek to the Green River is listed on Colorado's Section 303(d) list for iron impairment and on the State's monitoring and evaluation list for sediment (CDPHE 2012). Ephemeral streams within the SMCRA permit boundary could contribute iron and sediment to this impaired segment. Baseline water quality monitoring performed between 1975 and 1977 indicated that average iron concentrations in Flume Gulch, East Pyeatt Gulch, Johnson Gulch, and No Name Gulch were generally below the 1 mg/L water quality standard for the Yampa River (CDPHE 2015). However, in several instances, individual sample results were greater than the standard. For example, an upstream sampling location on Flume Gulch (CDPS Site 020) had an average baseline iron concentration of 0.69 mg/L, but a maximum recorded concentration of 2.3 mg/L. Baseline iron concentrations were even higher downstream in Flume Gulch, with an average iron concentration of 1.2 mg/L and a maximum value of 3.6 mg/L. Iron content was generally lower in East Pyeatt Gulch, Johnson Gulch, and No Name Gulch, with average concentrations typically less than 0.25 mg/L (TMI 1981 et seq.). These data illustrate that the SMCRA permit area drainages were contributing relatively high iron concentrations to the Yampa River in their natural state before mining was initiated. However, the iron loading from the area would still have been low given the small flow volumes associated with these ephemeral streams.

Sediment is another constituent of interest for the SMCRA permit area based on Colorado's monitoring and evaluation list (CDPHE 2012). Baseline monitoring data indicate that total suspended sediment (TSS) concentrations are highly variable for ephemeral drainages in the mine area. TSS results depend on the timing of sample collection relative to spring snowmelt and major rainfall events. Maximum TSS concentrations recorded during baseline monitoring ranged from 81 mg/L at No Name Gulch to 230 mg/L at Flume Gulch (TMI 1981 et seq.). Water quality data collected from the Yampa River below Craig (USGS Station 09247600) around the same time as the baseline program exhibited TSS concentrations up to 418 mg/L (USGS 2015).

Selenium also is a constituent of interest in the SMCRA permit area in part due to high selenium concentrations in the Mancos Shale (Environmental Sciences Laboratory 2011). During baseline monitoring, selenium was reported above the laboratory detection limit in Flume Gulch, East Pyeatt Gulch, Johnson Gulch, No Name Gulch, and Coyote Gulch. Reported concentrations ranged from 0.005 to 0.02 mg/L (TMI 1981 et seq.). Water quality data collected from the Yampa River below Craig (USGS Station 09247600) between 1975 and 1980, with a total of 14 samples, showed that over half the selenium values were reported at less than the laboratory detection limit, with a maximum reported value of 0.002 mg/L (USGS 2015). The chronic aquatic life standard for selenium is 0.0046 mg/L (CDPHE 2015).

In 2014, Trapper Mine began sampling for mercury at several of the mine CDPS outfall locations. Although the results have consistently been below detection limits, the sampling to date has not achieved a detection limit below the 0.01 microgram per liter (μg/L) mercury standard for the Yampa River (Hydro-Engineering 2015).

3.5.2 Groundwater

The Project Area is located in the Sand Wash Basin, a large east-west trending structural depression that underlies much of northwestern Colorado. The basin outline generally follows the outcrop of Cretaceous rocks. Locally, Cretaceous strata have been folded into a series of anticlines and synclines that influence groundwater occurrence, flow directions, and recharge and discharge areas. The Trapper Mine lies on the south limb of one of these features known as the Big Bottom syncline. Cretaceous strata in the Project Area dip to the north in the direction of the syncline axis. This means that geologic formations are younger immediately north of the mine, and increase in age to the south along the flanks of the Williams Fork Mountains.

The principal bedrock formations in the Project Area are the Upper Cretaceous Lewis Shale and Williams Fork formations (**Figure 3-5**). The Lewis Shale consists of dark gray marine shale that ranges in thickness from 1,500 to 1,900 feet (457 to 579 meters) (Tweto 1976). The formation has low permeability that restricts groundwater flow and, thus, is considered an aquitard. However, in the SMCRA permit area, the Lewis Shale has been known to produce some water, with well yields reported up to 5 gpm (TMI 1981 et seq.). The mine has one on-site monitoring well (P-3) installed in the Lewis Shale. Monitoring well locations at Trapper Mine are depicted on **Figure 3-5**.

Beneath the Lewis Shale lies the Williams Fork Formation. The Williams Fork Formation has been hydrologically subdivided into four members: the upper member, Twentymile Sandstone member, middle member, and lower member (Robson and Stewart 1990). The upper member is transitional with the Lewis Shale and consists primarily of dark gray mudstones, siltstones, and shale interbedded with coal seams and sandstone units. It is underlain by the Twentymile Sandstone member, a white to light gray, moderately well sorted, fine- to very fine-grained quartz arenite. Beneath the Twentymile Sandstone, the middle and lower members of the Williams Fork Formation are composed of gray to black siltstone, silty fine-grained sandstone, and shale interbedded with coal seams. At Trapper Mine, the upper Williams Fork member and Twentymile Sandstone member are the primary bedrock aquifers monitored. The lower two members are not part of the monitoring program since they lie well below the depth of mining.

The upper member of the Williams Fork Formation is approximately 500 feet (152.4 meters) thick in the Project Area (TMI 1981 et seq.). As a whole, the upper Williams Fork Formation acts as an aquitard; however, individual sandstones and coal seams within the unit have been shown to produce water. Trapper Mine has developed a detailed conceptual model to name and characterize these minor aquifers. From youngest to oldest, the minor aquifers include the Second White sandstone, Third White sandstone, “HI” aquifer, “KLM” aquifer, “QR” aquifer, and “U” aquifer. The hydraulic conductivity of these aquifers varies widely due to the lenticular geometry of the sandstones and the presence of intervening shale beds. In some areas, joints in the sandstone and coal strata provide a small amount of secondary porosity that increases the aquifer hydraulic conductivity. Average hydraulic conductivity values span orders of magnitude from about 10 feet per day in the Third White sandstone to less than 0.1 feet per day in the “QR” aquifer (TMI 1981 et seq.). Groundwater conditions are monitored within each of the minor aquifers as part of mine operations.

The Twentymile Sandstone is a regional sandstone aquifer that was deposited in a beach and barrier bar environment. It extends from the base of the upper Williams Fork member to a depth of over 1,100 feet (335 meters) in the Project Area (TMI 1981 et seq.). The aquifer is likely in hydraulic connection with the upper Williams Fork, but is separated from lower units by a regional confining layer formed by the middle Williams Fork member (Robson and Stewart 1990). Trapper Mine has installed two production wells in the Twentymile Sandstone. The first of these wells produced a sustained yield of 75 gpm. Near the axis of the Big Bottom syncline, wells in the aquifer may produce as much as 500 gpm. A hydraulic conductivity value of 20 feet per day was derived for the Twentymile Sandstone based on an aquifer test conducted on monitoring well GF-1 in 1986 (TMI 1981 et seq.).

Hydraulic heads and groundwater flow directions in the bedrock aquifers are strongly influenced by the structure of the Big Bottom syncline. Because of the orientation of the syncline, older strata crop out successively higher on the Williams Fork Mountains and receive recharge at higher elevations, allowing hydraulic potential to build up within the formations. As a result, the bedrock aquifers in the Project Area are typically confined except near the formation outcrops. Some deeper wells within the SMCRA permit area are even under artesian pressure with water levels rising above ground surface. The hydraulic potential created by the southerly recharge area results in a groundwater flow direction that is predominantly to the north (Hydro-Engineering 2015). Hydraulic gradients for the bedrock aquifers at the site range from approximately 0.07 to 0.14 feet/foot (TMI 1981 et seq.).

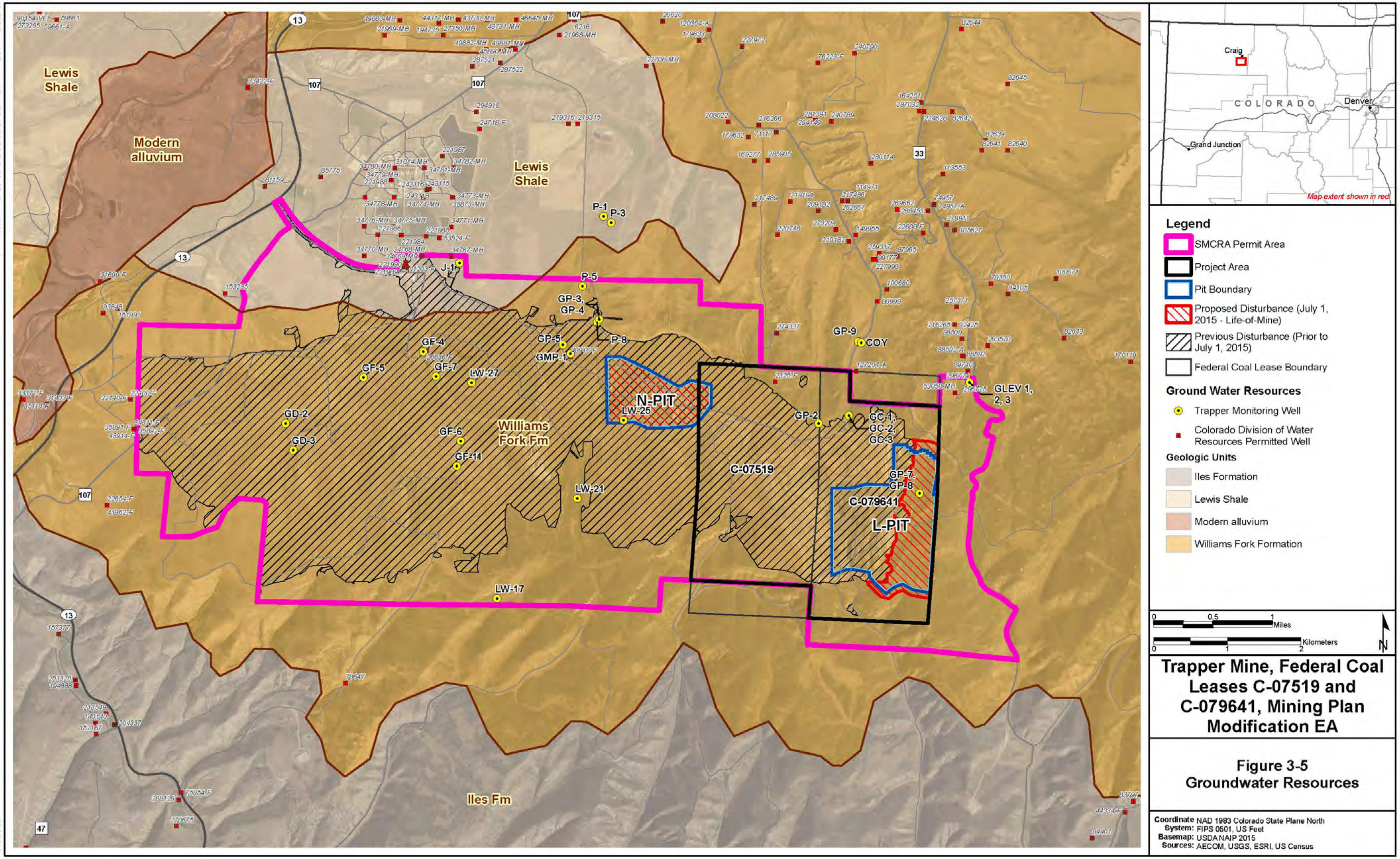

Figure 3-5
Groundwater Resources

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Quaternary alluvium in the SMCRA permit area also is known to contain and transmit groundwater. **Figure 3-5** shows the extent of alluvium associated with the Yampa River. In the mine area, the hydraulic conductivity of the Yampa River alluvium has been estimated at 160 feet per day, and well yields may range as high as 900 gpm (TMI 1981 et seq.). Johnson, Pyeatt, and Flume gulches also contain relatively extensive alluvial sediments, especially north of the mine permit area where the drainages approach the Yampa River. Hydraulic conductivity values for these smaller alluvial aquifers have been estimated to range from approximately two to 40 feet per day (TMI 1981 et seq.).

Groundwater has been monitored in or near the SMCRA permit area since 1974. These early investigations were focused on establishing pre-mining baseline conditions for the western portion of the Project Area included in the SMCRA permit area. In 1985, baseline sampling was extended to encompass areas east of Pyeatt Gulch to obtain data for a mine expansion proposed in the 1987 permit renewal (RN01). The baseline program included measuring water levels and collecting groundwater samples from the Lewis Shale, upper Williams Fork member, Twentymile Sandstone member, and Quaternary alluvium. Some of the monitoring wells used during the baseline program continue to be sampled as part of the ongoing groundwater monitoring program in place at the site. The current mine groundwater monitoring network is depicted on **Figure 3-5**.

Groundwater chemistry varies by geologic source, though most wells sampled during the initial baseline program exhibited a calcium-bicarbonate signature (TMI 1981 et seq.). TDS concentrations are generally higher in the Lewis Shale than in other water-bearing zones at the site because the formation contains more salt available for dissolution. The average baseline TDS concentration for the Lewis Shale was 3,240 mg/L. Groundwater TDS concentrations above 1,000 mg/L are common in the Pyeatt Gulch and Flume Gulch alluvial aquifers, and contribute to the relatively high TDS associated with those streams. Within the upper Williams Fork member, TDS is highly variable depending on the aquifer interval being sampled; however, for the unit as a whole, the average baseline TDS was around 840 mg/L. Average TDS for the Twentymile Sandstone during the baseline program was approximately 570 mg/L (TMI 1981 et seq.), making it one of the better drinking water aquifers in the area.

The Trapper Mine PAP contains an inventory of water wells within one mile (1.6 km) of the SMCRA permit boundary (TMI 1981 et seq.). The inventory shows that the majority of wells are completed in the upper Williams Fork, the Twentymile Sandstone, or in deeper units. Most of the wells are used for domestic supply, but permits have been issued for irrigation, livestock, commercial, industrial, municipal, and monitoring purposes. According to state records, static water levels within these wells range from 0 feet (artesian) to approximately 700 feet (213.4 meters) below ground surface (Colorado Division of Water Resources 2015). The permitted well locations are shown on **Figure 3-5**.

3.6 Soils

The geographical extent of the Project Area for soils includes the portions of Federal Coal Leases C-07519 and C-079641 that lie within the SMCRA permit boundary. Information on Major Land Resource Areas (MLRAs) and soil types was obtained from Natural Resources Conservation Service (NRCS) literature and databases, including the *Land Resource Regions and Major Land Resource Areas of the U.S., the Caribbean, and the Pacific Basin,* USDA Handbook 296 (USDA 2006) and the Soil Survey Geographic database (USDA 2015).

A soil survey specific to the Project Area was completed for Moffat County by the USDA NRCS in 2005 (USDA, NRCS 2005). The Order 3 soil survey data for this county forms the basis for the soils information presented in this section. Although the Moffat County soil survey is listed as an Order 3 in the vicinity of the coal producing areas, the soils were mapped as a high intensity Order 2 survey (Crofts 2015).

The Project Area lies within three MLRAs:

- MLRA 34A – Cool Central Desertic Basins and Plateaus
- MLRA 34B – Warm Central Desertic Basins and Plateaus
- MLRA 48A – Southern Rocky Mountains

Soils in MLRA 34A are generally calcareous and shallow or moderately deep to sedimentary bedrock. The average annual precipitation is 7 to 12 inches (17.8 to 30.5 cm) and the freeze-free period ranges from 45 to 160 days. The dominant soil orders in this MLRA are Aridisols and Entisols. Elevations range from 5,200 to 7,500 feet (1,585 to 2,286 meters) amsl.

Soils in MLRA 34B are generally calcareous and shallow or moderately deep to shale or sandstone bedrock. Soils at lower elevations likely have significant amounts of calcium carbonate, salts, and gypsum. The average annual precipitation is 13 to 15 inches (33 to 38 cm) and the freeze-free period ranges from 45 to 160 days. The dominant soil orders are Aridisols and Entisols with Mollisols at higher elevations. Elevations range from 4,100 to 7,500 feet (1,250 to 2,286 meters) amsl.

Soils in MLRA 48A are deep soils that are well drained and generally form on mountain slopes. The average annual precipitation is 16 to 20 inches (40.6 to 50.8 cm) and the freeze-free period ranges from 50 to 95 days. The dominant soil orders are Mollisols, Alfisols, Inceptisols, and Entisols. Elevations range from 6,500 to 14,400 feet (1,981 to 4,389 meters) amsl.

Various soil types occur within the Project Area. The soil variability stems primarily from a variety of parent materials as influenced by topography, aspect, elevation, vegetation, and differential rates of mineral weathering. The soils formed from alluvium, colluvium, residuum, and eolian parent materials are primarily derived from sedimentary rocks. Shallow to moderately deep soils are common within the Project Area. Soil depths range from shallow on ridges and hillslopes to very deep in valley bottoms.

The NRCS database identified 17 soil mapping units within the Project Area (**Figure 3-6**). These 17 soil types are listed in **Table 3-11** with the associated acres and percent of this mapping unit within the Project Area.

3.6.1 Moffat County Soil Mapping Units

The Moffat County soil survey mapped the soils within Moffat County, Colorado. Moffat County mapping units are classified by the dominant soil type in the unit. The purpose of the Moffat County survey was to separate landscapes into landforms with similar use and management requirements (USDA, NRCS 1989). Descriptions of the general characteristics for each soil mapping unit, the taxonomic classes, associated landforms, and typical vegetation found within the soil mapping units in Moffat County are described below. The detailed soil descriptions are typical descriptions for all of Moffat County and actual Project Area soils may show variation from the typical descriptions.

3.6.1.1 Adderton Series

Adderton soils are very deep, well drained soils formed in alluvium. These soils occur on alluvial fans and drainageways with an elevation range from 7,000 to 8,500 feet (2,134 to 2,591 meters) amsl. The mean temperature for these soil types ranges from 37 to 40°F, with 50 to 75 frost-free days. Annual precipitation ranges between 16 to 20 inches (40.6 to 50.8 cm).

Adderton loam, 1 to 10 percent slopes occurs in approximately 4.5 percent of the Project Area. The soil profile is mainly loam with 0 to 22 inches loam, 22 to 39 inches loam, and 39 to 60 inches fine sandy loam. The soil composition is 90 percent Adderton and similar soils and 10 percent moderately well and somewhat poorly drained soils.

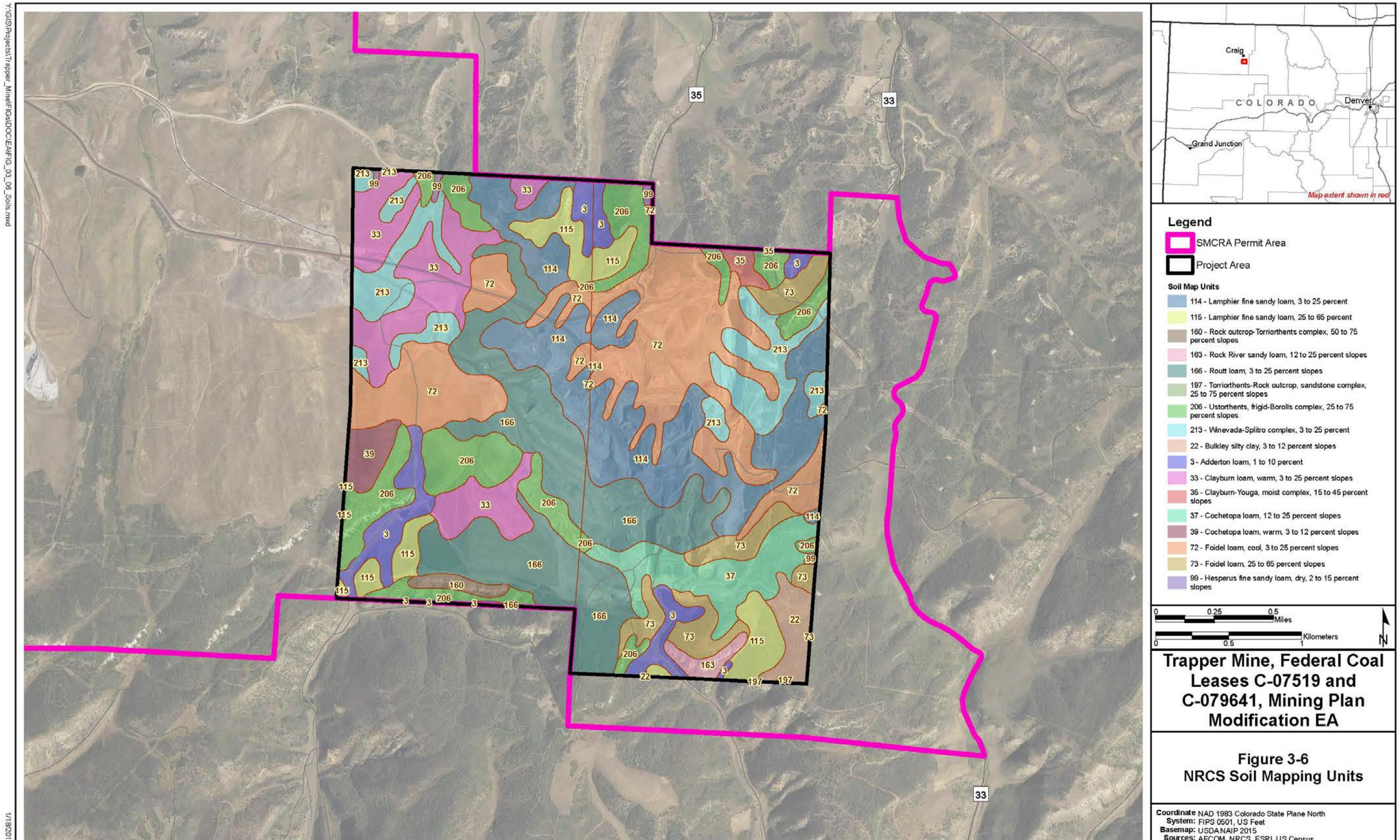

Figure 3-6
NRCS Soil Mapping Units

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Table 3-11 Soil Classifications within the Project Area

Dominant Soil Type	Mapping Unit No.	Type Description	Acres of Project Area	Percent of Project Area
Adderton	3	Adderton loam, 1 to 10% slopes	108.9	4.5
Bulkley	22	Bulkley silty clay, 3 to 12% slopes	38.7	1.6
Clayburn	33	Clayburn loam, warm, 3 to 25% slopes	205	8.5
	35	Clayburn-Youga moist complex, 15 to 45% slopes	12.50	0.5
Cochetopa	37	Cochetopa loam, 12 to 25% slopes	110.8	4.6
	39	Cochetopa loam, warm, 3 to 12% slopes	30.2	1.2
Foidel	72	Foidel loam, cool, 3 to 25% slopes	433	17.9
	73	Foidel loam, 25 to 65% slopes	103.5	4.3
Hesperus	99	Hesperus fine sandy loam, dry, 2 to 15% slopes	7.2	0.3
Lamphier	114	Lamphier fine sandy loam, 3 to 25% slopes	364.7	15.1
	115	Lamphier fine sandy loam, 25 to 65% slopes	114.5	4.7
Rock Outcrops	160	Rock outcrop-Torriorthents complex, 50 to 75% slopes	15.3	0.6
Rock River	163	Rock River sandy loam, 12 to 25% slopes	17.7	0.7
Routt	166	Routt loam, 3 to 25% slopes	418.8	17.3
Torriorthents	197	Torriorthents-Rock outcrop, sandstone complex, 25 to 75% slopes	0.6	<0.1
Ustorthents	206	Ustorthents, frigid-Borolls complex, 25 to 75% slopes	260.1	10.7
Winevada	213	Winevada-Splitro complex, 3 to 25% slopes	181.2	7.5
Total			**2,422.7**	**100.0**

This soil type is generally dominated by grasses with some shrubs. In Moffat County, potential native vegetation for this soil mapping unit and the typical rangeland composition include: basin wildrye (*Leymus cinereus*) at 35 percent, slender wheatgrass (*Elymus trachycaulus*) at 10 percent, western wheatgrass (*Pascopyrum smithii*) at 10 percent, Letterman's needlegrass (*Stipa lettermanii*) at 5 percent, mountain big sagebrush (*Artemisia tridentate vaseyana)* at 5 percent, mountain brome (*Bromus marginatus*) at 5 percent, and mountain snowberry (*Symphoricarpos oreophilus*) at 5 percent.

3.6.1.2 Bulkley Series

Bulkley soils are very deep and well drained with fine texture formed from calcareous alluvium derived from shale. This soil series occurs on alluvial fans and clayey foothills within an elevation range of 6,200 to 7,000 feet (1,890 to 2,134 meters) amsl. Mean annual temperature is between 42 and 45°F, with an average frost-free period of 75 to 95 days a year. Annual precipitation ranges between 13 to 15 inches (33 to 38 cm). This soil type is best for livestock grazing and wildlife habitat.

Bulkley silty clay, 3 to 12 percent slopes occurs in a small portion of the Project Area, approximately 1.6 percent. This soil profile is 0 to 4 inches silty clay, 4 to 36 inches clay, and 36 to 60 inches silty clay. The soil composition is 80 percent Bulkley and similar soils, 10 percent Pricecreek type soils, and 10 percent Abor soils.

The vegetation cover is typically native grasses and sagebrush. In Moffat County, potential native vegetation for this soil mapping unit and the typical rangeland composition include: western wheatgrass at 40 percent, Wyoming big sagebrush (*Artemisia tridentate wyomingensis*) at 15 percent, bottlebrush squirreltail (*Elymus elymoides*) at 5 percent, prairie Junegrass (*Koeleria macrantha*) at 5 percent, other perennial forbs at 5 percent, and other perennial grasses at 5 percent.

3.6.1.3 Clayburn Series

Clayburn soils are very deep, well drained mountain loam soils and consist of glacial drift, colluvium, and slope alluvium derived from sandstone and shale. Most soils in this series occur on plateaus, hills, and mountain slopes between elevations of 7,000 to 8,600 feet (2,134 to 2,621 meters) amsl. Mean temperature ranges from 37 to 40°F, with 50 to 75 frost-free days and annual precipitation between 18 to 20 inches (45.7 to 50.8 cm) a year. This soil type generally supports livestock grazing and wildlife habitat.

Clayburn loam, warm, 3 to 25 percent slope soils occur in approximately 8.5 percent of the Project Area. This soil profile is 0 to 11 inches loam, 11 to 46 inches clay loam, and 46 to 60 inches loam. Minor soil components are about 8 percent Routt type soils and 7 percent Jerry soil types.

Native vegetation for this soil type includes grasses and sagebrush. In Moffat County, potential native vegetation for this soil mapping unit and the typical rangeland composition include: Letterman's needlegrass at 15 percent, slender wheatgrass at 15 percent, mountain big sagebrush at 10 percent, Saskatoon serviceberry (*Amelanchier alnfolia*) at 5 percent, elk sedge (*Carex geyeri)* at 5 percent, mountain brome at 5 percent, mountain snowberry at 5 percent, nodding brome (*Bromus anomalus*) at 5 percent, other perennial forbs at 5 percent, other perennial grasses at 5 percent, and other shrubs at 5 percent.

Clayburn-Youga, moist complex soils are composed of 45 percent Clayburn soils, 35 percent Youga soils, and small percentages of various other soil types. Clayburn-Youga soils occur in approximately 0.5 percent of the Project Area. The Clayburn soil profile is typically 0 to 17 inches loam, 7 to 50 inches clay loam, and 50 to 60 inches sandy clay loam. The profile for Youga soils varies slightly from the Clayburn with 0 to 1 inch slightly decomposed plant material, 1 to 14 inches loam, 14 to 40 inches clay loam, and 40 to 60 inches sandy clay loam. Other soils include Cochetopa at 7 percent, Foidel at 6 percent, and moderately deep soils over sandstone bedrock at 7 percent.

Native vegetation for this soil type includes grasses and sagebrush. In Moffat County, potential native vegetation for this soil mapping unit and the typical rangeland composition include: Gambel's oak at 10 to 15 percent, Saskatoon serviceberry at 10 percent, mountain brome at 10 percent, Letterman's needlegrass at 5 percent, elk sedge at 5 to 10 percent, mountain snowberry at 5 percent, nodding brome at 5 percent, slender wheatgrass at 5 percent, other perennial forbs at 5 percent, other perennial grasses at 5 percent, and other shrubs at 5 percent.

3.6.1.4 Cochetopa Series

Cochetopa soils are very deep, well drained mountain loam soils that are formed in colluvium and alluvium derived from sandstone and shale. These soils occur on mountain slopes, hills, and valley sides with an elevation range from 7,000 to 8,300 feet (2,134 to 2,530 meters) amsl. The mean temperature for these soil types ranges from 37 to 40°F, with 50 to 75 frost-free days. Annual precipitation ranges between 18 to 20 inches (45.7 to 50.8 cm). Cochetopa loam, 12 to 25 percent slopes and Cochetopa loam, warm, 3 to 12 percent slopes occur within the Project Area. Cochetopa loam, 12 to 25 percent slopes covers almost 5.8 percent of the Project Area. Both soil classes have a similar clay loam soil profile with 0 to 11 inches of loam, with the 11 to 19 inches, 19 to 48 inches, and 48 to 60 inches profiles all characterized as clay loam. The soil compositions are 85 percent Cochetopa and similar soils, approximately 8 percent Jerry soils, and 7 percent Routt type soils.

This soil type supports livestock grazing and wildlife habitat, with big sagebrush, snowberry, and grasses dominating the vegetation type. In Moffat County, potential native vegetation for this soil mapping unit and the typical rangeland composition includes: slender wheatgrass at 15 percent, Letterman's neddlegrass at 10 percent, mountain big sagebrush at 10 percent, elk sedge at 5 percent, mountain brome at 5 percent, mountain snowberry at 5 percent, nodding brome at 5 percent, other perennial forbs at 5 percent, other perennial grasses at 5 percent, and other shrubs at 5 percent.

3.6.1.5 Foidel Series

The Foidel soils are very deep, well drained soils formed in loess and alluvium, colluvium, and residuum derived from sandstone and shale. These soils occur on mountain slopes, hills, and plateaus at elevations ranging from 7,000 to 8,400 feet (2,134 to 2,560 meters) amsl. The mean temperature for this soil type falls between 37 to 40°F, with 50 to 75 frost-free days. Annual precipitation ranges between 18 to 20 inches (45.7 to 50.8). This soil type largely accommodates livestock grazing and wildlife habitat. Foidel soils support vegetation that is a mix of small shrubs and native grasses.

Foidel loam, cool, 3 to 25 percent slopes and Foidel loam, 25 to 65 percent slopes cover approximately 22.2 percent of the Project Area. These soil mapping units have a similar soil profile of 0 to 2 inches slightly decomposed plant material, 2 to 28 inches loam, 28 to 39 inches clay loam, and 39 to 60 inches clay loam. The soil composition for Foidel loam soils with slopes of 3 to 25 percent is 85 percent Foidel soils with the remaining 15 percent split between Winevada, Routt, Cochetopa, Clayburn, and coarse texture soils. Foidel, 25 to 65 percent slopes are 85 percent Foidel soils; 4 percent Skyway, Routt, and Clayburn soils; and 3 percent Lamphier soils.

These soils support vegetation that is a mix of small shrubs and native grasses. In Moffat County, potential native vegetation for this soil mapping unit and the typical rangeland composition include: Gambel's oak at 20 percent, Saskatoon serviceberry at 10 percent, mountain brome at 10 percent, Letterman's needlegrass at 5 percent, common chokecherry (*Prunus virginiana*) at 5 percent, elk sedge at 5 percent, mountain snowberry at 5 percent, slender wheatgrass at 5 percent, other perennial forbs at 5 percent, other perennial grasses at 5 percent, and other shrubs at 5 percent.

3.6.1.6 Hesperus Series

Hesperus soils are very deep, well to moderately well drained mountain loam soils and are formed from loess and alluvium derived from sandstone and shale. Most soils in this series occur in hills and plateaus between elevations of 6,500 to 7,000 feet (1,981 to 2,134 meters) amsl. Mean temperature ranges from 40 to 43°F, with 65 to 85 frost-free days per year. Annual precipitation falls between 16 to 18 inches (40.6 to 45.7 cm). Hesperus fine sandy loam, dry, 2 to 15 percent slopes cover approximately 0.3 percent of the Project Area with a soil profile of 0 to 5 inches fine sandy loam, 5 to 20 inches loam, 20 to 52 inches clay loam, and 52 to 60 inches clay loam. Minor inclusions consist of approximately 8 percent Weed soil types and similar soils and 7 percent Pagoda soil types.

This soil type generally supports grazing and wildlife habitat. Vegetation is likely to be grasses and sagebrush. In Moffat County, potential native vegetation for this soil mapping unit and the typical rangeland composition include: Letterman's needlegrass at 15 percent, mountain big sagebrush at 15 percent, slender wheatgrass at 10 percent, western wheatgrass at 10 percent, elk sedge at 5 percent, mountain brome at 5 percent, mountain snowberry at 5 percent, nodding brome at 5 percent, other perennial forbs at 5 percent, and other perennial grasses at 5 percent.

3.6.1.7 Lamphier Series

Lamphier soils are very deep, well-drained mountain loam soils formed in alluvium and colluvium from sandstone. These soils occur mostly on mountainsides. Elevations range between 7,000 to 8,600 feet (2,134 to 2,621 meters) amsl. Mean temperature ranges from 37 to 40°F, with 50 to 75 frost-free days and annual precipitation between 18 to 20 inches (45.7 to 50.8 cm) a year.

Lamphier fine sandy loam, 3 to 25 percent slopes and Lamphier fine sandy loam, 25 to 65 percent slopes comprise approximately 19.8 percent of the Project Area. Lamphier soils have a profile 0 to 2 inches moderately decomposed plant material, 2 to 24 inches fine sandy loam, and 24 to 60 inches sandy clay loam. Minor soil components for 3 to 25 percent slopes include Foidel at 8 percent and Clayburn at 7 percent. Additional soil inclusions within the 25 to 65 percent slopes include Foidel, Clayburn, and Skyway at approximately 5 percent each.

This soil type generally supports rangeland, and native grasses dominate the vegetation cover. In Moffat County, potential native vegetation for this soil mapping unit and the typical rangeland composition include: Gambel's oak at 20 percent, Saskatoon serviceberry at 10 percent, elk sedge at 10 percent, mountain snowberry at 10 percent, Letterman's needlegrass at 5 percent, mountain brome at 5 percent, nodding brome at 5 percent, slender wheatgrass at 5 percent, other perennial forbs at 5 percent, other perennial grasses at 5 percent, and other shrubs at 5 percent.

3.6.1.8 Rock Outcrop-Torriorthents Series

Rock outcrop-Torriorthents soils occur between 5,900 to 8,000 feet (1,798 to 2,438 meters) amsl, receiving annual precipitation between 9 to 16 inches (22.9 to 40.6 cm). Mean temperature falls between 42 to 48°F, with 75 to 105 frost-free days.

Rock outcrop-Torriorthents complex, 50 to 75 percent slopes occur over approximately 0.6 percent of the Project Area and are composed of 70 percent rock outcrop, 25 percent Torriorthents, and 5 percent deep soil types. The rock outcrops occur on hills and cliffs. Torriorthents soils are shallow and form on colluvium and residuum derived from sandstone and shale. This well drained soil type is found on mountainsides and hillslopes. Vegetation consists of grasses and small shrubs with a profile of 0 to 2 inches channery sandy loam, 2 to 14 inches very channery sandy loam, and 14 to 18 inches unweathered bedrock.

In Moffat County, potential native vegetation for this soil mapping unit and the typical rangeland composition include: Wyoming big sagebrush at 15 percent; Indian ricegrass (*Achnatherum hymenoides*) at 10 percent, Bottlebrush squirreltail at 10 percent, saltbush (A*triplex canescens)* at 10 percent, needle-and-thread grass (*Hesperostipa comata*) at 5 percent, and shadscale (*Atriplex confertifolia)* at 5 percent.

3.6.1.9 Rock River Series

Rock River soils are very deep and well drained soils formed in residuum derived from sandstone. This soil series occurs on shallow slopes within an elevation range of 6,500 to 6,800 feet (1,981 to 2,073 meters) amsl. Mean annual temperature is between 42 and 45°F, with an average frost-free period of 75 to 95 days a year. Annual precipitation ranges between 11 to 13 inches (27.9 to 33 cm). Rock River sandy loam, 12 to 25 percent slopes, is found in approximately 0.7 percent of the Project Area. This soil profile is 0 to 3 inches sandy loam, 3 to 22 inches sandy clay loam, 22 to 32 inches sandy clay loam, and 32 to 60 inches sandy loam. The soil composition is 85 percent Rock River and similar soils, 8 percent Forelle type soils, and 7 percent Berlake soils.

The vegetation cover is typically native grasses and small shrubs. In Moffat County, potential native vegetation for this soil mapping unit and the typical rangeland composition include: Wyoming big sagebrush at 15 percent, needle and thread grass at 15 percent, Indian ricegrass at 10 percent, western wheatgrass at 10 percent, Nevada bluegrass (*Poa secunda*) at 5 percent, bottlebrush squirreltail at 5 percent, and prairie junegrass at 5 percent.

3.6.1.10 Routt Series

Routt soils are very deep, well drained soils formed in loess and in residuum derived from shale. Most soils in this series occur on mountainsides and plateaus. Elevations range between 7,000 to 8,000 feet (2,134 to 2,438 meters) amsl. Mean temperature ranges from 37 to 40°F, with 50 to 70 frost-free days and annual precipitation between 18 to 20 inches (45.7 to 50.8 cm) a year.

Routt loam, 3 to 25 percent slopes comprises approximately 17.3 percent of the Project Area. Routt loam soils have a profile 0 to 2 inches slightly decomposed plant material, 2 to 27 inches loam, 27 to 33 inches clay loam, and 33 to 60 inches clay. Minor soil components consist of Foidel, Clayburn, Binco, and Cochetopa at 5 percent each.

This soil type generally supports rangeland and wildlife habitat. Native grasses dominate the vegetation cover with large shrubs. In Moffat County, potential native vegetation for this soil mapping unit and the typical rangeland composition include: Gambel’s oak at 10 percent, Saskatoon serviceberry at 10 percent, mountain brome at 10 percent, Letterman’s needlegrass at 5 percent, elk sedge at 5 percent, mountain snowberry at 5 percent, nodding brome at 5 percent, and slender wheatgrass at 5 percent.

3.6.1.11 Torriorthents-Rock Outcrop Series

Torriorthents-Rock outcrop soils occur at elevations between 6,000 and 11,280 feet (1,829 to 3,438 meters) amsl. Mean annual precipitation is 9 to 16 inches (22.9 to 40.6 cm) and temperature is 42 to 48°F, with approximately 75 to 105 frost-free days each year.

Torriorthents-Rock outcrop, sandstone complex, 25 to 75 percent slopes occur over less than 0.1 percent of the Project Area and are composed of 60 percent Torriorthents, 30 percent Rock outcrop, and 10 percent deep loamy soil types. For this series, Rock outcrop consists of sandstone and limestone ledges and exposed soft shale. The typical soil profiles for this soil mapping unit are described in Section 3.6.1.8.

The vegetation cover is typically native grasses and shrubs. In Moffat County, potential native vegetation for this soil mapping unit and the typical rangeland composition include: Indian ricegrass at 10 percent; Wyoming big sagebrush at 10 percent, bluebunch wheatgrass (*Pseudoroegneria spicata*) at 10 percent, western wheatgrass at 10 percent, antelope bitterbrush (*Purshia tridentate*) at 5 percent, needle and thread grass at 5 percent, and mountain mahogany (*Cercocarpus montanus*) at 5 percent.

3.6.1.12 Ustorthents, Frigid Borolls Series

Ustorthents, frigid Borolls complex soils are shallow to moderately deep and well drained soils that are found on mountainsides and are formed from residuum and colluvium primarily derived from sedimentary rocks. Soils in this series occur mainly on mountainsides between 7,000 to 8,500 feet (2,134 to 2,591 meters) amsl. Mean temperature ranges from 37 to 45°F, with 50 to 85 frost-free days and annual precipitation between 16 to 20 inches (40.6 to 50.8 cm) each year.

Ustorthents, frigid-Borolls complex, 25 to 75 percent slopes cover approximately 10.7 percent of the Project Area. The soils within this complex consist of 55 percent Ustorthents, 35 percent Borolls, 5 percent Abor, and 5 percent Rencot soils. The soil profile for Ustorthents is 0 to 3 inches very channery sandy loam, 3 to 28 inches extremely channery sandy loam, and 28 to 32 inches unweathered bedrock. Borolls soils have a profile of 0 to 19 inches loam, 19 to 30 inches cobbly sandy clay loam, and 30 to 34 inches unweathered bedrock.

This soil type generally supports rangeland where vegetation cover is a mixture of native grasses, shrubs, and small trees. In Moffat County, potential native vegetation for this soil mapping unit and the typical rangeland composition include: wheatgrass varieties at 10 to 20 percent, Indian ricegrass at 0 to 10 percent, mountain big sagebrush at 10 percent, antelope bitterbrush at 0 to 5 percent, Nevada bluegrass at 0 to 5 percent, needle and thread grass at 0 to 5 percent, Saskatoon serviceberry at 5 to 10 percent, Mountain mahogany at 0 to 5 percent, Columbia needlegrass (*Achnatherum nelsonii*) at 0 to 10 percent, Gambel’s oak at 0 to 10 percent, elk sedge at 0 to 10 percent, Letterman’s needlegrass at 0 to 10 percent, mountain brome at 0 to 10 percent, and mountain snowberry at 0 to 10 percent.

3.6.1.13 Winevada-Splitro Series

Winevada-Splitro complex soils are well drained, occur between 7,000 to 8,500 feet (2,134 to 2,591 meters) amsl, and are generally found on mountainsides. Mean annual precipitation is between 18 to 20 inches (45.7 to 50.8 cm). Mean temperature falls between 37 and 40°F, with 50 to 75 frost-free days.

The Winevada-Splitro complex, 3 to 25 percent slopes occur in approximately 7.5 percent of the Project Area. The main soil compositions for this series are 60 percent Winevada soil types and 30 percent Splitro soils. Minor soils components include Skyway, Foidel, Lamphier, and Clayburn. Winevada soils are moderately deep and formed from residuum and colluvium derived from sandstone. These soils generally support livestock grazing and wildlife habitat. Vegetation for this series includes grasses and medium and large shrubs. The Winevada soil profile for the 3 to 25 percent slopes series is 0 to 10 inches loam, 10 to 25 inches loam, and 26 to 29 inches unweathered bedrock.

Splitro soils are shallow and formed in medium textured alluvium, residuum, and eolian material mainly from sandstone. Soils may be derived from basalt in some areas of Colorado. This soil type can support native pastureland and recreation, with vegetation dominated by grasses but can include ponderosa pine and quaking aspen. The Splitro soil profile has 0 to 1 inch slightly decomposed plant material, 1 to 12 inches fine sandy loam, 12 to 14 inches fine sandy loam, and 14 to 17 inches unweathered bedrock.

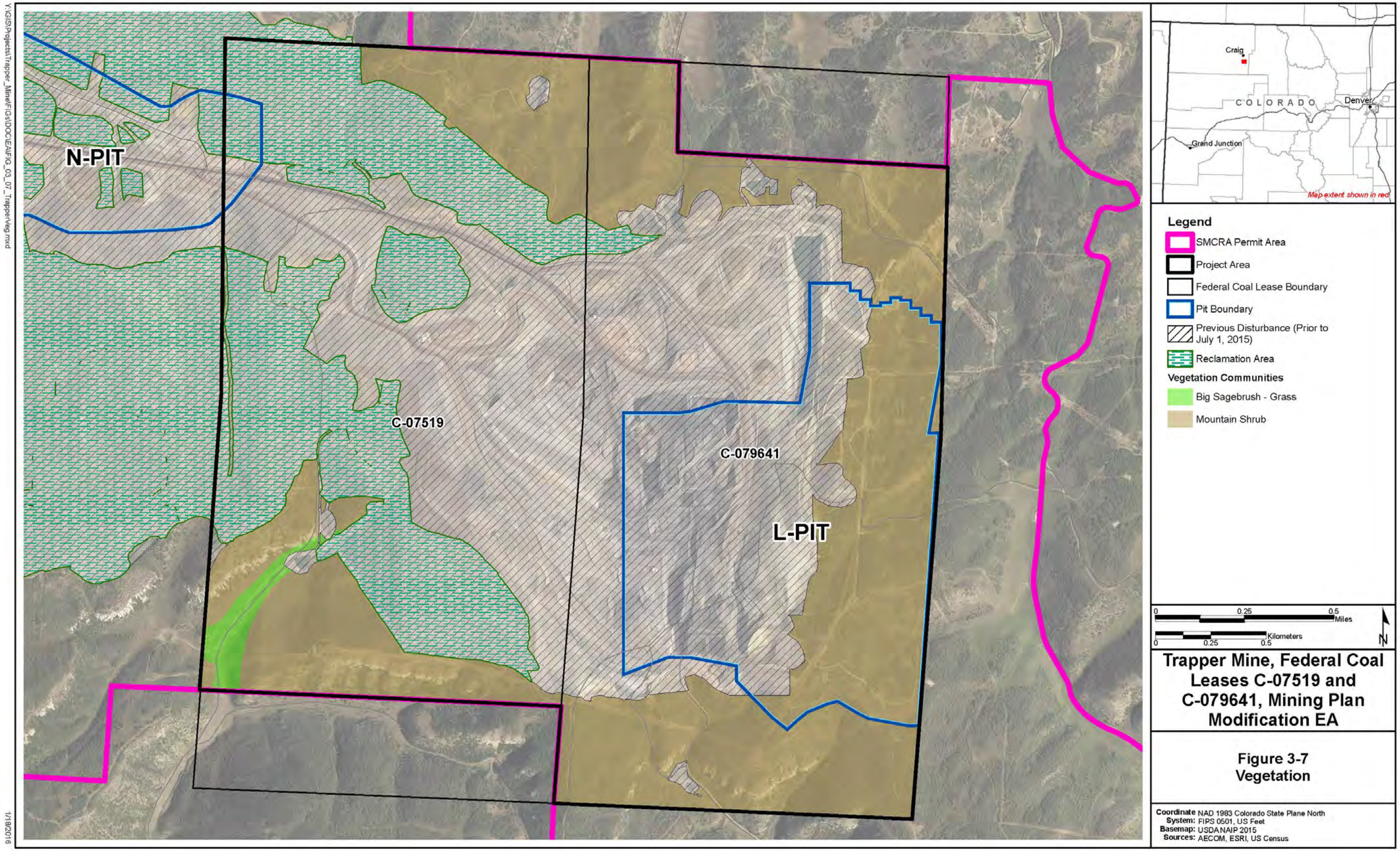
In Moffat County, potential native vegetation for this soil mapping unit and the typical rangeland composition include: Saskatoon serviceberry at 0 to 10 percent, mountain big sagebrush at 10 percent, mountain brome at 5 to 10 percent, nodding brome at 10 percent, slender wheatgrass at 10 percent, elk sedge at 5 percent, mountain snowberry at 5 percent, Letterman’s needlegrass at 0 to 5 percent, other perennial grasses at 10 to 15 percent, other perennial forbs at 5 percent, and other shrubs at 0 to 5 percent.

3.7 Vegetation

Quantitative vegetation inventories at the Trapper Mine commenced in the early 1970s prior to the enactment of SMCRA. The studies detailed vegetation mapping using aerial photography, plant community descriptions, and intensive preparation of plant species lists. Intensive baseline sampling of the pre-disturbance plant communities commenced in 1979 and continued through 1985. Additional surveys have been conducted since then, including a sensitive species survey completed in 2013. Information on vegetation cover, forage production, and shrub density was taken from the results of vegetation surveys conducted by TMI and available in the TMI PAP. The plant communities with mappable acreages that occur in the Project Area are summarized in **Table 3-12** and are depicted in **Figure 3-7**. In addition to the plant communities, the Project Area also includes disturbed areas and reclaimed lands as listed in **Table 3-12**. A discussion of each vegetation community follows.

Table 3-12 Vegetation Communities

Vegetation Community Type	Acres	Percent of Project Area
Mountain Shrub	853	35.2
Big Sagebrush Grass	23	0.9
Reclaimed Rangeland	494	20.4
Disturbed Area	1,053	43.5
Totals	**2,423**	**100.0**


N-PIT
C-07519
C-079641
L-PIT
Craig
COLORADO
Denver
Grand Junction
Map extent shown in red
Legend
SMCRA Permit Area
Project Area
Federal Coal Lease Boundary
Pit Boundary
Previous Disturbance (Prior to July 1, 2015)
Reclamation Area
Vegetation Communities
Big Sagebrush - Grass
Mountain Shrub
0 0.25 0.5 Miles
0 0.25 0.5 Kilometers
N
Trapper Mine, Federal Coal Leases C-07519 and C-079641, Mining Plan Modification EA
Figure 3-7
Vegetation
Coordinate System: NAD 1983 Colorado State Plane North FIPS 0501, US Feet
Basemap: USDA NAIP 2015
Sources: AECOM, ESRI, US Census
1/18/2016

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3.7.1 Mountain Shrub Community

The mountain shrub community is the predominant plant community in the Project Area, covering approximately 853 acres (35.2 percent of the Project Area). This is a common plant community in the Colorado Plateau ecoregion that is typically found along dry foothills and lower mountain slopes from 5,000 to 9,000 feet (1,524 to 2,743 meters) amsl. In the Project Area, shrubs are the major lifeform, with grasses growing as a secondary component. Perennial forbs are less common. The most common shrubs in the Project Area include mountain snowberry, Gambel's oak, and Saskatoon serviceberry, with black chokecherry representing a lesser component. Kentucky bluegrass (*Poa pratensis*) and smooth brome (*Bromus inermis*) are the most common grasses within the mountain shrub community in the Project Area. Overall, the mountain shrub community provides dense cover and provides palatable forage for domestic livestock and wildlife.

3.7.2 Big Sagebrush-Grass Community

The big sagebrush-grass community covers approximately 23 acres (0.9 percent of the Project Area). This plant community usually grows along flat rolling hills in well drained soils at elevations between 7,000 to 10,000 feet (2,134 to 3,048 meters) amsl. In the Project Area, grasses are the major species in the big sagebrush-grass community, with shrubs forming a secondary component. Mountain big sagebrush is the most common species and typically forms about 25 percent of the plant cover within the big sagebrush-grass community in the Project Area. Other shrubs found in minor amounts in the Project Area include mountain snowberry, Saskatoon serviceberry, and black chokecherry. The dominant grasses within the big sagebrush-grass community in the Project Area include smooth brome, Kentucky bluegrass, western wheatgrass, and intermediate wheatgrass (*Thinopyrum intermedium*). The big sagebrush plant community provides forage and cover for a wide variety of wildlife and could support grazing for livestock.

3.7.3 Reclaimed Rangeland

Reclaimed rangeland occurs on areas previously disturbed by mining activities that have undergone final reclamation. Reclaimed rangeland occupies approximately 494 acres (20.4 percent) of the Project Area. These lands support a mixture of mostly native grasses, forbs, and shrubs planted from a seed mixture approved by the CDRMS. Reclaimed rangeland undergoes several years of revegetation monitoring to ensure that reclaimed areas are progressing toward the approved revegetation success standards. Some of these reclaimed areas have already met the Phase III reclamation standards and have been released from bonding. Reclaimed rangeland provides productive forage and cover for wildlife and domestic livestock.

3.7.4 Disturbed Area

Disturbed areas are not vegetation communities in the classical sense because these areas are typically void of plant cover. Disturbed areas are the active mine disturbance areas that are being used to support current mining operations and are not ready for final reclamation. Disturbed areas cover approximately 1,053 acres (43.5 percent) of the Project Area.

3.7.5 Noxious Weeds

Noxious weeds are those plants that have been designated by the Colorado Noxious Weed Act as species that have been included on state or county lists and which, according to the CDRMS regulations and policies, must be controlled in all mining and reclamation areas. Section 35-5.5-103 (16), of the *Colorado Noxious Weed Act* defines a noxious weed as "*an alien plant or parts of an alien plant that have been designated by rule as being noxious or has been declared a noxious weed by a local advisory board*." Under the *Colorado Noxious Weed Act*, the State maintains a "*list of plant species that are designated as noxious weeds*" that are included on one of three lists of regulated species: List A, List B, or List C. Plants in List A are designated for eradication in the state. Plants in List B are to be prevented from spreading by implementing weed management plans that have been developed in consultation with the state, local governments, and other interested parties. List C plants are widespread and well-established noxious weed species for which weed control is recommended but not required by the state, although local governing bodies may require management. Moffat County does not maintain its own list of noxious weeds but has developed an Undesirable Plant Management Plan that is part of the County's Land Use Plan of 2001 (Moffat County 2001). This plan outlines recommended steps to support federal, state, and local weed control activities but does not cite additional noxious weeds outside of the state list. The predominant noxious weeds relevant to Trapper Mine are those appearing in List C.

Weed control measures are ongoing within the Project Area and are focused on reclaimed land and areas with known noxious weeds. Noxious weeds actively controlled within the Project Area include hoary cress (*Cardaria draba*), dalmatian toadflax (*Linaria dalmatica*), houndstongue (*Cynoglossum officinale*), Scotch thistle (*Onopordum acanthium*), musk thistle (*Carduus nutans*), Canada thistle (*Cirsium arvense*), and Russian knapweed (*Acroptilon repens*) (TMI 2015). Control measures include application of selective and non-selective broadleaf herbicides where noxious weeds are found. Noxious weeds often consist of small localized patches or are interspersed with other plants to such a degree that it is extremely difficult to map these areas as a separate vegetation type.

Not all noxious weeds are List A and List B species that are required to be actively controlled within the Project Area. List C noxious weeds such as cheatgrass (*Bromus tectorum*) are prevalent throughout the region and are managed at Trapper Mine through management of revegetation efforts rather than through control with herbicides. Noxious weeds typically represent a very small part of the total plant cover in the Project Area. As recommended in the CDRMS's Bond Release Guidance, the cover and production contribution for all state listed noxious weeds is deleted prior to the calculation of the final plant cover and forage production amounts on all reclaimed lands (CDRMS 1995).

3.8 Wetlands and Riparian Zones

Wetlands and riparian environments play an important role in the general health of various ecosystems, supporting diverse biota, filtering pollutants, and storing flood waters. Wetland delineation surveys and surveys to identify any waters of the U.S. (WOTUS) within the SMCRA permit boundary were conducted by IME Consulting (IME) in 1998 and 2008.

Pursuant to CWA regulations, the U.S. Army Corps of Engineers (USACE) has regulatory authority over disturbances to all jurisdictional WOTUS (which include wetlands).

WOTUS include all interstate waters (traditional navigable waters) and wetlands. Other WOTUS include channels and wetlands that connect directly, or through a significant nexus, to traditional navigable waters. Any water connected through a significant nexus is evaluated and approved by the USACE. These waters are evaluated to ensure that impacts to wetlands and streams connected to traditional navigable waters do not have downstream impact on the general health of the permitted waters. Possible impacts include reduction in flow, pollutant runoff, and impacts to biota. Not all interstate wetlands are WOTUS. Wetlands within the Project Area are all jurisdictional and considered WOTUS.

3.8.1 Wetlands

Wetlands are evaluated based on the presence of three main criteria: hydrophytic vegetation, hydric soils, and hydrology. When all three indicators are present, the USACE categorizes a wetland as jurisdictional. Wetlands within the Project Area were evaluated in accordance with the USACE Wetlands Delineation Manual (USACE 1987), and the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (USACE 2010).

In 1998, IME performed field surveys within the Project Area. Most of the wetlands identified within the Project Area occur along incised channels and are determined jurisdictional based on presence of the three defining criteria (i.e., hydrophytic vegetation, hydric soils, and hydrology). These ephemeral stream channels are seasonally inundated and supported by runoff from surrounding topography and considered isolated where they occur. Additionally, isolated spring-fed wetlands occur within the Project Area, with most of those identified being less than 0.10 acre in size. These isolated wetlands met all three criteria from the USACE. A total of 1.55 acres of jurisdictional wetlands and 0.33 acre of ponds were delineated within the Project Area in the 1998 survey; 0.399 acre of those were approved to be affected by mining activities (IME 1998). Dominant wetland vegetation includes: spreading bentgrass (*Agrostis stolonifera*), Nebraska sedge (*Carex nebrascensis*), clustered field sedge (*C. praegracilis*), and curly dock (*Rumex crispus*).

Flume Gulch has been identified as the only drainage with incised channels within the Project Area. This series of drainages includes several smaller drainages that flow into the main Flume Gulch channel, lie on the northeastern portion of the Project Area, and flow north out of the Project Area along County Road (CR) 35 toward the Yampa River. Portions of Deacon Gulch occur on the eastern edge of the Project Area and will not be impacted by mining activities. The National Wetlands Inventory shows wetlands within the Project Area but most are outside of the disturbance area (National Wetland Inventory 2015). On October 2, 1998, the USACE issued Trapper Mine a Nationwide Permit 21, Surface Coal Mining Activities, which encompassed the Project Area and the associated mining activities.

3.8.2 Riparian Areas

Riparian areas are generally defined as the vegetated transitional zones that lie between aquatic and terrestrial (upland) environments. Riparian areas usually occur as belts along streams, rivers, lakes, marshes, bogs, and other waterbodies. As a transitional zone between aquatic and upland environments, riparian systems often exhibit characteristics of both. Generally, only perennial and intermittent streams can support riparian areas that serve the entire suite of riparian ecological functions. The Project Area lies mostly above 7,000 feet (2,134 meters) amsl with no perennial or intermittent streams. Ephemeral streams rarely possess the hydrologic conditions that allow true riparian vegetation to grow. There are no riparian areas mapped within the Project Area.

3.9 Fish and Wildlife Resources

3.9.1 Regulatory Background

Laws, regulations, and policies that directly influence wildlife management decisions made as part of the EA for the Trapper Mine are primarily implemented by the USFWS and CPW. Prominent laws, regulations, directives, and agreements relevant to the fish and wildlife resources within the Project Area include:

- CRS 33-1-101, 33-2-104;
- ESA;
- Migratory Bird Treaty Act (MBTA) (16 United States Code [USC] 703 et seq.);
- EO 13186 (66 FR 3853);
- CRS 33-2-105; and
- Bald and Golden Eagle Protection Act (BGEPA) (16 USC, 668 et seq.).

Information regarding wildlife species and their habitats within the Project Area was obtained from a review of the Trapper Mine PAP, published sources, public database information, BLM RMPs, CPW resource information, and USFWS data and documents.

3.9.2 Analysis Areas

Analysis areas for terrestrial and wildlife species were chosen to represent the combination of geographic areas containing contiguous habitat that would be impacted by the Proposed Action, as well as the management regimes to which this habitat is subject. The analysis areas for terrestrial wildlife species are defined as follows:

- *Big Game Analysis Area*: The big game analysis area consists of the Data Analysis Units (DAUs) and Game Management Units (GMUs) that are crossed by the Project Area. The Project Area boundary is within GMU 13. Sensitive habitat is typically considered a limiting factor for big game populations; therefore, the analysis focuses on these areas (e.g., winter range, migratory corridors, production areas, and summer range) within the DAUs for each species and GMU 13. DAU plans provide specific information including herd dynamics and population trends, habitat utilized by the herd, and current land use within the DAU.
- *Nongame and Small Game Terrestrial Wildlife Analysis Area*: The terrestrial wildlife analysis area for small game species and nongame species, including raptors and other migratory birds, includes suitable habitat within the Project Area.

The wildlife habitat located within the Project Area is predominately composed of the mountain shrub vegetation community and reclaimed rangelands. Other habitat types include sagebrush shrubland and grasslands.

The region supports a diverse terrestrial wildlife community of large and small mammals, migratory birds, and reptiles. Occurrence and density of wildlife species within the region are dependent upon a variety of factors including the size and mobility of the animal, food habits, water, existing and ongoing development, and overall habitat carrying capacities (Prior Magee et al. 2007). All wildlife species present in the analysis areas are important members of a functioning ecosystem and wildlife community, but most are common and have wide distributions in the region.

3.9.3 Nongame Species

The Nongame and Small Game Terrestrial Wildlife Analysis Area supports many types of nongame species (e.g., small mammals, raptors, passerines, and reptiles) occupying the habitat types within the Project Area. Nongame species serve as predators, prey, and scavengers in ecosystems.

3.9.3.1 Small Mammals

Within the Project Area, bat species could use trees, caves, and rock crevices as day and maternal roost sites, as well as hibernacula. No bat surveys have been conducted within the Project Area. However, bat species with the potential to occur within the wildlife analysis area include the little brown bat (*Myotis lucifugus*), long-eared myotis (*Myotis evotis*), western small-footed myotis (*Myotis ciliolabrum*), silver-haired bat (*Lasionycteris noctivagans*), big brown bat (*Eptesicus fuscus*), hoary bat (*Lasiurus cinereus*), and pallid bat (*Antrozous pallidus*) (TMI 1981 et seq.).

Other common small mammals occurring within the terrestrial wildlife analysis area include voles, shrews, chipmunks, pocket gophers, raccoons, woodrats, ground squirrels, mice, and other species that provide a substantial prey base for predators within the Project Area including larger mammals and raptors (TMI 1981 et seq.). Common small mammals that are known to occur within the Project Area include the masked shrew (*Sorex cinereus*), vagrant shrew (*Sorex vagrans*), Nuttall's cottontail (*Sylvilagus nuttallii*), white-tailed jackrabbit (*Lepus townsendii*), least chipmunk (*Tamias minimus*), yellow-bellied marmot (*Marmota flaviventris*), Richardson's ground squirrel (*Urocitellus richardsonii*), golden-mantled ground squirrel (*Callospermophilus lateralis*), northern pocket gopher (*Thomomys talpoides*), deer mouse (*Peromyscus maniculatus*), bushy-tailed wood rat (*Neotoma cinerea*), red-backed vole (*Myodes gapperi*), long-tailed vole (*Microtus longicaudus*), porcupine (*Erethizon dorsatum*), coyote (*Canis latrans*), red fox (*Vulpes vulpes),* raccoon (*Procyon lotor*), long-tailed weasel (*Mustela frenata*), American badger (*Taxidea taxus*), striped skunk (*Mephitis mephitis*), and bobcat (*Lynx rufus*) (TMI 1981 et seq.).

3.9.3.2 Migratory Birds

The MBTA provides federal legal protection from human depredation for more than 1,000 bird species (16 USC 703-712). In addition to the MBTA, bald and golden eagles are protected under the BGEPA (16 USC 668 et seq.). The majority of birds found within the Project Area and vicinity are considered migratory under the MBTA. These birds are primarily summer residents in the region. Many of the summer residents are neotropical migrants that winter in Central and South America. Many bird species are more vulnerable to disturbance during the breeding season when human disturbances can compromise successful reproduction. The timing and duration of the breeding season is species-specific and may vary according to latitude, elevation, and climatic conditions. **Table 3-13** provides a list of migratory birds known to occur or with the potential to occur within the Project Area and surrounding region.

Table 3-13 Migratory Birds Known to Occur and with the Potential to Occur in the Vicinity of the Project Area

Red-winged blackbird (*Agelaius phoeniceus*)	Brewer's blackbird (*Euphagus cyanocephalus*)	Mountain bluebird (*Sialia currucoides*)
Lazuli bunting (*Passerina amoena*)	Bushtit (*Psaltriparus minimus*)	Black-capped chickadee (*Poecile atricapillus*)
Gray catbird (*Dumetella carolinensis*)	Brown-headed cowbird (*Molothrus ater*)	Sandhill crane (*Grus canadensis*)
American crow (*Corvus brachyrhynchos*)	Mourning dove (*Zenaida macroura*)	Gadwall (*Anas strepera*)
Mallard (*Anas platyrhynchos*)	Pintail (*Anas acuta*)	Blue-winged teal (*Anas discors*)
Cinnamon teal (*Anas cyanoptera*)	Green-winged teal (*Anas crecca*)	Northern shoveler (*Anas clypeata*)
American wigeon (*Anas americana*)	Bald eagle (*Haliaeetus leucocephalus*)	Golden eagle (*Aquila chrysaetos*)
American kestrel (*Falco sparverius*)	Prairie falcon (*Falco mexicanus*)	House finch (*Haemorhous mexicanus*)
Northern flicker (*Colaptes auratus*)	Dusky flycatcher (*Empidonax oberholseri*)	Blue-gray gnatcatcher (*Polioptila caerulea*)
American goldfinch (*Spinus tristis*)	Lesser goldfinch (*Spinus psaltria*)	Canada goose (*Branta canadensis*)
Black-headed grosbeak (*Pheucticus melanocephalus*)	Cooper's hawk (*Accipter cooperii)*	Ferruginous hawk (*Buteo regalis*)
Red-tailed hawk (*Buteo jamaicensis*)	Rough-legged hawk (*Buteo lagopus*)	Sharp-shinned hawk (*Accipter striatus*)
Swainson's hawk (*Buteo swainsoni*)	Great blue heron (*Ardea herodias)*	Black-chinned hummingbird (*Archilochus alexandri*)
Broad-tailed hummingbird (*Selasphorus platycercus*)	Western scrub- jay (*Aphelocoma californica*)	Steller's jay (*Cyanocitta stelleri*)
Dark-eyed junco (*Junco hyemalis*)	Killdeer (*Charadrius vociferous*)	Western kingbird (*Tyrannus verticalis*)
Ruby-crowned kinglet (*Regulus calendula*)	Horned lark (*Eremophila alpestris*)	Black-billed magpie (*Pica hudsonia*)
Western meadowlark (*Sturnella neglecta*)	Common nighthawk (*Chordeiles minor*)	Bullock's oriole (*Iceterus bullockii*)
Great-horned owl (*Bubo virginianus*)	Long-eared owl (*Asio otus*)	Say's phoebe (*Sayornis saya*)
American pipit (*Anthus rubescens*)	Common poor-will (*Phalaenoptilus nuttallii*)	Common raven (*Corvus corax*)
American robin (*Turdus migratorius*)	Red-naped sapsucker (*Sphyrapicus nuchalis*)	Loggerhead shrike (*Lanius ludovicianus*)
Northern shrike (*Lanius excubitor*)	Pine siskin (*Spinus pinus*)	Wilson's snipe (*Gallinago delicata*)

Table 3-13 Migratory Birds Known to Occur and with the Potential to Occur in the Vicinity of the Project Area

Brewer's sparrow (*Spizella breweri*)	Barn swallow (*Hirundo rustica*)	Chipping sparrow (*Spizella passerina*)
Lark sparrow (*Chondestes grammacus*)	Song sparrow (*Melospiza melodia*)	Vesper sparrow (*Pooecetes gramineus*)
White-crowned sparrow (*Zonotrichia leucophrys*)	Cliff swallow (*Petrochelidon pyrrhonota*)	Tree swallow (*Tachycineta bicolor*)
Violet-green swallow (*Tachycineta thalassina*)	White-throated swift (*Aeronautes saxatalis*)	Western tanager (*Piranga ludoviciana*)
Sage thrasher (*Oreoscoptes montanus*)	Green-tailed towhee (*Pipilo chlorurus*)	Spotted towhee (*Pipilo maculatus)*
Plumbeous vireo (*Vireo plumbeus*)	Warbling vireo (*Vireo gilvus*)	MacGillivray's warbler (*Geothlypis tolmiei*)
Orange-crowned warbler (*Oreothlypis celata*)	Virginia's warbler (*Vermivora virginiae*)	Wilson's warbler (*Cardelina pusilla*)
Yellow warbler (*Setophaga petechia*)	Yellow-rumped warbler (*Setophaga coronata*)	Cedar waxwing (*Bombycilla cedrorum*)
Downy woodpecker (*Picoides pubescens*)	Hairy woodpecker (*Picoides villosus*)	Western wood-pewee (*Contopus sordidulus*)
House wren (*Troglodytes aedon*)	Rock wren (*Salpinctes obsoletus*)	

Raptors

Raptors are protected under state and federal laws including the MBTA, and bald and golden eagle are protected under the BGEPA. A variety of raptor habitats are found within and adjacent to the Project Area, from lower elevation grassland and shrublands to montane shrublands and forests. As a result, there are a variety of raptor species likely to hunt or breed in the area including: red-tailed hawk, long-eared owl, great-horned owl, turkey vulture (*Cathartes aura*), golden eagle, bald eagle, ferruginous hawk, prairie falcon, Cooper's hawk, rough-legged hawk, American kestrel, sharp-shinned hawk, and Swainson's hawk (TMI 1981 et seq.).

Surveys were conducted between 2001 and 2015 to identify the status of a historic prairie falcon nest site at the southeast corner of Trapper Mine's SMCRA permit boundary near the Hamill property. The surveys did observe active prairie falcon and golden eagle nests within the vicinity of the Project Area (TMI 1981 et seq.).

3.9.3.3 Reptiles and Amphibians

Most reptiles occur in lower elevations and in drier habitats such as sagebrush, greasewood, and pinyon-juniper vegetation communities. Common reptile species that have been noted in the Project Area include the greater short-horned lizard (*Phrynosoma hernandesi*), Great Basin gopher snake (*Pituophis melanoleucus deserticola*), wandering garter snake (*Thamnophis elegans vagrans*), and prairie rattlesnake (*Crotalus viridis viridis*) (TMI 1981 et seq.).

Native amphibians that could potentially occur in the Project Area include the chorus frog (*Pseudacris triseriata*), tiger salamander (*Ambystoma tigrinum*), and northern leopard frog (*Lithobates pipiens*).The chorus frog and tiger salamander are not managed by CPW. The northern leopard frog is a species receiving more interest by CPW as a species in need of conservation. Northern leopard frogs are the only potentially occurring species known to inhabit ponds and other suitable habitats within the SMCRA permit boundary, but the species has not been documented in the Project Area (TMI 2015).

3.9.4 Game Species

3.9.4.1 Big Game

As described above, the analysis area for big game species includes CPW-designated big game ranges (e.g., overall range, severe winter range, production range, etc.) within the GMU 13 that overlaps with the Project Area. In Colorado, big game is managed by CPW within specific geographic areas within herd areas, or GMUs, based on objectives set within a herd management plan, also known as a DAU. Herds are capable of using multiple or single GMUs (CPW 2015-2016). The DAU represents the year-round range of a big game herd and includes all of the seasonal ranges of a specific herd. The purpose of a DAU plan is to integrate the plans and intentions of CPW with the concerns and ideas of land management agencies and the interested public to determine how a big game herd in a DAU should be managed (CPW 2015a). This analysis area provides the context for Project impacts and cumulative impacts involving the habitat specifically managed for big game populations. This is further referred to as the big game analysis area through the remainder of this section.

The big game species whose overall range overlap with the Project Area include mule deer (*Odocoileus hemionus*), elk (*Cervus canadensis*), moose (*Alces alces*), black bear (*Ursus americanus*), and mountain lion (*Puma concolor*). The Project Area does not overlap with the overall range for pronghorn (*Antilocapra americana*) (CPW 2014a). The Project Area does occur within DAU A-9 for pronghorn and pronghorns are known to occur within the Project Area. In 2014, this DAU had an estimated population of 12,370 individuals, and in 2004 there was an estimated population of 16,200. This is approximately 17 percent of the statewide population (CPW 2015b).

<u>Mule Deer</u>

Within the region, mule deer use a variety of vegetation communities that provide year-round suitable habitat. These vegetation communities include aspen forests and woodlands, conifer forests, shrublands, and pinyon-juniper woodlands. The White River deer herd is the largest mule deer herd in Colorado. The total herd population was estimated to be 71,380 in 2007 and 37,530 in 2014. 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 (CPW 2015b).

The entire Project Area is within the overall winter and summer range of the White River deer herd (DAU D-7) (**Figure 3-8**). CPW (2012a) defines summer range as that part of the overall range where 90 percent of the individuals are located between spring green-up and the first heavy snowfall. The northern two-thirds of the Project Area falls within winter range for mule deer. Winter range is that part of the range where 90 percent of the animals are located during average winters. Winter habitat for mule deer occurs in areas of relatively high amounts of sagebrush and bitterbrush and overall low snow accumulation – typically on south- and west-facing slopes.

<u>Elk</u>

In Colorado, elk are distributed across the western two-thirds of the state, generally at elevations above 6,000 feet (1,829 meters) amsl (Armstrong et al. 2011). Elk are typically found in forested habitats, although in northwestern Colorado elk are found in large herds during the winter months in open sagebrush shrublands and grasslands (CPW 2012b). Winter habitat for elk typically consists of low elevation rolling hills, meadows, and agricultural fields. However, unlike mule deer, elk are not as susceptible to harsh winter conditions due to their nutritional requirements and large body size, and often remain at higher elevations longer. Spring and fall migrations are facultative and are tied to weather and forage quality. Upland meadow and mountain shrub habitats provide the highest-quality forage areas for elk within the big game analysis area.

Elk within the Project Area are part of the White River herd (DAU E-6) as defined by CPW. The population of the White River elk herd has grown steadily since the early 1980s, and CPW has been attempting to reduce the herd size to maintain it within the management goal of 32,000 to

39,000 animals (CPW 2015b). In 2007, the herd was estimated to be 43,870 animals. In 2014, the total herd population was estimated at 39,900, and represents the largest elk herd in Colorado (CPW 2015b).

Elk seasonal ranges that overlap with the Project Area are shown on **Figure 3-9**. **Figure 3-10** shows elk resident population and production areas that overlap with the Project Area. CPW data indicate that the entire Project Area is located within designated winter and summer ranges, as well as a production area for elk. Portions of the Project Area are located within migration corridors, a resident population area, severe winter range, and a winter concentration area.

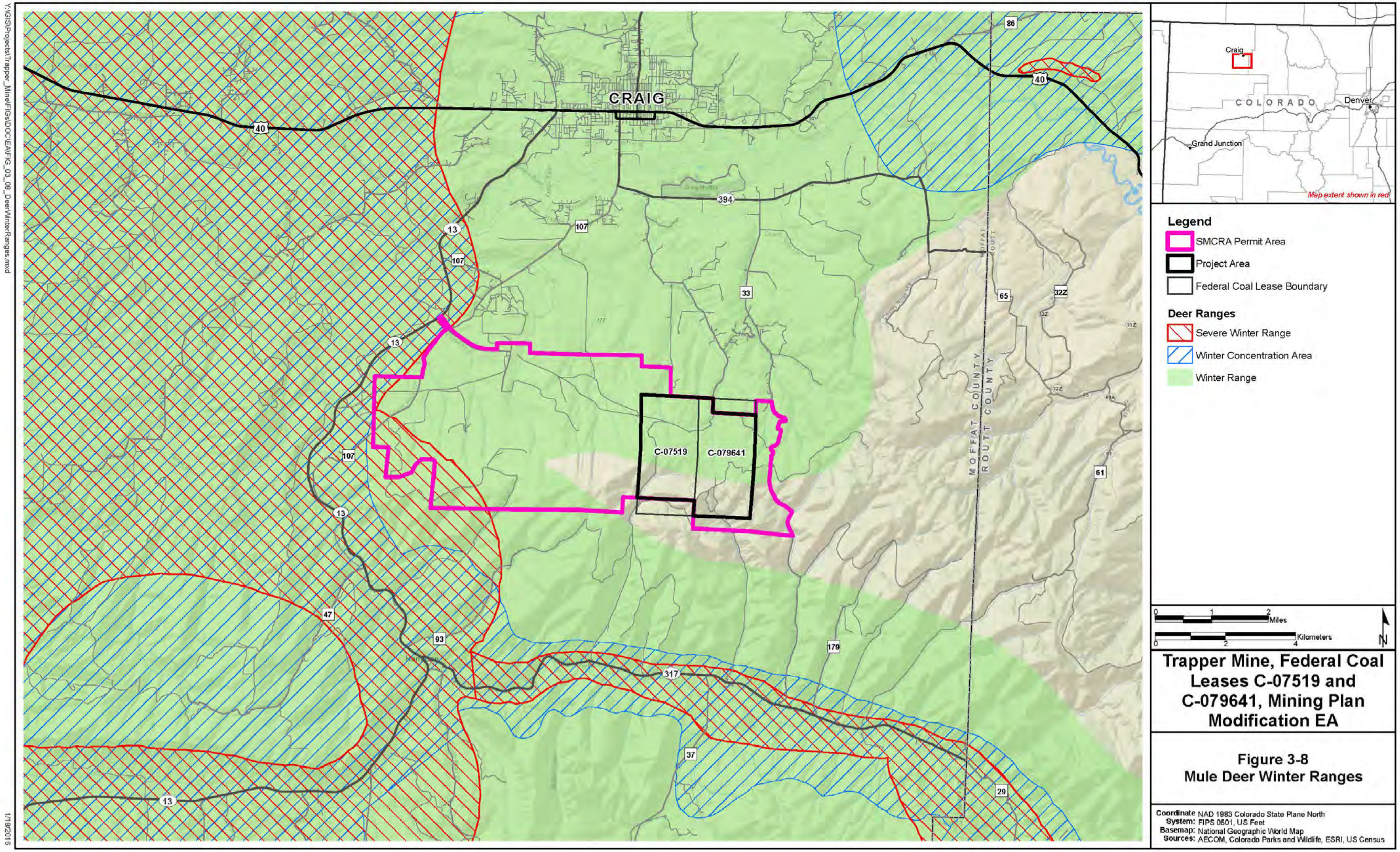
The CPW defines these ranges and production areas as follows:

- Migration corridors are a specific site through which large numbers of animals migrate; loss of which would change migration routes.
- Production areas are that part of the overall range occupied by the females from May 15 to June 15 for calving.
- A resident population area is an area used year-round by a population of elk. Individuals could be found in any part of the area at any time of the year; the area cannot be subdivided into seasonal ranges. It is most likely included within the overall range of the larger population.
- Summer range is that part of the range of a species where 90 percent of the individuals are located between spring green-up and the first heavy snowfall, or during a site specific period of summer as defined for each DAU. Summer range is not necessarily exclusive of winter range; in some areas winter range and summer range may overlap.
- Winter range is that part of the overall range of elk where 90 percent of the individuals are located during the average five winters out of 10 from the first heavy snowfall to spring green-up, or during a site-specific period of winter as defined for each DAU.
- Winter concentration areas include that part of the winter range where densities are at least 200 percent greater than the surrounding winter range density during the average five winters out of six from the first heavy snowfall to spring green-up, or during a site-specific period of winter as defined for each DAU.
- Severe winter range represents that part of the overall range of elk where 90 percent of the individuals are located when the annual snowpack is at its maximum and/or temperatures are at a minimum in the two worst winters out of 10.

Moose

Moose are not common within the big game analysis area. Until 1978 when moose were reintroduced to North Park from Utah and Wyoming, moose were not breeding in Colorado and were only considered infrequent migrants into the state (CPW 2014b). From 2005 to 2007, moose were reintroduced to the Grand Mesa (CPW 2014c). Typically, this species is found in forested areas, primarily along riparian areas with abundant willow habitat. Typically, moose are not as susceptible to severe winter conditions as other big game animals due to their large body size and adaptions that allow them to forage in deep snow and survive in colder climates.

The Project Area boundary does not occur within any moose DAUs, but moose overall range and summer range are within the Project Area. According to CPW, moose summer range is defined as that part of the overall range where 90 percent of the individuals are located during the summer months. This summer time frame will be delineated with specific start/end dates for each moose population within the state (e.g., May 1 to September 15). Summer range is not necessarily exclusive of winter range. Moose ranges in and near the Project Area are shown in **Figure 3-11**.


CRAIG
C-07519
C-079641
MOFFAT COUNTY
ROUTT COUNTY
Craig
COLORADO
Denver
Grand Junction
Map extent shown in red
Legend
SMCRA Permit Area
Project Area
Federal Coal Lease Boundary
Deer Ranges
Severe Winter Range
Winter Concentration Area
Winter Range
Miles
Kilometers
Trapper Mine, Federal Coal Leases C-07519 and C-079641, Mining Plan Modification EA
Figure 3-8
Mule Deer Winter Ranges
Coordinate System: NAD 1983 Colorado State Plane North FIPS 0501, US Feet
Basemap: National Geographic World Map
Sources: AECOM, Colorado Parks and Wildlife, ESRI, US Census
Y:\GIS\Projects\Trapper_Mine\FIGs\DOC\EA\FIG_03_08_DeerWinterRanges.mxd
1/19/2016

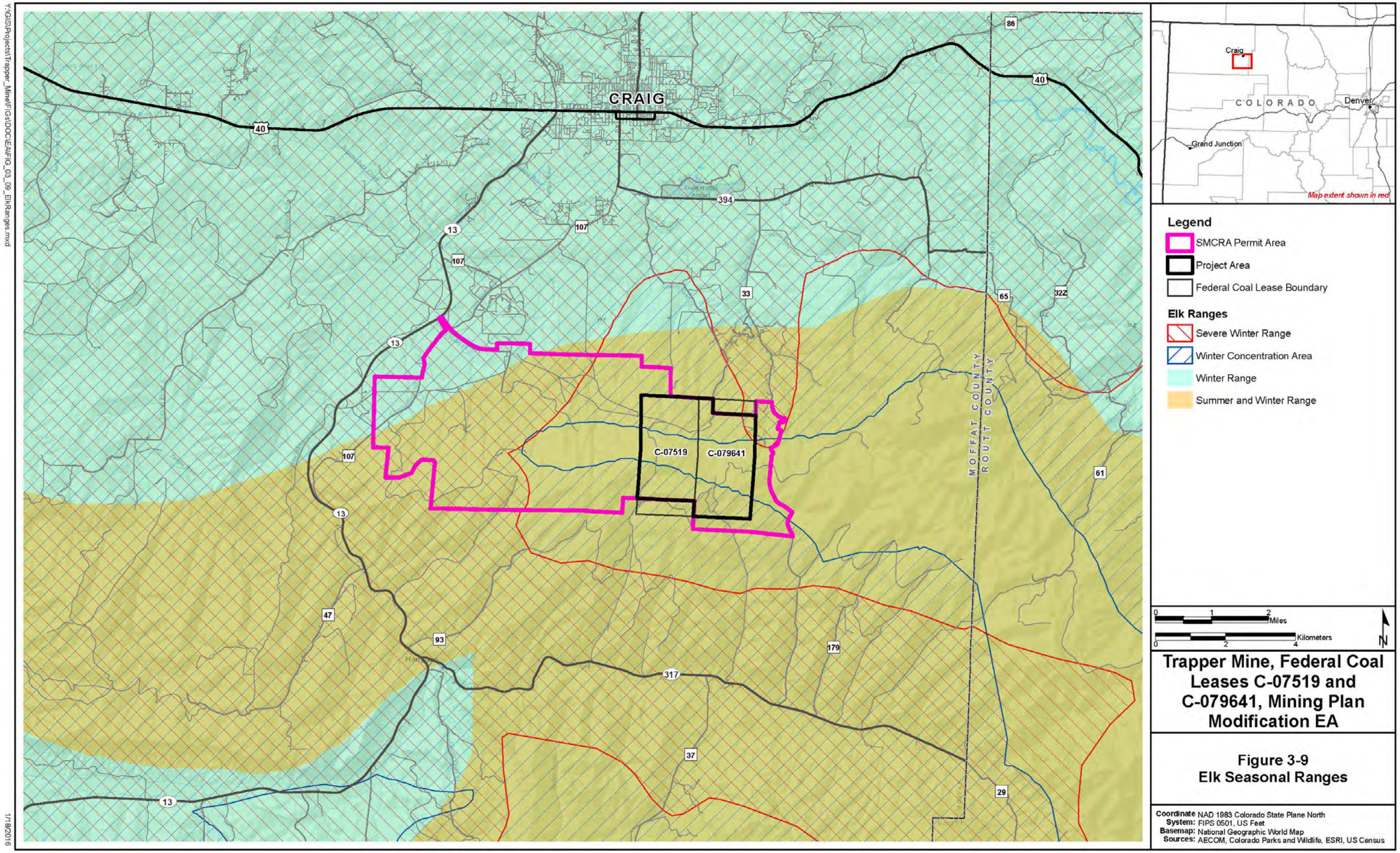
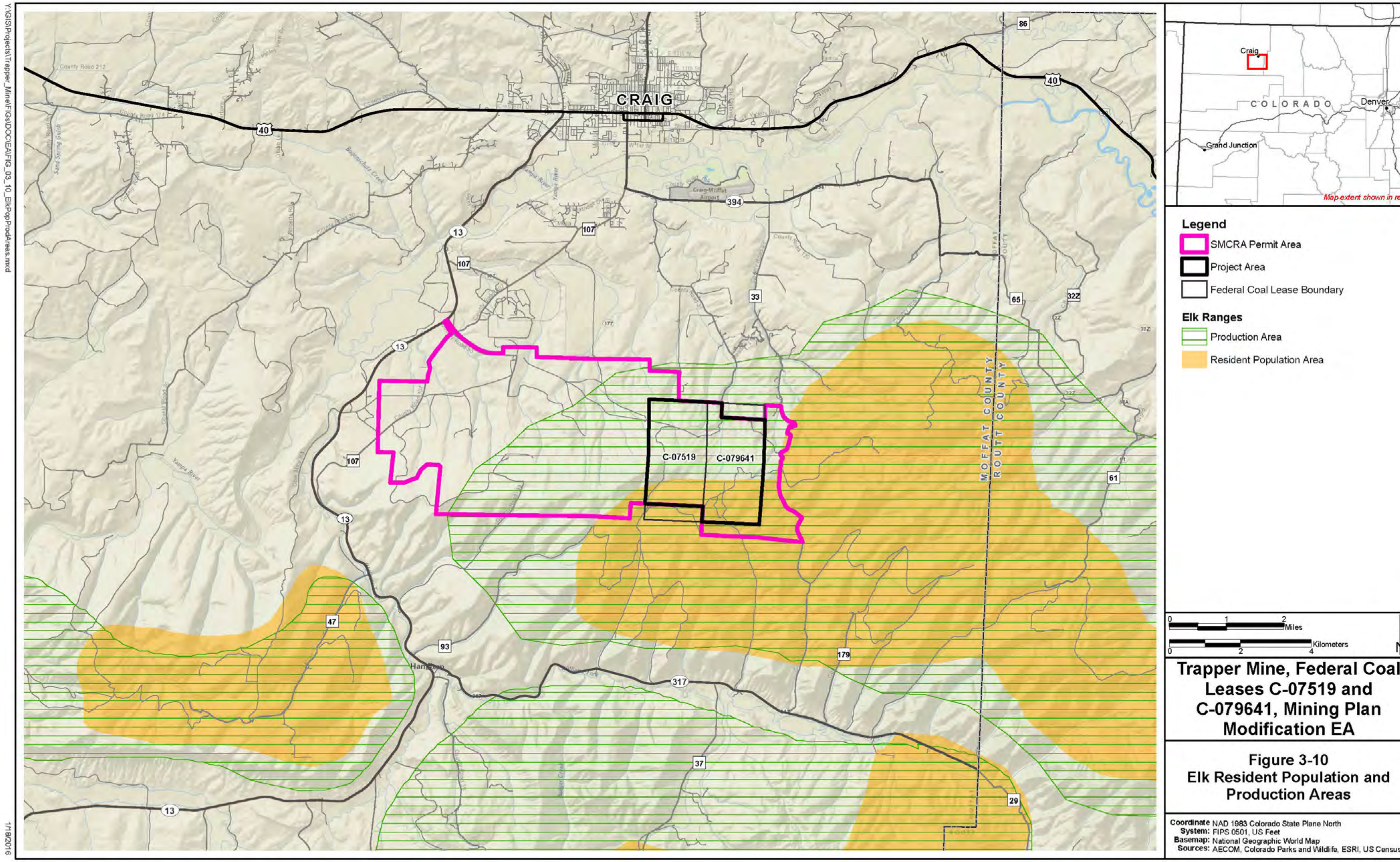


Figure 3-9
Elk Seasonal Ranges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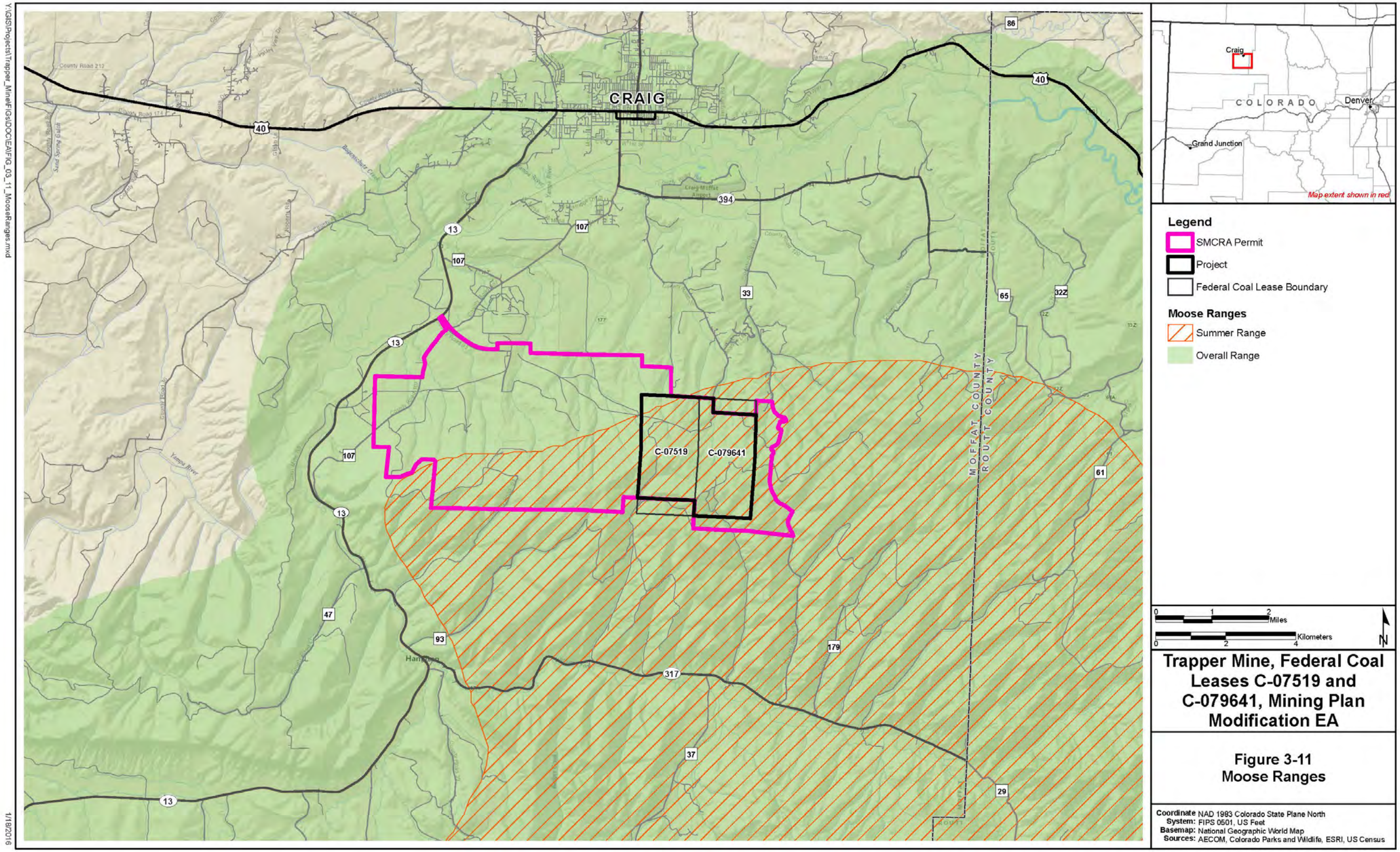
CRAIG
C-07519
C-079641
MOFFAT COUNTY
ROUTT COUNTY
Hamilton
Craig-Moffat Airport
Craig
COLORADO
Denver
Grand Junction
Map extent shown in red
Legend
SMCRA Permit Area
Project Area
Federal Coal Lease Boundary
Elk Ranges
Production Area
Resident Population Area
Miles
Kilometers
N
Trapper Mine, Federal Coal Leases C-07519 and C-079641, Mining Plan Modification EA
Figure 3-10
Elk Resident Population and Production Areas
Coordinate System: NAD 1983 Colorado State Plane North FIPS 0501, US Feet
Basemap: National Geographic World Map
Sources: AECOM, Colorado Parks and Wildlife, ESRI, US Census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CRAIG
Craig
COLORADO
Denver
Grand Junction
Map extent shown in red
Legend
SMCRA Permit
Project
Federal Coal Lease Boundary
Moose Ranges
Summer Range
Overall Range
C-07519
C-079641
MOFFAT COUNTY
ROUTT COUNTY
Miles
Kilometers
Trapper Mine, Federal Coal Leases C-07519 and C-079641, Mining Plan Modification EA
Figure 3-11
Moose Ranges
Coordinate System: NAD 1983 Colorado State Plane North FIPS 0501, US Feet
Basemap: National Geographic World Map
Sources: AECOM, Colorado Parks and Wildlife, ESRI, US Census

Black Bear and Mountain Lion

Black bear are fairly common within the big game analysis area. The species is especially common in forested, woody riparian, and wetland areas along perennial waterbodies (Armstrong et al. 2011). Black bears usually occur at low densities in similar habitats within the region, and their presence or absence is highly dependent on existing disturbance and available food sources. The Project Area falls within DAU B-10. Fall concentration areas and summer concentration areas overlap with the Project Area (**Figure 3-12**). Fall concentration areas are that portion of the overall range occupied from August 15 until September 30 for the purpose of ingesting large quantities of mast and berries to establish fat reserves for the winter hibernation period. Summer concentration areas are that portion of the overall range of the species where activity is greater than the surrounding overall range from June 15 to August 15 (CPW 2012b).

Similar to black bear, mountain lions are fairly common in the region. Mountain lions generally occur at low densities in a variety of habitats found within the big game analysis area and their distribution is dependent on available food sources, primarily mule deer. The Project Area falls within the range of DAU-L7 for mountain lion.

3.9.4.1 Small Game Species

Small game species that occur within the region include furbearers, upland game birds, and waterfowl. Potential habitat for small game species (except waterfowl) within the Project Area includes all of the plant communities that occur there. Potential habitat for waterfowl within the wildlife analysis area is limited to sediment ponds within the Project Area.

Furbearers

Furbearers likely to occur within the wildlife analysis area include cottontail (*Sylvilagus* spp.), black-tailed jackrabbit (*Lepus californicus*), Richardson's ground squirrel, ring-tail (*Bassariscus astutus*), raccoon (*Procyon lotor*), striped skunk , long-tailed weasel , American badger , bobcat , coyote , and red fox (CPW 2012b). These species have wide distributions and are found within a variety of habitat types in the greater region (e.g., sagebrush shrubland, desert shrub, pinyon-juniper, montane shrubland, grassland, etc.). The distribution of furbearers within the wildlife analysis area is typically determined by available food sources and suitable cover sites for burrows or dens.

Upland Game Birds

Upland game bird species that occur within the wildlife analysis area include Columbian sharp-tailed grouse (*Tympanuchus phasianellus columbianus*), dusky grouse (*Dendragapus obscurus*), and mourning dove. The Columbian sharp-tailed grouse is discussed under Special Status Species, Section 3.10. Mourning doves occur in habitats ranging from deciduous forests to shrubland and grassland communities, often nesting in trees or shrubs near riparian areas or water sources (Stokes and Stokes 1996). Most upland game bird species feed on a wide variety of plant and insect species depending on the time of year (i.e., insects during the spring and summer and leaves and seeds during the fall and winter). Many of the species described above exhibit annual population fluctuations depending on habitat conditions and weather patterns.

Waterfowl

The Project Area is located within the Pacific Flyway. Common waterfowl species that have been reported to occur in the region or that may occur in the Project Area include Canada goose, mallard, green-winged teal, pintail, gadwall, American wigeon, and common goldeneye (*Bucephala clangula*). Other common summer residents include blue-winged teal, northern shoveler, redhead (*Aythya americana*), and lesser scaup (*Anas affinis*) (Cerovski et al. 2004; Kingery 1998; Stokes and Stokes 1996).

These species distributions are limited to the rivers, streams, lakes, reservoirs, ponds, and wetlands found within the greater region. These habitats are absent from the Project Area with the exception of water impounded at sediment ponds. Population numbers for these species vary annually based on available food and weather patterns. While waterfowl species are considered game birds, they also are protected under the MBTA.

3.9.5 Fish

The Project Area for aquatic biological resources includes streams located within the mine boundary (**Figure 2-1**). In addition, a downstream section of the Yampa River is considered part of the regional effects area and deposition effects and water use are analyzed for that area. The affected environment description for aquatic biological resources focuses on perennial streams, which support fish species.

Aquatic habitat within the mine boundary of the Project Area consists of only ephemeral streams. There are no intermittent or perennial streams within the mine boundary area. Ephemeral (short-lived or transitory flow) streams provide temporary habitat during the year. Water availability would be limited to periods when water is present as a result of spring snowmelt or storm events. None of the streams are managed for recreational sports fisheries by CPW. The Yampa River is located approximately 4.5 miles (7.2 km) north of the mine boundary, and it contains a mixture of runs, riffles, and deep pools but lies outside the Project Area.

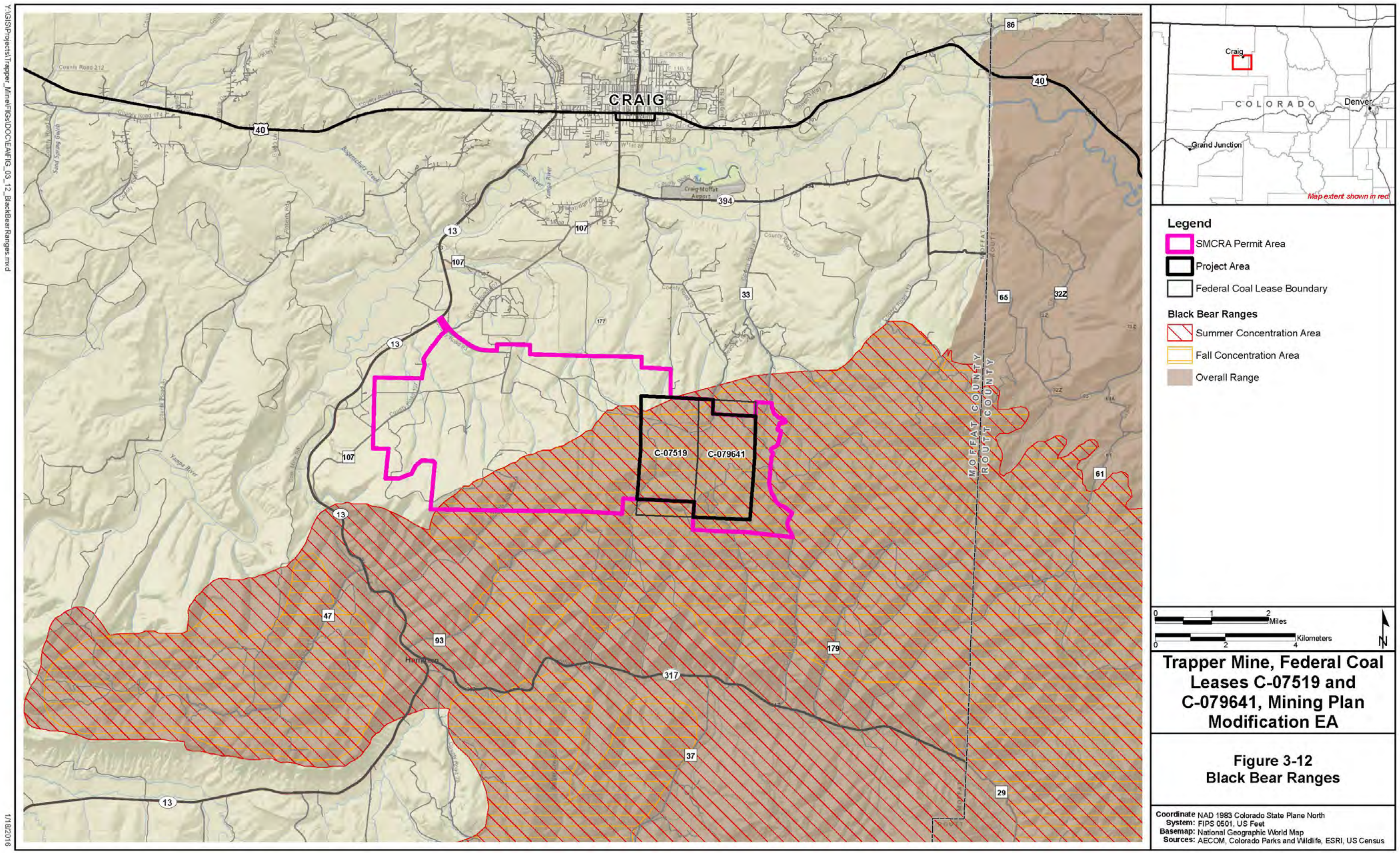
The aquatic communities in the ephemeral streams would mainly support macroinvertebrates when water is present. Macroinvertebrate groups would be represented by species that are indicative of seasonal availability of water. Fish would not occur in the streams due to a lack of water on a consistent basis throughout the year. It is possible that a few scattered pools could provide fish habitat on an infrequent basis, but there are no upgradient perennial streams that would be a source of fish during flow events.

The Yampa River, 4.5 miles (7.2 km) north of the Project Area, is part of the CPW's Middle Yampa Fish Management Unit (FMU) (CPW 2010). This section of the river contains a mixture of coldwater and warmwater fish species. The upper portion of the Middle Yampa FMU is utilized as a recreational trout fishery, while the lower portion (from Hayden downstream to the confluence with the Williams Fork River) is managed for the recovery of federally endangered fishes of the Upper Colorado River Basin and other native fish species. Special status aquatic species are discussed in Section 3.10. The typical recreational sport fish species along the Yampa River include: rainbow trout (*Oncorhynchus mykiss*), brown trout (*Salmo trutta)*, channel catfish (*Ictalurus punctatus*), northern pike (*Esox lucius*), and smallmouth bass (*Micropterus dolomieu*) (Johnson et al. 2008). Colorado River cutthroat trout (*Oncorhynchus clarkii pleuriticus*) and mountain whitefish (*Prosopium williamsoni*) are found in lakes and ponds in the area.

3.10 Special Status Species

Special status species are those species for which state or federal agencies afford an additional level of protection by law, regulation, or policy. Included in this category are federally listed species that are protected under the ESA; BLM sensitive species; and species that CPW has designated as threatened, endangered, or species of concern in Colorado. The analysis area for state listed and BLM sensitive species is the Project Area within suitable, historic, or occupied habitat and is coincident with the analysis area described for vegetation in Section 3.7.

The analysis area for federally listed species is larger and equivalent to the areas analyzed in a separate Biological Assessment (BA) submitted to the USFWS for Section 7 consultation under the ESA (OSMRE 2015). The analysis area for the yellow billed-cuckoo includes the airshed analysis boundary for mercury deposition from mining and coal combustion. The analysis area for federally listed fish species includes this same airshed analysis boundary and an adjoining area to the west between the Yampa and White rivers to their confluences with the Green River.



Trapper Mine, Federal Coal Leases C-07519 and C-079641, Mining Plan Modification EA

Figure 3-12 Black Bear Ranges

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Special status species known to occur within Moffat County are shown in **Table 3-14**, which also describes those species that were carried forward for analysis in the EA and those that were not. Several sources of information were reviewed to identify sensitive species that have the potential to occur in the Project Area: the USFWS Information for Planning and Conservation (USFWS 2015a) for federally listed species, Colorado Natural Heritage Program's (CNHP) Species Tracking Lists (CNHP 2015), BLM sensitive species list for the LSFO (BLM 2015), published books and journal articles, and other sources of publicly available information.

Table 3-14 Special Status Species in Moffat County

	Common Name (*Scientific Name*)	**Federal Status**	**State Status**	**Carried Forward for Further Analysis**
Amphibians	Boreal toad *(Anaxyrus boreas)*	BLM LSFO Sensitive		No – suitable habitat is not found within the Project Area.
	Northern leopard frog *(Lithobates pipiens)*	BLM LSFO Sensitive	SC	Yes – suitable habitat is not found within the Project Area. However, the species occurs in the SMCRA permit area and could disperse into Project Area in the future.
Birds	Northern goshawk *(Accipter gentilis)*	BLM LSFO Sensitive	NL	No – suitable habitat is not found within the Project Area.
	Golden eagle (*Aquila chrysaetos*)	BLM LSFO Sensitive	NL	Yes – suitable foraging habitat occurs in the Project Area. The species nests east of the Project Area.
	Burrowing owl *(Athene cunicularia)*	BLM LSFO Sensitive	NL	Yes – suitable habitat is not found within the Project Area. However, the species is found on reclaimed lands west of the Project Area.
	Ferruginous hawk *(Buteo regalis)*	BLM LSFO Sensitive	SC	Yes – species is rare in the region, with limited potential to occur in the Project Area.
	Greater sage-grouse *(Centrocercus urophasianus)*	BLM LSFO Sensitive	SC	No – suitable habitat for the species is not present in the Project Area.
	Mountain plover *(Charadrius montanus)*	BLM LSFO Sensitive	SC	No – rare in the region with unsuitable habitat in the Project Area.
	Yellow-billed cuckoo *(Coccyzus americanus)*	Threatened	NL	Yes – suitable habitat is not found within the Project Area but occurs in a wider analysis area for this species.
	American peregrine falcon *(Falco peregrinus anatum)*	BLM LSFO Sensitive	SC	Yes – rare spring and fall migrant in the wider analysis area with limited potential to occur in the Project Area.
	Sandhill crane *(Grus canadensis)*	NL	SC	No – suitable habitat is not found within the Project Area although this species does nest in wetlands near the western SMCRA permit boundary.
	Bald eagle *(Haliaeetus leucocephalus)*	BLM LSFO Sensitive	SC	No – suitable habitat is not found within the Project Area.
	Long-billed curlew *(Numenius americanus)*	NL	SC	No – rare in the region with no suitable habitat in the Project Area.

Table 3-14 Special Status Species in Moffat County

	Common Name (*Scientific Name*)	**Federal Status**	**State Status**	**Carried Forward for Further Analysis**
	Brewer's sparrow *(Spizella berweri)*	BLM LSFO Sensitive	NL	Yes – suitable habitat occurs in the Project Area where there is adequate shrub cover.
	Mexican spotted owl *(Strix occidentalis)*	Threatened	NL	No – suitable habitat is not found within the Project Area.
	Columbian sharp-tailed grouse *(Tympanuchus phasianellus columbianus)*	BLM LSFO Sensitive	SC	Yes – found within reclaimed areas.
Fish	Bluehead sucker *(Catostomus discobolus)*	BLM LSFO Sensitive	NL	No – no suitable habitat in the Project Area.
	Flannelmouth sucker *(Catostomas latipinnis)*	BLM LSFO Sensitive	NL	No – no suitable habitat in the Project Area.
	Mountain sucker *(Catostomas platyrhynchus)*	BLM LSFO Sensitive	SC	No – no suitable habitat in the Project Area.
	Bonytail chub *(Gila elegans)*	Endangered	SE	Yes – suitable habitat is not found within the Project Area but occurs in the wider analysis area for this species.
	Humpback chub *(Gila cypha)*	Endangered	ST	Yes – suitable habitat is not found within the Project Area but occurs in the wider analysis area for this species.
	Roundtail chub *(Gila robusta)*	BLM LSFO Sensitive	SC	No – occurs outside Project Area in the Yampa and White rivers.
	Colorado River cutthroat trout *(Oncorhynchus clarkii pleuriticus)*	BLM LSFO Sensitive	SC	No – occurs outside Project Area in the Yampa and White rivers.
	Colorado pikeminnow *(Ptychocheilus lucius)*	Endangered	ST	Yes – suitable habitat is not found within the Project Area but occurs in the wider analysis area for this species.
	Razorback sucker *(Xyrauchen texanus)*	Endangered	SE	Yes – suitable habitat is not found within the Project Area but occurs in the wider analysis area for this species.
Mammals	Townsend's big-eared bat *(Corynorhinus townsendii)*	NL	SC	No – suitable habitat is not found within the Project Area.
	White-tailed prairie dog *(Cynomys ludovicianus)*	BLM LSFO Sensitive	NL	No – the species is not present in the Project Area, but potential habitat occurs on reclaimed land and in native range land.
	Spotted bat *(Euderma maculatum)*	BLM LSFO Sensitive	NL	No – suitable habitat is not found within the Project Area.
	Canada lynx *(Lynx canadensis)*	Threatened	SE	No – suitable habitat is not found within the Project Area.
	Black-footed ferret *(Mustela nigripes)*	Endangered	SE	No – the geographic range of re-introduced populations of the species is outside the Project Area.

Table 3-14 Special Status Species in Moffat County

	Common Name (*Scientific Name*)	Federal Status	State Status	Carried Forward for Further Analysis
	Kit fox (*Vulpes macrotis*)	NL	SE	No – Project Area is outside the geographic range of the species.
Reptiles	Midget faded rattlesnake *(Crotalus oreganus concolor)*	BLM LSFO Sensitive	SC	No – suitable habitat is not found within the Project Area; the species is restricted to outcrops of the Green River Formation in the region.
Plants	Ute ladies'-tresses *(Spiranthes diluvalis)*	Threatened	NL	No – suitable habitatis not found within the Project Area.
	Dudley bluffs twinpod *(Physaria obcordata)*	Threatened	NL	No – suitable habitat is not found within the Project Area.
	Duchesne milkvetch *(Astragalus duchesnensis)*	BLM LSFO Sensitive	NL	No – the Project Area is outside the geographic range of the species.
	Tufted cryptantha *(Cryptantha caespitosa)*	BLM LSFO Sensitive	NL	No – the Project Area is outside the geographic range of the species.
	Uinta Basin spring-parsley *(Cymopterus duchesnensis)*	BLM LSFO Sensitive	NL	No – the Project Area is outside the geographic range of the species.
	Singlestem buckwheat (*Eriogonum acaule*)	BLM LSFO Sensitive	NL	No – the Project Area is outside the geographic range of the species.
	Woodside buckwheat *(Eriogonum tumulosum)*	BLM LSFO Sensitive	NL	No – the Project Area is outside the geographic range of the species.
	Clay Hill buckwheat *(Eriogonum viridulum)*	BLM LSFO Sensitive	NL	No – the Project Area is outside the geographic range of the species.
	Flaming Gorge evening primrose *(Oenothera acutissima)*	BLM LSFO Sensitive	NL	No – the Project Area is outside the geographic range of the species.
	Colorado feverfew *(Parthenium ligulatum)*	BLM LSFO Sensitive	NL	No – the Project Area is outside the geographic range of the species.
	Gibbens' beardtongue *(Penstemon gibbensii)*	BLM LSFO Sensitive	NL	No – the Project Area is outside the geographic range of the species.
	Yampa beardtongue (*Penstemon yampaensis*)	BLM LSFO Sensitive	NL	No – the Project Area is outside the geographic range of the species.
	Rock tansy *(Sphaeromeria capitata)*	BLM LSFO Sensitive	NL	No – the Project Area is outside the geographic range of the species.
	Hairy Townsend daisy *(Townsendia strigosa)*	BLM LSFO Sensitive	NL	No – the Project Area is outside the geographic range of the species.

Note*:* SE – State endangered; ST - State threatened; SC - State species of concern; NL – Not Listed.

Sources: BLM 2015; CNHP 2015; OSMRE 2015; USFWS 2015a.

3.10.1 Federally Threatened, Endangered, and Candidate Species

3.10.1.1 Colorado River Federally Endangered Fish

Bonytail Chub (Endangered with Critical Habitat)

Currently, no self-sustaining populations of bonytail chub are known to exist in the wild, with very few individuals being reported throughout the Colorado River Basin (USFWS 2002a). The last known riverine area where bonytail chub were common was the Green River in Dinosaur National Monument, where Vanicek (1967) and Holden and Stalnaker (1970) collected 91 specimens from 1962 to 1966. From 1977 to 1983, no bonytail chub were collected from the Colorado or Gunnison rivers in Colorado or Utah. However, in 1984, a single bonytail chub was collected from Black Rocks on the Colorado River. Several suspected bonytail chub were captured in Cataract Canyon from 1985 to 1987. Current stocking plans for bonytail chub identify the middle Green River and the Yampa River in Dinosaur National Monument as the highest priority for stocking in Colorado (USFWS 2008).

The typical types of habitat used by bonytail chub consist of mainstem riverine areas and impoundments in the Colorado River system. Deep pools and eddies with slow to fast currents and muddy to rocky bottoms are characteristic of the riverine habitat (Kaeding et al. 1986). Based on five specimens captured in the Upper Colorado River Basin, four were captured in deep, swift, rocky canyon areas (i.e., Yampa Canyon, Black Rocks, Cataract Canyon, and Coal Creek Rapid) (USFWS 2002a). Critical habitat for the bonytail chub in the analysis area is present along the Yampa River and its 100-year floodplain within Dinosaur National Monument, which is roughly 60 miles (96.6 km) downstream from Craig, Colorado (**Figure 3-13**).

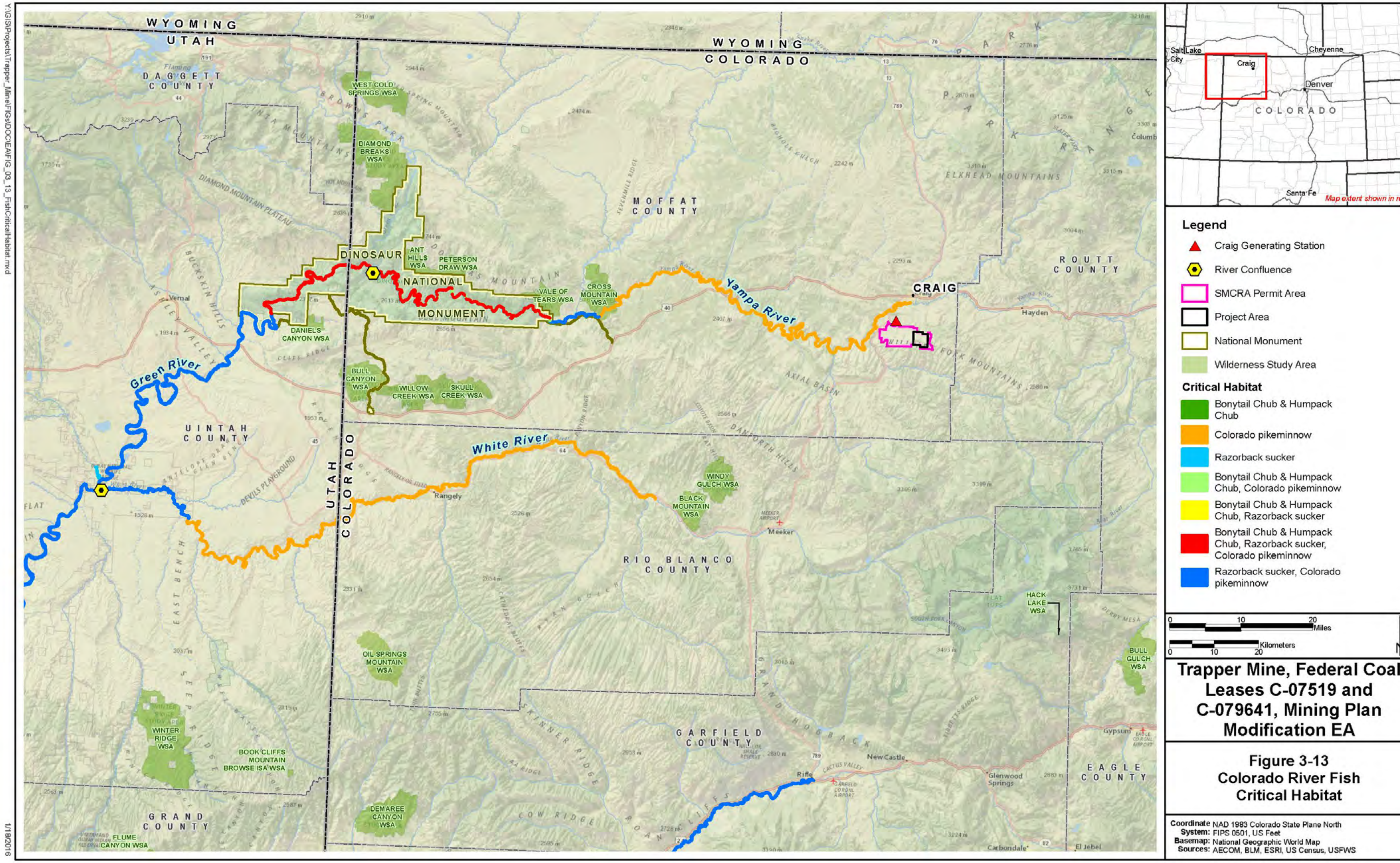
The bonytail chub is an omnivorous feeder with a diet consisting of a wide variety of aquatic and terrestrial insects, small fish, worms, algae, plankton, and plant matter (Lower Colorado Multi-Species Conservation Program 2014).

Colorado Pikeminnow (Endangered with Critical Habitat)

Wild populations of Colorado pikeminnow are now found only in the upper basin of the Colorado River above Lake Powell. Three wild populations of Colorado pikeminnow exist in 1,090 miles (1,754 km) of riverine habitat in the Green River, upper Colorado River, and San Juan River sub-basins. The occurrence of Colorado pikeminnow in the Yampa River extends from the confluence with the Green River upstream to the Craig area. The most recent population estimates are still being analyzed, but the results seem to indicate a population decline throughout the entire Green River sub-basin which includes the Yampa and White rivers. The decline is likely due to introduced non-native predatory fish (USFWS 2014a).

Habitat requirements of Colorado pikeminnow vary depending on the life stage and time of year. Young-of-the-year and juveniles prefer shallow backwaters, while adults use pools, eddies, and deep runs that are maintained by high spring flows (USFWS 2002b). Habitat, that was the focus of sampling efforts for Colorado pikeminnow in the Green River during low flow periods, includes small eddies and pools in nearshore areas and mid-channel sites near sand and gravel bars (Bestgen et al. 2010). Colorado pikeminnow is a long-distance migrator, with adults moving hundreds of miles to and from spawning areas. During peak runoff in the spring and early summer, fish usually move into backwater areas of flooded riparian zones to avoid swift velocities, feed, and prepare for the upcoming spawning period. Spawning occurs over riffle areas with gravel or cobble substrate between late June and early September. Spawning has been observed for Colorado pikeminnow in the lower 20 miles (32.2 km) of the Yampa River above the Green River confluence. This species primarily feeds on other fish, but smaller individuals also eat insects and other invertebrates.

Critical habitat is present in the Yampa River and its 100-year floodplain within Dinosaur National Monument and continues upstream to Craig, Colorado. Critical habitat continues beyond the analysis area downstream below the Yampa's confluence with the Green River (**Figure 3-13**).


Y:\GIS\Projects\Trapper_Mine\FIGs\DOC\EA\FIG_03_13_FishCriticalHabitat.mxd
1/18/2016
WYOMING
UTAH
COLORADO
DAGGETT COUNTY
MOFFAT COUNTY
ROUTT COUNTY
UINTAH COUNTY
RIO BLANCO COUNTY
GARFIELD COUNTY
GRAND COUNTY
EAGLE COUNTY
DINOSAUR NATIONAL MONUMENT
CRAIG
Hayden
Rangely
Meeker
Rifle
New Castle
Glenwood Springs
Carbondale
Gypsum
El Jebel
Green River
Yampa River
White River
WEST COLD SPRINGS WSA
DIAMOND BREAKS WSA
ANT HILLS WSA
PETERSON DRAW WSA
VALE OF TEARS WSA
CROSS MOUNTAIN WSA
DANIEL'S CANYON WSA
BULL CANYON WSA
WILLOW CREEK WSA
SKULL CREEK WSA
WINDY GULCH WSA
BLACK MOUNTAIN WSA
OIL SPRINGS MOUNTAIN WSA
WINTER RIDGE WSA
BOOK CLIFFS MOUNTAIN BROWSE ISA WSA
DEMAREE CANYON WSA
FLUME CANYON WSA
HACK LAKE WSA
BULL GULCH WSA
Salt Lake City
Cheyenne
Craig
Denver
Santa Fe
Map extent shown in red.
Legend
Craig Generating Station
River Confluence
SMCRA Permit Area
Project Area
National Monument
Wilderness Study Area
Critical Habitat
Bonytail Chub & Humpack Chub
Colorado pikeminnow
Razorback sucker
Bonytail Chub & Humpack Chub, Colorado pikeminnow
Bonytail Chub & Humpack Chub, Razorback sucker
Bonytail Chub & Humpack Chub, Razorback sucker, Colorado pikeminnow
Razorback sucker, Colorado pikeminnow
0 10 20 Miles
0 10 20 Kilometers
N
Trapper Mine, Federal Coal Leases C-07519 and C-079641, Mining Plan Modification EA
Figure 3-13
Colorado River Fish Critical Habitat
Coordinate System: NAD 1983 Colorado State Plane North FIPS 0501, US Feet
Basemap: National Geographic World Map
Sources: AECOM, BLM, ESRI, US Census, USFWS

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Humpback Chub (Endangered with Critical Habitat)

Currently, six populations of humpback chub are known to exist: 1) Black Rocks, Colorado River, Colorado; 2) Westwater Canyon, Colorado River, Utah; 3) Yampa Canyon, Colorado; 4) Desolation/Gray Canyons, Green River, Utah; 5) Cataract Canyon, Colorado River, Colorado; and 6) mainstem Colorado River in Marble and Grand canyons, Colorado. Populations in the Yampa River and Cataract Canyon are too small to monitor through mark-recapture analysis. The Yampa Canyon population is the closest occurrence to Trapper Mine, roughly 60 miles (96.6 km) west of Craig, Colorado. Critical habitat for the humpback chub is present in the analysis area along the Yampa River and its 100-year floodplain within Dinosaur National Monument (**Figure 3-13**), which is roughly 60 miles (96.6 km) downstream from Craig, Colorado.

Humpback chub mainly occur in river canyons where they utilize a variety of habitats including deep pools, eddies, upwells near boulders, and areas near steep cliff faces. Humpback chub exhibit minimal movement from the canyon reaches, as indicated by a one-mile (1.6-km) movement distance in the Black Rocks area (Kaeding et al. 1990). As young humpback chub mature, they shift toward deeper and swifter offshore habitats (USFWS 2002c). In the Yampa and Green rivers, juveniles and adults use habitats consisting of rocky shoreline runs and small shoreline eddies. Humpback chub are opportunistic feeders that consume aquatic and terrestrial arthropods, small fishes, diatoms, planktonic crustaceans, and algae (USFWS 2015b).

Razorback Sucker (Endangered with Critical Habitat)

The largest population of the razorback sucker in the Upper Colorado River Basin exists in the middle Green River between the Duchesne and Yampa rivers, and is considered a single reproducing population (USFWS 2002d). The estimated numbers range from approximately 500 to 950 fish. Relatively low numbers are present in the Yampa, White, and Upper Colorado rivers. There are no current population estimates of razorback sucker in the Yampa River due to low numbers captured in recent years. Razorback suckers mainly occur in the lower four miles (6.4 km) of the Yampa River and occasionally utilize the river up to the confluence with the Little Snake River.

Razorback suckers are permanent residents of the Green River below the confluence with the Yampa River and depend on in-channel habitat for spawning and flooded off-channel habitats for several phases of their development. The razorback sucker is found in deep clear to turbid waters of large rivers and some reservoirs over mud, sand, or gravel substrates. Habitat types used by razorback suckers vary depending on the life stage and time of year. Adults use eddies, pools, and backwaters during the nonbreeding period from July through March (Maddux et al. 1993). Seasonal habitat use includes pools and eddies from November through April, runs and pools from July through October, runs and backwaters in May, and backwaters and flooded gravel pits during June. Juveniles prefer shallow water with minimal flow in backwaters, tributary mouths, off-channel impoundments, and lateral canals (Maddux et al. 1993). In the upper basin, bottomlands, low-lying wetlands, and oxbow channels that are perennially flooded or ephemerally connected to the main channel by high spring flows are important habitats for all life stages of razorback sucker. Razorback suckers in riverine environments consume a mixture of benthic invertebrates, algae, detritus, and inorganic materials, with little evidence of zooplankton consumption.

Critical habitat for the species is present in the Yampa River and its 100-year floodplain from about the east service road within Dinosaur National Monument and continuing downstream beyond the confluence with the Green River (BLM 2012) (**Figure 3-13**). Designated critical habitat also occurs along the White River upstream for approximately 15 miles (24 km) from its confluence with the Green River (**Figure 3-13**).

3.10.1.2 Yellow-billed Cuckoo (Threatened with Proposed Critical Habitat)

The yellow-billed cuckoo declined substantially in western Colorado during the 20th Century but was never very common. The most recent records show only sparse occurrences in western Colorado. The

Colorado Breeding Bird Atlas II (2007-2011) shows two confirmed occurrences on the Western Slope (Wickersham 2015). One is along the North Fork of the Gunnison River near Paonia and Hotchkiss in Delta County (Wickersham 2015). The second is along the Gunnison River in Gunnison County. The previous Colorado Breeding Bird Atlas (1987-1994) had a confirmed record along the Yampa River, west of Steamboat Springs in Routt County (Kingery 1998).

Other recent records also indicate that the species is rare and breeding is not well documented on the Western Slope. Reports of single yellow-billed cuckoos have come primarily from the Grand Junction area and Mesa County in 2001, 2002, 2005, and 2008, with a report of more than one cuckoo at Orchard Mesa Wildlife Area in 2006 (USFWS 2011). More recently, cuckoos have been observed or heard by USFWS staff and include one along the Gunnison River in Grand Junction in 2013, one along the Colorado River in 2014, and one along the North Fork of the Gunnison River in 2015. It is unknown if these birds were nesting (USFWS 2015c). Additional reports include a cuckoo south of Montrose in Montrose County near the Uncompahgre River in 2009, a cuckoo along the Gunnison River near Gunnison in 2007 (USFWS 2011), and detections by the Rocky Mountain Bird Observatory along the Yampa River near Craig in 2007 and 2008, and in far western Colorado near Nucla in 2005 and 2008 (Beason 2012; Dexter 1998; USFWS 2011). The detections near Craig and Nucla in 2008 resulted from surveys completed by the Rocky Mountain Bird Observatory in five western counties. However, surveys repeated in two of the counties in 2009 failed to detect these birds. Surveys by the Rocky Mountain Bird Observatory in 2010 were conducted near historical detections and at sites with suitable habitat in Archuleta, Conejos, Montezuma, and Rio Grande counties in southcentral and southwest Colorado; no cuckoos were detected (Beason 2012). Survey results to date are insufficient to determine population size or trend.

Yellow-billed cuckoos winter in South America and typically arrive on the Western Slope of Colorado in late May and leave by late August (Andrews and Righter 1992), with outlying records as late as mid-September and mid-October. The species typically breeds at elevations below 6,000 feet (1,829 meters) amsl but occasionally breeds at elevations as high as 8,500 feet (2,591 meters) amsl (Andrews and Righter 1992).

The yellow-billed cuckoo nests in large, contiguous blocks of riparian habitat (greater than 50 acres), particularly woodlands with cottonwoods (*Populus fremontii*) and willows (*Salix* sp.). A dense multi-layered canopy of understory foliage appears to be an important factor in nest site selection. The multilayered canopy provides shade and traps moisture to create the relatively cooler and more humid streamside conditions that are believed to be important for nesting success. At the landscape level, the amount of cottonwood-willow-dominated vegetation in the landscape and the width of riparian habitat appear to influence yellow-billed cuckoo distribution and abundance (USFWS 2014b). Cuckoos appear to avoid nesting in isolated patches of about one to two acres in size or in narrow, linear riparian habitats that are less than 33 to 66 feet (10 to 20 meters) wide (Halterman et al. 2015).

Overall, migration and wintering habitats appear to be less restrictive to this species (USFWS 2014b). Single birds have been detected in isolated habitat patches or linear riparian corridors during migration or the early breeding season (mid to late June). Migrating yellow-billed cuckoos also have been found in coastal scrub, second-growth forests and woodlands, hedgerows, forest edges, and in smaller riparian patches than those used for breeding (USFWS 2014b).

The Project Area does not contain riparian habitat for the cuckoo. However, the species has been described as an occasional, localized breeder along the Yampa River near Craig, Colorado (USFWS 2014c). Proposed critical habitat for the species occurs along the Yampa River from approximately five miles (8 km) west of Craig to about eight miles (13 km) east of Hayden, which is within the wider analysis area for the cuckoo. The last known sighting of the cuckoo along the Yampa River occurred in 2008 and was within the proposed critical habitat. No information is available to indicate if the birds observed were nesting in the area or in the process of migration.

Yellow-billed cuckoos usually forage within riparian habitats that are similar to breeding habitats, but they may undertake short flights from riparian habitats into surrounding low vegetation to capture prey

(Halterman et al. 2015). Cuckoos primarily eat large insects such as caterpillars, cicadas, and grasshoppers. They will consume frogs and small lizards and have been known to take eggs and young of other birds. Yellow-billed cuckoos will eat small fruits and seeds on wintering grounds and occasionally during the breeding season (Bennett and Keinath 2003).

3.10.2 State Listed and BLM Sensitive Species

3.10.2.1 Northern Leopard Frog

The northern leopard frog is a species of concern in Colorado, as well as a BLM sensitive species. It inhabits the banks and shallows of marshes, ponds, lakes, reservoirs, beaver ponds, streams, and other habitats with permanent surface water (Hammerson 1986). This species is absent from otherwise suitable habitats where predatory fish, bullfrogs, or crayfish are abundant. Northern leopard frogs inhabit ponds and other suitable habitats within the SMRCA permit boundary, but the species has not been documented in the Project Area.

3.10.2.2 Golden Eagle

The golden eagle is a BLM sensitive species that is resident throughout Colorado but is more common in winter. The species is found in a wide array of habitats with open landscapes within Colorado (Andrews and Righter 1992). Nests are located on cliffs and trees in rugged areas. Golden eagle presence in an area is largely dictated by the availability of its preferred prey, rabbits and hares. Golden eagles are relatively common in Moffat County, and individuals occur regularly within the Project Area. There is a known golden eagle nest to the east of the Project Area.

3.10.2.3 Burrowing Owl

The burrowing owl is a BLM sensitive species. It is a summer resident in Colorado that occurs in grasslands and occasionally in semi-desert shrublands (Andrews and Righter 1992). Burrowing owls usually nest in prairie dog towns but will nest in burrows dug by other mammals. The species is uncommon on the Western Slope. Burrowing owls have been documented on reclaimed lands west of the Project Area but not within the Project Area itself.

3.10.2.4 Ferruginous Hawk

The ferruginous hawk is a species of concern in Colorado, as well as a BLM sensitive species. The species breeds in grasslands, semi-desert 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 (Travsky and Beauvais 2005). Although this species is rare in Moffat County, suitable habitat for ferruginous hawks is present within the Project Area. There is a historic breeding record near Craig, Colorado (Andrews and Righter 1992).

3.10.2.5 American Peregrine Falcon

The American peregrine falcon is a state species of concern and a BLM sensitive species that is found in open spaces associated with cliffs and bluffs that overlook rivers and open bodies of water. Habitat does exist, but is limited in the Project Area. There have been no reported sightings in the Project Area.

3.10.2.6 Brewer’s Sparrow

Brewer’s sparrow is a BLM sensitive species that is locally common in Moffat County throughout the year. It primarily inhabits and breeds in sagebrush shrublands. It also occurs in other shrublands dominated by mountain mahogany or rabbitbrush (Andrews and Righter 1994). Habitat exists for this species within the Project Area in older reclaimed lands and shrublands on unmined land.

3.10.2.7 Columbian Sharp-tailed Grouse

The Columbian sharp-tailed grouse is a species of concern in Colorado and 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, and/or alfalfa fields. Display grounds are on knolls or ridges (Marks 2007). The entire Project Area is within Columbian sharp-tailed grouse overall range and winter range (CPW 2014). Approximately 410 acres of designated production areas for this species are located within the northwest corner of the Project Area (17 percent of the analysis area) (**Figure 3-14**). This species is known to occur within the Project Area although no leks are known to occur within the Project Area. Reclaimed areas at Trapper Mine have shown an increased presence of Columbian sharp-tailed grouse. TMI has worked cooperatively with CPW to develop reclaimed areas to promote Columbian sharp-tailed grouse habitat and evaluate the presence of the species. Lek count data from reclaimed areas west of the Project Area are provided in **Table 3-15**.

Table 3-15 Columbian Sharp-tailed Grouse Lek Counts in the Vicinity of the SMCRA Permit Area Boundary

Lek Description	Year Found	2006	2007[1]	2008[2]	2009	2010	2011	2012	2013	2014[3]
Above Cottonwood Spring (D-B-84)	1998	40	30 (4/5)	18 (4/22)	20 (4/21)	27 (4/27)	27 (4/29)	32 (4/9)	31 (4/30)	26 (4/9)
D Pit Haulroad by LSWT JW3	1998	10	7 (4/16)	6 (4/30)	3 (4/23)	5 (4/27)	2 (5/3)	1 (4/10)	0 (5/1)	0 (4/22)
C Pit Reclamation West Edge (C-C-92)	2001	3	2 (4/5)	5 (5/12)	5 (4/22)	3 (4/27)	0 (5/3)	0 (4/4)	0 (4/30)	0 (4/22)
D Pit Reclamation by LSWT NNM5 (D-B-90)	2002	17	15 (5/9)	13 (4/22)	12 (4/22)	7 (4/27)	0 (5/3)	0 (4/5)	0 (4/30)	2 (4/9)
D Pit Reclamation at top of Elk Drainage	2010	ND	ND	ND	ND	16 (5/7)	12 (5/2)	11 (4/4)	8 (4/30)	7 (4/9)
A Pit Reclamation S of Ash Pit (A-A-93)	2003	18	13 (5/3)	26 (4/29)	9 (4/21)	11 (4/27)	0 (4/29)	0 (4/5)	ND	0 (4/10)
Johnson Gulch (rock pile ridge)	2011	ND	ND	ND	ND	ND	7 (5/9)	14 (4/10)	8 (5/2)	6 (4/10)
Empire Reclamation Area	2006	16	16	19 (4/29)	13 (4/21)	19 (4/27)	11 (5/2)	24 (4/4)	10 (4/30)	12 (4/9)
D Pit Reclamation by LSWT CE6 (D-B-90)	2006	12	19	15 (4/30)	22 (4/21)	23 (4/27)	31 (5/23)	34 (4/4)	34 (4/30)	45 (4/22)
A Pit Reclamation east of Ash Pit (A-B-94)	2006	9	8 (5/3)	8 (5/3)	4 (4/21)	0 (4/20)	0 (5/16)	0 (4/5)	--	0 (4/10)
A East Reclamation (A-B-97)	2008	ND	ND	14 (4/29)	13 (4/22)	17 (4/20)	17 (4/29)	24 (4/5)	18 (4/26)	18 (4/25)
H Pit (top of ridge)	2009	ND	ND	ND	5 (4/30)	8 (4/20)	11 (5/3)	14 (4/11)	13 (4/30)	11 (4/21)

Table 3-15 Columbian Sharp-tailed Grouse Lek Counts in the Vicinity of the SMCRA Permit Area Boundary

Lek Description	Year Found	2006	2007[1]	2008[2]	2009	2010	2011	2012	2013	2014[3]
F Pit (SW corner of reclaim)	2014	ND	ND	ND	ND	ND	ND	ND	ND	7 (4/11)
Satellite Leks	--	2	6	3	14	11	19	18	12	17
Annual Total		**127**	**116**	**127**	**120**	**147**	**137**	**172**	**134**	**151**

[1] Thirteen females were trapped on Lek 1 and taken to Middle Park by CPW.

[2] Nine females were trapped on leks 1, 6, and 7 and taken to Middle Park by CPW.

[3] Ten and eight males were trapped on leks 1 and 7, respectively, in September 2014 by CPW and relocated to Middle Park.

ND – No data.

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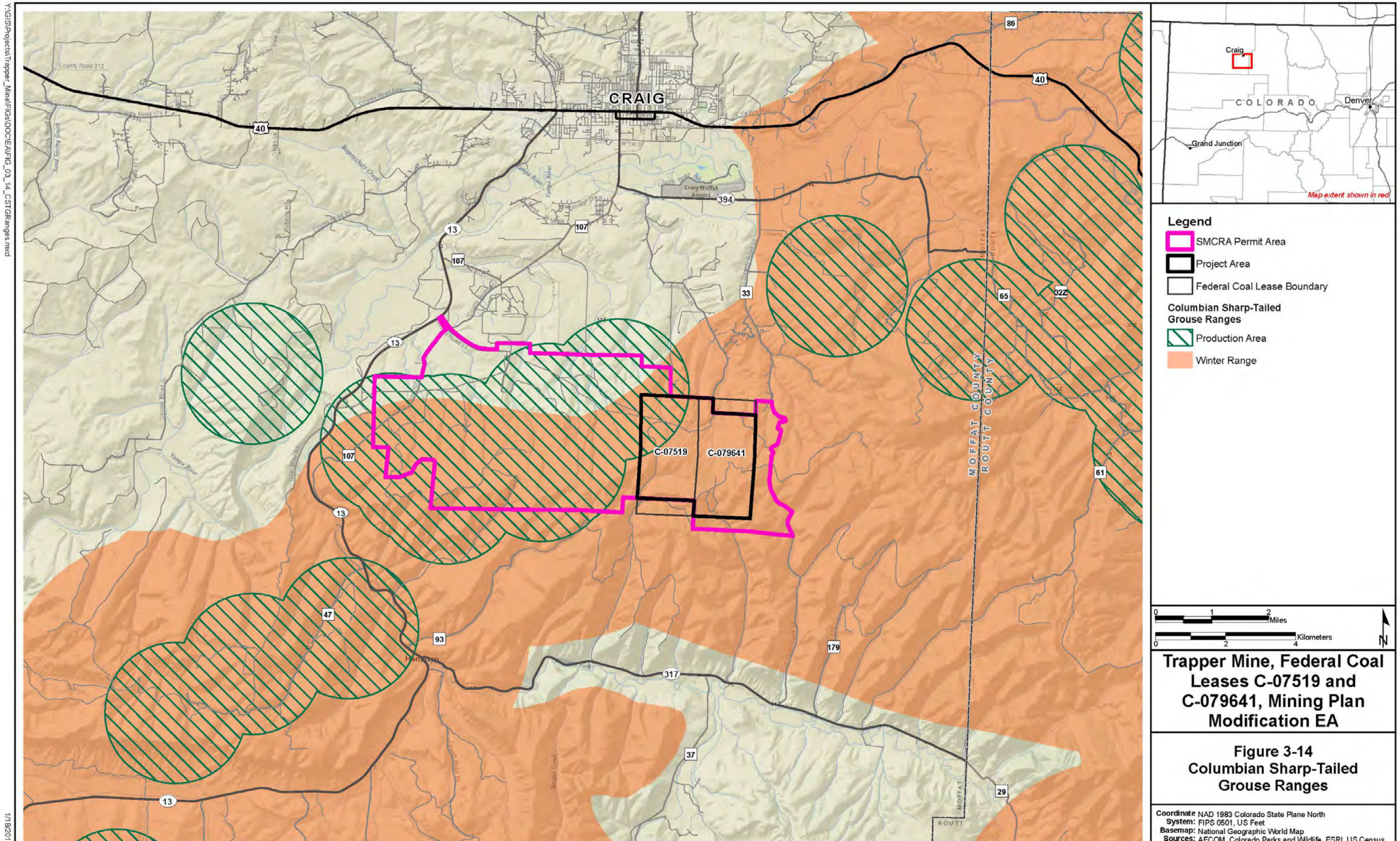
Y:\GIS\Projects\Trapper_Mine\FIGs\DOC\EA\FIG_03_14_CSTGRanges.mxd
1/18/2016
CRAIG
C-07519
C-079641
MOFFAT COUNTY
ROUTT COUNTY
Craig
COLORADO
Denver
Grand Junction
Map extent shown in red
Legend
SMCRA Permit Area
Project Area
Federal Coal Lease Boundary
Columbian Sharp-Tailed Grouse Ranges
Production Area
Winter Range
Miles
Kilometers
Trapper Mine, Federal Coal Leases C-07519 and C-079641, Mining Plan Modification EA
Figure 3-14 Columbian Sharp-Tailed Grouse Ranges
Coordinate System: NAD 1983 Colorado State Plane North FIPS 0501, US Feet
Basemap: National Geographic World Map
Sources: AECOM, Colorado Parks and Wildlife, ESRI, US Census

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3.11 Cultural Resources

3.11.1 Introduction

Cultural resources can be defined as "those parts of the physical environment – natural and built – that have cultural value of some kind to some sociocultural group" (King 1998). In broader terms, the concept of "cultural resources" embraces an "intricate mosaic of things and institutions and values, beliefs and perceptions, customs and traditions, symbols and social structures" (King 1998). This broader perspective forms the context in which the direct, as well as the indirect, effects of any undertaking are assessed.

The mining plan modification of the Trapper Mine under review is considered a federal undertaking, which is subject to compliance with Section 106 of the NHPA, as amended through 2014 (54 USC 300101 et seq.). The NHPA, as amended, requires that federal agencies take into account the effects of their undertakings on historic properties and afford the Advisory Council on Historic Preservation (ACHP) a reasonable opportunity to comment. The historic preservation review process mandated by Section 106 is outlined in regulations issued by the ACHP, found at 36 CFR 800, Protection of Historic Properties, which became effective in 2004. Historic properties are defined at 36 CFR 800.16(l)(1) as any resource determined eligible for listing in the National Register of Historic Places (NRHP).

NEPA also considers effects to cultural and historic resources. The term "cultural resources" covers a wider range of resources than "historic properties," such as sacred sites, archaeological sites not eligible for the NRHP, and archaeological collections. The ACHP and the CEQ encourage integration of the NEPA process with Section 106 of NHPA and other planning and environmental reviews.

The following sections define the area of potential effects (APE), identify tribal concerns, define historic properties, describe the regional culture history, and identify previous surveys and known cultural resources. This information provides the context in which the environmental consequences and cumulative impacts of this Project on historic properties in the APE can be assessed and interpreted.

3.11.2 Definition of the APE

The APE for direct project effects is defined as all associated mine-related disturbance and facilities with the Project Area. In addition to the APE, a number of cultural resource surveys have been conducted within the broader Project Area, SMCRA permit boundary, and extending 0.25 mile (0.4 km) beyond the SMCRA permit boundary.

3.11.3 American Indian Concerns

OSMRE has notified the Colorado SHPO and has corresponded with the following American Indian tribes that consider the Project Area to be located within their traditional territory.

- Eastern Shoshone Tribe
- Southern Ute Indian Tribe
- Ute Mountain Ute Tribe
- Ute Indian Tribe
- Navajo Nation
- Hopi Tribe

OSMRE has consulted with the Hopi Tribe and the Southern Ute Indian Tribe on a site identified as eligible for listing as described in Section 3.11.7 below. *Section 6.3 provides additional details on the consultation.*

3.11.4 Historic Properties

Historic properties are defined at 36 CFR 800.16(l)(1) as any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the NRHP. Historic properties can be identified through historical documentation, field survey, and/or oral evidence. The significance of the known resources is evaluated within a regional cultural context. Historic properties and other cultural resources within the APE are discussed in Section 3.11.7.

3.11.5 Regional Culture History

Several recent studies have established a cultural history of northwestern Colorado. The most current and comprehensive study is the Northern Colorado River Basin cultural context, prepared by Reed and Metcalf (1999). Other pertinent studies, although somewhat dated, are the prehistory of northwestern Colorado (Grady 1984) and history of northwestern Colorado (Athearn 1982).

The prehistory of northwestern Colorado extends back more than 12,000 years, when current evidence suggests that native peoples first arrived in this area (Reed and Metcalf 1999). These early inhabitants, collectively grouped as Paleoindians, are described generally as hunters of big game animals, many of which (e.g., mammoth, mastodon, and large bison) are now extinct. The succeeding Archaic era, which lasted from approximately 8,400 years ago until the Christian era, is characterized by a broad-based subsistence strategy focused on hunting and gathering (Reed and Metcalf 1999). The Formative era is distinguished from the preceding Archaic era by a major subsistence focus on horticulture, especially corn growing (Reed and Metcalf 1999). This period overlaps with the Archaic focus, approximately 2,500 years ago and continues approximately 700 years when climatic changes upset this carefully honed pattern of subsistence. Not all of the early inhabitants of western Colorado pursued a Formative lifestyle; some places were simply unsuitable for horticulture, and those groups continued to hunt and gather. In some places, horticultural and non-horticultural groups lived side by side. Besides cultigens, Formative sites are marked by small arrow points, grinding stones, pottery, and living structures. The concluding Protohistoric era refers to aboriginal occupation of western Colorado between the end of the Formative era and the expulsion of the Ute tribes to reservations in 1881 (Reed and Metcalf 1999).

The distribution of prehistoric sites varies depending on the age of the materials and the consequences of natural and cultural disturbances. Paleoindian artifacts are scarce near the Project Area (Reed and Metcalf 1999), an observation that is probably more attributable to natural (erosion and deposition) and cultural (modern disturbance) factors than true absence. Fremont tradition sites are located well to the west of the Project Area (Reed and Metcalf 1999). The Formative-era Gateway and Anasazi tradition sites are located farther to the south (Reed and Metcalf 1999). The non-horticultural cultural systems scattered throughout the area are included under the Aspen tradition. A greater frequency of Aspen tradition sites are found near the Project Area (Reed and Metcalf 1999). Evidence for Protohistoric sites is scarce and located south of the Project Area (Reed and Metcalf 1999).

Athearn (1982) has succinctly summarized the non-aboriginal history of northwestern Colorado. Visits by Euroamericans and other non-natives prior to the mid-19th Century were infrequent. The discovery of gold, in 1859, near Denver, precipitated a major rush to Colorado. Mining eventually spread beyond the Front Range into other parts of Colorado, but it did not significantly develop in northwestern Colorado until the late 19th Century and early 20th Century. The development of transportation networks, especially the railroad, had a dramatic effect and spurred settlement and development throughout the region. Athearn (1982) describes the modern (1890-1980) development of northwestern Colorado as follows:

> *towns were founded, natural resources developed, and vast areas of the public domain were withdrawn from use by homesteaders and cattlemen. The period was one of consolidation and reorganization; the old frontier rule of "he who got there first" was no longer in effect. Now settlers had to deal with large corporations, governmental agencies, and the law.*

3.11.6 Previous Surveys

Between 1970 and 2013, 22 cultural resources surveys have been conducted within the broader SMCRA permit boundary of the Trapper Mine, including the APE (**Table 3-16**) and extending 0.25 mile beyond. The earliest surveys in the 1970s were completed by the University of Colorado at Boulder and Colorado State University's Laboratory of Public Archaeology. Since the early 1980s, however, the surveys have been conducted by consulting firms. During these 43 years, the surveys were completed at a somewhat regular pace (approximately one survey every other year), except for 1981 when four surveys were completed. The areas surveyed ranged from 1 to 281,600 acres, and a total of 591 sites were recorded. Many of those surveys (e.g., Arthur et al. 1981; Lischka 1975; Mehls and Mehls 1991; Sherman et al. 1999; Treat and Newkirk 1981) included acres outside the SMCRA permit boundary, and the total sites recorded do not reflect the site density within the SMCRA permit boundary or APE. These surveys also resulted in the recording of 126 Isolated Finds (IFs). IFs are generally defined as "transportable artifacts representing a single activity" and a single feature may be treated as an IF (Colorado SHPO 2015).

3.11.7 Known Cultural Resources

Five cultural resources have been recorded within the direct APE. A Protohistoric rock art site (5MF.948) was documented in Federal Coal Lease C-079641 and determined eligible for listing in the NRHP. The other four resources were evaluated as not eligible for listing in the NRHP: a prehistoric sheltered camp with rock art (5MF.290) in Federal Coal Lease C-07519, and a prehistoric open camp/historic homestead (5MF.950) and two IFs (5MF.1145 and 5MF.1146) in Federal Coal Lease C-079641. These five resources are listed at the beginning of **Table 3-17**.

Thirty-two cultural resources have been recorded outside the direct APE, but within the SMCRA permit boundary including 0.25 mile (0.4 km) beyond the boundary. Of these, 14 are sites and 18 are IFs. **Table 3-17** summarizes these sites and IFs. Of the total number of resources, 24 are prehistoric in age and cultural affiliation, one site dates to the Protohistoric era, nine sites are historic, one site has both prehistoric and historic components, and the age of one site is unknown. Prehistoric site types include open camp, open lithic, sheltered camp, and rock art. The historic site types include homestead, shepherd's camp, temporary shelter, and linear routes (highway, road, and wagon road). Most of the IFs are prehistoric lithic artifacts.

Additional sites have been located outside the direct APE, but within the SMCRA permit boundary including 0.25 mile (0.4 km) beyond the boundary. A historic highway (5MF.5138) has been recommended as eligible for listing in the NRHP. Additional data are needed for two prehistoric open camps (5MF.288 and 5MF.945) before their eligibility for listing in the NRHP can be evaluated.

Table 3-16 Summary of Previous Surveys within SMCRA Permit Boundary Plus 0.25-mile Buffer

Survey ID	Completion Date	Author(s)	Institution	Description*	Results		
					Acres	Sites	IFs
MF.LM.R1036	7/30/2013	C.E. Conner	Grand River Institute	Survey of Lease Modification Area	860	3	0
MC.LM.R652	5/15/2012	C.E. Conner, C. Martin, and B. Davenport	Grand River Institute	Survey of Williams Fork Mountain's Exploration Project Phase IV	139	4	1

Table 3-16 Summary of Previous Surveys within SMCRA Permit Boundary Plus 0.25-mile Buffer

Survey ID	Completion Date	Author(s)	Institution	Description*	Results		
					Acres	Sites	IFs
MF.LM.R898	6/9/2011	P. O'Brien	BLM LSFO	Survey for TMI's Proposed Williams Fork Mountain's Exploration Phase 2	121	1	0
MF.LM.R890	5/26/2011	P. O'Brien	BLM LSFO	Survey for TMI's Proposed Williams Fork Mountain's Exploration Phase 1	57	1	0
MF.LM.R704	7/19/2006	T. Bott	Metcalf Archaeological Consultants	Empire Mine Seismic Line #2	44	0	2
MC.CH.R98	5/4/2000	M.W. Painter and R.D. Vickers	Centennial Archaeology	Survey of 12-Region Wide Fencing Upgrade Locations	320	7	4
MC.CH.R96	6/7/1999	S.A. Sherman, T.R. Metcalf, M.W. Painter, D.C. Jones, and C.J. Zier	Centennial Archaeology	Survey of Interstates 25, 70, 225, and 270, U.S. Highway 34 and 160; and SH 13 and 470	16,570	255	22
MC.CM.R1	9/1/1991	S. Mehls, and C. Mehls	Western Historical Studies	Coal Mining Survey	281,600	81	0
MC. LM. NR135	6/28/1983	C.J. Zier	Metcalf-Zier Archaeologists	Survey of Drill Hole Locations for Williams Fork	29	0	0
MF.LM.R619	8/1/1981	C.S. Arthur, J.L. Brower, S.M. Collins, J.E. Ingmanson, C.J. Jennings, L.M. Viola, and G.J. Krause	CSU Laboratory of Public Archaeology	Archaeological Investigations Along Colowyo Coal Company Railroad Spur	220	21	0
MC.E.R58	7/24/1981	P. Treat and J.A. Newkirk	Gilbert/ Commonwealth	Survey of Craig-Rifle 230- to 345-kV Transmission Line	1,498	5	10
MF.LM.R531	7/2/1981	M. Loscheider	Archaeological Services	Addendum to Trapper Mine Survey	1	8	0
MC.LM.R294	5/22/1981	G.E. Williams, and M. Emery	Powers Elevation	Phases I and II Survey of Mobil-Pagoda Pipeline	835	7	4

Table 3-16 Summary of Previous Surveys within SMCRA Permit Boundary Plus 0.25-mile Buffer

Survey ID	Completion Date	Author(s)	Institution	Description*	Results		
					Acres	Sites	IFs
MR.LM.R524	11/1/1980	C.F. Caraveo and J.W. Greer	Archaeological Services	Survey of Trapper Mine	5,583	7	18
MC.LM.R2	5/1/1977	C. Arthur and C.H. Jennings	CSU Laboratory of Public Archaeology	Reconnaissance Survey of Proposal Coal Lease Areas	14,280	53	0
MF.LM.R616	3/1/1977	P.R. Williams and C.H. Jennings	CSU Laboratory of Public Archaeology	Archaeological Reconnaissance of Utah International Craig Underground	1,120	1	0
MC.LM.R50	9/1/1975	C.S. Arthur	CSU Laboratory of Public Archaeology	Interim Report on Reconnaissance Survey of Proposed Coal Lease Areas	23,000	54	0
MF.LM.R287	6/1975	J.J. Lischka	CU Boulder	W.R. Grace & Company Railroad Corridors & Colowyo Mine Site	10,152	72	65
MF.CU.R7	8/7/1973	J.J. Hester and B. Williams	CU Boulder	Archaeological Survey of Proposed Railroad Construction	Unknown	4	0
MF.CU.R8	11/19/1972	J.E. Smith	CU Boulder	Archaeological Appraisal of Proposed Plant Site	Unknown	1	0
MF.CU.R3	5/5/1972	D.A. Breternitz	CU Boulder	Survey of Archaeological Resources Within Coal Stripping Area, Williams Fork Mountains	Unknown	3	0
MF.CU.R4	10/20/1970	D.A. Breternitz	CU Boulder	Archaeological Appraisal of Proposed Hayden and Yampa-Williams Fork Power Plant Sites	320	3	0

CSU = Colorado State University.

CU = Colorado University.

Table 3-17 Summary of Identified Sites within Project Area and SMCRA Permit Boundary Plus 0.25-mile Buffer

Site No. (5MF.___)	Recording Date	Description	Age	Date	Lease Areas?	NRHP Eligibility
948	**8/21/2013**	**Rock Art**	**Protohistoric**	**UD-**	**Yes**	**Determined Eligible**
950	**5/12/1987**	**Open Camp/Homestead**	**Prehistoric/Historic**	**1910-1969**	**Yes**	**Determined Not Eligible**
290	**7/29/1980**	**Shelter Camp/Rock Art**	**Unknown**	**UD**	**Yes**	**Determined Not Eligible**
1145	**7/3/1980**	**Isolated Find (P)**	**Prehistoric**	**UD**	**Yes**	**Recommended Not Eligible**
1146	**7/3/1980**	**Isolated Find (P)**	**Prehistoric**	**UD**	**Yes**	**Recommended Not Eligible**
7402.1	5/5/2014	Road	Historic	UD	No	Determined Not Eligible
7566.1	5/5/2014	Wagon Road	Historic	UD	No	Does Not Support Eligibility of Linear Resource
5138	2/6/2002	Highway	Historic	1916	No	Recommended Eligible
445	4/11/1999	Open Camp	Prehistoric	UD	No	Recommended Needs Data
2427	5/13/1987	Homestead	Historic	1920	No	Determined Not Eligible
2253	10/2/1985	Temporary Shelter	Historic	UD	No	Determined Not Eligible
1960	8/15/1984	Homestead	Historic	1920	No	Determined Not Eligible
1399	7/1/1981	Shepherd's Camp	Historic	1900-1930	No	Determined Not Eligible
1202	5/27/1981	Isolated Find (flake)	Prehistoric	UD	No	Determined Not Eligible
947	7/8/1980	Open Camp	Late Plains Archaic	UD	No	Determined Not Eligible
945	7/7/1980	Open Camp	Prehistoric	UD	No	Determined Not Eligible
946	7/7/1980	Open Lithic	Late Plains Archaic	UD	No	Determined Not Eligible
1130	7/3/1980	Isolated Find (P)	Prehistoric	UD	No	Recommended Not Eligible
1131	7/3/1980	Isolated Find (P)	Prehistoric	UD	No	Recommended Not Eligible
1132	7/3/1980	Isolated Find (P)	Prehistoric	UD	No	Recommended Not Eligible
1133	7/3/1980	Isolated Find (P)	Prehistoric	UD	No	Recommended Not Eligible

Table 3-17 Summary of Identified Sites within Project Area and SMCRA Permit Boundary Plus 0.25-mile Buffer

Site No. (5MF.___)	Recording Date	Description	Age	Date	Lease Areas?	NRHP Eligibility
1134	7/3/1980	Isolated Find (P)	Prehistoric	UD	No	Recommended Not Eligible
1135	7/3/1980	Isolated Find (H)	Historic	UD	No	Recommended Not Eligible
1136	7/3/1980	Isolated Find (P)	Prehistoric	UD	No	Recommended Not Eligible
1137	7/3/1980	Isolated Find (P)	Prehistoric	UD	No	Recommended Not Eligible
1138	7/3/1980	Isolated Find (P)	Prehistoric	UD	No	Recommended Not Eligible
1139	7/3/1980	Isolated Find (P)	Prehistoric	UD	No	Recommended Not Eligible
1140	7/3/1980	Isolated Find (P)	Prehistoric	UD	No	Recommended Not Eligible
1141	7/3/1980	Isolated Find (P)	Prehistoric	UD	No	Recommended Not Eligible
1142	7/3/1980	Isolated Find (P)	Prehistoric	UD	No	Recommended Not Eligible
1143	7/3/1980	Isolated Find (P)	Prehistoric	UD	No	Recommended Not Eligible
1144	7/3/1980	Isolated Find (P)	Prehistoric	UD	No	Recommended Not Eligible
1147	7/3/1980	Isolated Find (P)	Prehistoric	UD	No	Recommended Not Eligible
903	10/13/1976	Isolated Find (P)	Prehistoric	UD	No	Recommended Not Eligible
348	8/1/1975	Homestead	Historic	1920	No	Determined Not Eligible
288	6/10/1972	Open Camp	Prehistoric	UD	No	Recommended Needs Data

Sites in **bold** are found within the Project Area.

Sites highlighted in gray are eligible for listing in the NRHP; sites highlighted in blue require additional data for evaluation.

P = Prehistoric; H = Historic.

UD – Undated.

3.12 Socioeconomics

The Trapper Mine is located approximately six miles (9.7 km) southwest of the City of Craig and approximately 16 miles (25.7 km) west of the Town of Hayden. The mine is to the east of SH 13 in Moffat County. The Town of Hayden is within Routt County. **Table 3-18** details the populations of these communities. Ethnic demographics are further discussed in Section 3.13.

Table 3-18 Population Estimates

Community	2000 Census	2010 Census	2014 Estimate
Craig	9,189	9,464	8,846
Hayden	1,634	1,810	1,837

Source: U.S. Census Bureau 2013, 2015.

In general, the populations of Craig and Hayden have increased since 2000, with 3 percent total growth from 2000 to 2010 for Craig, and 11 percent growth from 2000 to 2010 for Hayden. Growth for Hayden is expected to turn static, while it is estimated that Craig has experienced negative growth since the 2010 census.

Per capita personal income has grown in both Craig and Hayden between 2000 and 2014, with Craig and Hayden recording 26 and 39 percent growth, respectively. The growth rate for Craig was less than the State of Colorado average. Per capita personal income is shown in **Table 3-19**. Mean household income grew for each municipality during the 2000 to 2014 timeframe with the City of Craig recording higher mean household income growth than the Town of Hayden, but less than the State of Colorado. Mean household income growth for the Town of Hayden also was lower than the average for the State of Colorado. Mean household income is portrayed in **Table 3-20**.

Table 3-19 Per Capita Personal Income

Community	2000	2014 Estimate	% Change
Craig	$18,140	$22,936	26
Hayden	$18,574	$25,795	39
State of Colorado	$24,049	$31,674	32

Source: U.S. Census Bureau 2015.

Table 3-20 Mean Household Income

Community	2000 Estimate	2014 Estimate	% Change
Craig	$45,836	$59,186	29
Hayden	$47,317	$59,718	26
State of Colorado	$59,313	$79,990	35

Source: U.S. Census Bureau 2015.

The three largest employment sectors in Craig in terms of employment are educational services and health care, retail trade, and arts and entertainment. The agriculture, forestry, fishing and hunting, and mining sector is Craig's fourth largest employment sector. The three largest employment sectors in Hayden are education and health care, retail trade, and construction. The agriculture, forestry, fishing and hunting, and mining sector is Hayden's fourth largest employment sector. The top three employment industries for the State of Colorado roughly mirror those of Craig and Hayden (U.S. Census Bureau 2013).

Both Moffat and Routt counties have recorded declining unemployment rates over the past several years as local and national economic conditions improved. The preliminary July 2015 unemployment rates for Moffat and Routt counties were 4.4 percent and 3.2 percent, respectively. The July 2015 preliminary unemployment for the State of Colorado was 3.8 percent (U.S. Bureau of Labor Statistics 2015). The unemployment scenario for mining is less optimistic as Bureau of Economic Analysis data indicates a decrease of 10 percent in total full- and part-time employment within the mining sector from 2010 to 2014 (Bureau of Economic Analysis 2015). Routt County also recorded a decrease in employment of 2 percent during the same timeframe. Moffat County experienced a decline in employment related to workers in the oil and gas and residential and commercial construction industries as workers have left Moffat County to seek jobs elsewhere as a result of declines in these industries. Such worker relocations are not typically reflected in employment statistics as workers leave the area for work elsewhere instead of filing for unemployment in the area

Craig and Hayden median home price growth rates have exceeded that of the State of Colorado, as has the growth rate for median rent (**Table 3-21**); however, more recent data suggests a downturn in home prices, as the Craig Chamber of Commerce reports its fourth quarter median price of home sales in Moffat County at approximately $130,000 (Craig Chamber of Commerce 2014). Recent data on real estate website Zillow (Zillow.com) also reflects a potential softening of local home prices (Zillow 2015).

Table 3-21 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	$719	60
Hayden	$132,100	$216,800	64	$662	$882	33
State of Colorado	$166,600	$236,600	42	$671	$852	27

Source: U.S. Census Bureau 2013.

The mining industry in Moffat County is the largest industry in the county in terms of employee compensation, consisting of 19 percent of total county private nonfarm compensation (Bureau of Economic Analysis 2014). *The Trapper Mine directly employed 191 workers as of the end of 2015.* These workers were mostly from the municipalities of Craig and Hayden, in Moffat and Routt counties, respectively. In 2014, TMI expended approximately $19.7 million in gross wages, including benefits (TMI 2015). This amount rose to $20.3 million in 2015 (TMI 2016a).

Trapper Mine supports many businesses both directly and indirectly. A number of industries directly provide services to the daily operation of the mine, while a number of industries, such as retail and the accommodation industry, are indirectly supported by the mine. The local expenditures on goods and services within the City of Craig in 2015 totaled $6.0 million. Total 2015 expenditures on goods and services in neighboring Routt and Rio Blanco counties totaled $5.2 million and $83,000, respectively (TMI 2016a). The Economic Development Council of Colorado (EDCC) prepared a report detailing the economic activity within the Yampa-White River Region of Northwest Colorado (EDCC 2015). The most recent data available at the time of the report was for 2012. Moffat County's coal mining sector contributed about $229 million, or 31 percent of the county Gross Regional Product of $742 million (EDCC 2015). Coal mining in Moffat County also directly employed 776 workers for a total of 1,144 direct and indirect workers supported by the mining industry, providing direct labor income of $61.1 million and total income of $75.3 million. Routt County's coal mining sector contributed about $191 million, or 12 percent of the county gross regional product of $1,618 million (EDCC 2015). Coal mining in Routt County directly employed 586 workers for a total of 1,152 direct and indirect workers supported by the mining industry, providing direct labor income of $62.4 million and total income of $93.3 million (EDCC 2015). Coal mining in Rio Blanco also contributes revenue and employment to the local economy. These contributions are detailed in the Colowyo Coal Mine South Taylor/Lower Wilson Permit Expansion Area Project, Federal Mining Plan Modification EA (OSMRE 2015).

Coal production in Moffat County has been declining over the past several years. Production declined by 89,000 tons, or 21 percent, in September 2015 compared to September 2010 (CDRMS 2015). Total coal production for the full year 2014 was approximately 4.4 million tons, down 8 percent from 4.8 million tons in 2010. This represents an average monthly decline in production of 34,000 tons, from 400,000 average monthly tons in 2010 to 366,000 average monthly tons in 2014 (CDRMS 2015).

A national program, established by SMCRA, is in place that includes an inventory of high priority abandoned mine sites, a reclamation fee paid by the coal mining industry, and a funding mechanism comprised largely of grants to states and Indian tribes with approved OSMRE programs to provide clean-up of these abandoned mines. This fee is known as the Abandoned Mine Land fee (DOI 2015). During the 2010 to 2015 timeframe, Trapper Mine paid a total of $3.9 million in federal Abandoned Mine Land fees (TMI 2015, 2016b). A federal coal lease royalty tax rate of 12.5 percent is applied to mined federal coal per 43 CFR 3473. Of the revenue collected through federal mineral lease royalties, 49 percent is distributed to the state and 51 percent to the federal government. The federal government disperses approximately 78 percent of its share to the Reclamation Fund for western water projects, and 22 percent to the General Fund of the U.S. Treasury. The state distributes its portion to the State Public School Fund (48.3 percent), Colorado Water Conservation Board (10 percent), and school districts (1.7 percent). Approximately 40 percent of the state's portion is directed to the Local Impact Program through the Department of Local Affairs (DOLA). Trapper Mine paid a total of $36.9 million in federal mineral lease royalties during the 2010 to 2015 timeframe, 49 percent ($18.1 million) of which was distributed to Colorado. In addition, from 2010 to 2015, Trapper Mine paid approximately $1.5 million to the CSLB for state-leased coal with the money used to support public schools.

Colorado severance tax on surface-mined coal is 36 cents per ton produced, with the first 300,000 tons produced per quarter exempt (Section 39-29-106, CRS). Of the state severance tax received, half is distributed to the DNR and the remaining half to the DOLA. DOLA then distributes funds to local impact grants and counties based on the number of production employees living in the energy-impacted communities, as well as permits, production, population and highway user miles (Colorado 2010; Colorado DOLA 2015). Trapper Mine paid a total of $4.8 million from 2010 through 2015 in severance tax, averaging $796,500 a year, of which a portion was distributed to local governments and impact grant funds. Trapper Mine also paid $8.0 million in property tax during the 2010 to 2015 timeframe (TMI 2015). It also is estimated that TMI paid Moffat County over $1.36 million in tax revenue for the 2015 tax year (TMI 2016a).

TMI is socially involved in the community in a number of ways. Local community participation has included reclamation of a gravel pit resulting in a waterfowl sanctuary which will become a part of the South Beach State Park, construction of the Trapper Fitness Center for the benefit of local residents, donation of labor and equipment for Loudy-Simpson Park soccer field construction, construction of the "back nine" at the Yampa Valley golf course, construction and maintenance of local athletic facilities, and educational mine tours. Further discussion of TMI community involvement is included in Section 4.12.1.

3.13 Environmental Justice

Environmental justice is defined as the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies (USEPA1998). EO 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, tasks "each Federal agency [to] make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high adverse human health and environmental effects of its programs, policies, and activities on minority populations and low-income populations."

According to the CEQ and USEPA 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.

Of the total estimated 2014 population of Moffat County, the large majority classify themselves as White (82.2 percent). The second largest ethnic/racial group is Hispanic or Latino (14.3 percent), followed by those who classify themselves as American Indian or Alaska Native (1.5 percent) and Asian (0.8 percent) (U.S. Census Bureau 2015). All of the minority populations within Moffat County are below the Colorado average.

The guidance recommends that low-income populations in an affected area be identified using the annual statistical poverty thresholds from the Bureau of Census. In identifying low-income populations, agencies may consider a community as either a group of individuals living in geographic proximity to one another, or a set of individuals (such as migrant workers or Native Americans), where either type of group experiences common conditions of environmental exposure. In 2014 the U.S. Census Bureau annual income poverty threshold for a family of three was $18,850 (U.S. Census Bureau 2014). The percent of the population living below the poverty level in Moffat County is 11.5 percent. The state average is 13.2 percent (U.S. Census Bureau 2015). The number of people living below the poverty level in Moffat County is well below the state average. Additionally, all of the minority populations within Moffat County are below the Colorado average. These factors indicate the lack of an environmental justice population in the study area. The analysis of environmental justice populations was not carried forward into Chapter 4.0 because of the lack of an environmental justice population in the study area.

3.14 Recreation

Popular forms of recreation on public lands in the region include boating and river based recreation, camping, hiking, horseback riding, hunting, mountain biking, off-highway vehicle use, and wildlife viewing on public lands managed by the BLM. Most of these activities occur west of the Town of Craig where public lands are more prevalent; however, the Yampa River does flow immediately to the west of the Craig Station approximately 4.5 miles (7.2 km) north of the Project Area. Recreation on the Yampa River has been managed by CPW (previously the Colorado Division of Wildlife) since 1999 under an agreement with the BLM (BLM 2010). Boating activities on the Yampa River are typically limited to late spring and early summer when spring runoff occurs and there is peak water flow. By July, the irrigation water demand decreases the water levels and boating becomes less feasible.

The land within the Project Area is private and state-owned and, therefore, not open to public recreation except when landowners agree to lease portions of their land for specific activities such as for hunting or fishing. Recreational activities are not allowed within the Project Area while active mining operations are in process due to public safety concerns. All routes that provide access to the Project Area are gated and require keys or access codes to open. Because public land recreational opportunities do not exist within the Project Area or vicinity, recreation was not carried forward for further analysis in this EA.

3.15 Visual Resources

OSMRE does not have its own visual standards and uses the BLM visual management standards to assess visual impacts of projects. The BLM manages visual resources using an inventory system to identify visual values and minimize visual impacts to the overall landscape character of federally managed lands.

3.15.1 BLM Visual Resources Management

3.15.1.1 Visual Resource Inventory

The Visual Resource Inventory (VRI) process consists of scenic quality evaluations, analysis of scenic sensitivity, and delineation of distance zones. The combination of these three factors result in

BLM-administered lands being placed in one of four VRI classes to inform the RMP decision makers in assigning the Visual Resource Management (VRM) class. VRI Class I is assigned to lands where previous management decisions have determined that a natural landscape is to be maintained, such as for national wilderness areas and national scenic and wild rivers. Classes II through IV are assigned through a combined assessment of scenic quality, sensitivity levels, and distance zones (BLM 1986).

3.15.1.2 Visual Resource Management

For BLM-managed lands, VRM classes are assigned through RMPs with consideration of the actions proposed during the RMP process. All actions that would result in surface disturbance must consider VRM objectives to assess the level of allowable change to the viewshed. Per the BLM Manual H-8410-1 (BLM 1986), the VRM Class objectives are defined as follows:

- **Class I**: Preserve the existing character of the landscape. This class provides for natural ecological changes; however, it does not preclude very limited management activity. The level of change to the characteristic landscape should be very low and must not attract attention.
- **Class II:** Retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.
- **Class III**: Partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.
- **Class IV**: Provide for management activities which require major modifications of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements.

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

3.15.1.3 Visual Resources Surrounding the Project Area

Trapper Mine is located in the Intermountain Semidesert Province Ecoregion on the northern slope of the Williams Fork Mountains with the Yampa River to the west and north. The Williams Fork River runs south of the SMCRA permit area. The mine area ranges from approximately 6,500 to 7,800 feet (1,981 to 2,377 km) amsl and is dominated by a mountain shrub community to the east that transitions into a sagebrush steppe community in the western portion.

3.15.1.4 View Points

Viewers of the Trapper Mine Project Area would be travelers on U.S. Highway 40, SHs 13 and 394, and CRs 35, 93, and 107 (see Section 3.17) in the vicinity of the Project Area where roads are traversing comparatively higher or more open ground.

Some recreationists may experience views of Trapper Mine while engaging in disbursed recreation on public lands. This would require an individual to be on relatively high or open ground. The draglines would be visible from portions of the Yampa River for approximately five miles (8 km) east of Craig, intermittent areas of the Yampa River for eight miles (13 km) west of Craig, and intermittent areas north of Craig. Trapper Mine would not be visible from the Williams Fork River because mining occurs on the north side of the Williams Fork Mountains. The dragline booms would be visible but would likely blend with the exposed soils in a manner that would limit the ability to distinguish the booms. However, as mining activities move up the hillside, the dragline house, which is painted white, would become more visible because the color would contrast with the exposed soils.

3.15.2 Lighting

Trapper Mine lies in the light shadow of the Craig Station. The Craig Station is the dominant nighttime light source in the vicinity of the City of Craig. Lighting within the Trapper Mine is limited to active mining areas. All mining equipment has lights that are used at nighttime. Portable light plants also are used within the active mining areas and are moved as needed to ensure working areas are well lit. Lighting for nighttime activities is required for worker safety. All lighting is directed downward to provide the maximum amount of light for work areas and least visual disturbance outside the work area.

There are no lights on the haul roads. The main office complex located west of the Project Area does have nighttime lighting that is typical of an office complex.

3.16 Paleontological Resources

OSMRE does not have its own paleontological resource standards and uses the BLM and USFS Potential Fossil Yield Classification (PFYC) to provide an assessment method to determine the potential for fossils in geologic units (BLM 2007). The PFYC system includes the following classifications:

- **Class 1**: Igneous and metamorphic geologic units (excluding tuffs) that are not likely to contain recognizable fossil remains.
- **Class 2**: Sedimentary geologic units that are not likely to contain vertebrate fossils or scientifically significant non-vertebrate fossils.
- **Class 3**: Fossiliferous sedimentary geologic units where fossil content varies in significance, abundance, and predictable occurrence. A Class 3 formation may have unknown potential.
- **Class 4**: Class 4 geologic units are Class 5 units that have lowered risks of human-caused adverse impacts or lowered risk of natural degradation. Proposed ground-disturbing activities would require assessment to determine whether significant paleontological resources occur in the area of a Proposed Action and whether the action would impact the resources.
- **Class 5**: Highly fossiliferous geologic units that regularly and predictably produce vertebrate fossils or scientifically significant non-vertebrate fossils and that are at high risk of natural degradation or human-caused adverse impacts.

The higher the PFYC number, the higher the fossil yield potential and greater sensitivity to adverse impacts. The Williams Fork Formation in northwestern Colorado has yielded valuable fossils including dinosaurs, other vertebrates, fossil tracks, and plants (Sullivan and Lucas 2006). Fossils that have been observed at the Trapper Mine include mollusks, evidence of burrowing animals in soft sediment (bioturbation), angiosperm leaf impressions, in situ tree stumps, and root casts (Massoth 1982). Because of the high-potential for important fossils in the Williams Fork Formation, the BLM has assigned a PFYC system rating of 5 (BLM 2010). The Lewis Shale that outcrops within the mine permit area has a PFYC rating of 3. TMI reports minimal fossil finds (Hinkemeyer 2015). No pre-blasting paleontological surveys have been performed so information on actual fossil yield is limited.

3.17 Access and Transportation

Trapper Mine is located approximately six miles (9.7 km) south of the City of Craig. The primary access to the mine is from U.S. Highway 40 (east-to-west route) to SH 13 (north-to-south route). SH 394 (east-to-west route) runs from Craig eastward and is located east of the Trapper Mine. The 2014 Annual Average Daily Traffic (AADT) count (Colorado Department of Transportation [CDOT] 2015) for U.S. Highway 40 varies depending on which side of the intersection with SH 394 counts are taken. West of the intersection, the AADT is 5,200 vehicles of which 8.7 percent are commercial-size trucks. East of the intersection the AADT increases to 7,200, with 5.3 percent commercial-size trucks. The 2014 AADT for SHs 13 and 394 were recorded at 5,000 and 4,400 vehicles, respectively, with 8.6 and 3.6 percent, respectively, commercial-size trucks. Trapper Mine is accessed from CR 107 (off SH 13), which becomes a private road shortly after turning off SH 13. Other county roads that terminate at the mine permit boundary include CRs 35, 93, and 107, which terminate at locked gates. CR 33 runs adjacent to the eastern edge of the SMCRA permit boundary. CR 177 once led all the way to the Trapper Mine SMCRA permit boundary but has since been abandoned.

Trapper Mine-related traffic outside of the SMCRA permit boundary typically consists of passenger vehicles for commuting to work and trucks delivering supplies to the mine. Coal is delivered from the Trapper Mine to the Craig Station via a private road. Trucks haul CCRs back to the mine for placement in areas outside of the Project Area via the same private road. That road is located partially within the SMCRA permit boundary and partially within the boundary of the Craig Station. The transport of coal from the mine to the power plant requires 27,368 truck trips per year. Deliveries of CCRs (fly ash) from the power plant to the mine require 9,858 truck trips per year (Air Resource Specialists 2015). The mine employs approximately 191 employees and operates seven days per week on 8-, 10-, and 12-hour shifts (TMI 2016). When shift changes occur, traffic necessary to transport employees to and from work occur over a condensed period of time.

3.18 Solid Waste

Solid waste is defined by the Resource Conservation and Recovery Act (RCRA) as a broad range of materials that include garbage, refuse, wastewater treatment plant sludge, non-hazardous industrial waste, hazardous waste, and other materials (solid, liquid, or contained gaseous substances) resulting from industrial, commercial, mining, agricultural, and community activities (USEPA 2011). Solid waste includes hazardous waste and non-hazardous waste and is regulated under different subtitles of RCRA. Non-hazardous waste is regulated under RCRA Subtitle D and hazardous waste is regulated under Subtitle C.

The Trapper Mine generates mostly non-hazardous solid waste (TMI 1981 et seq.). The mine also generates small amounts of hazardous waste and is registered as a Conditionally Exempt Small Quantity Generator (USEPA 2015a). Under the generator requirements for a Conditionally Exempt Small Quantity Generator, no more than 2,200 pounds (1,000 kilograms) of hazardous waste can be stored onsite at any given time. The hazardous waste is disposed at permitted offsite facilities.

Non-hazardous waste consists of lumber, concrete, tires, office waste, empty barrels, oil filters, and rags. Most of these materials can be disposed in pits under the SMCRA permit and under a landfill permit (or Certificate of Designation) that was granted by Moffat County in 1980 and 1981 *and remains active*. Scrap iron is recycled if it is recoverable. If it cannot be recovered, scrap iron is *disposed as solid waste.* Solid waste is hauled off site for disposal or placed in the on-site landfill. Petroleum wastes including waste oil and lubricants are recycled or blended into the mine’s petroleum supply. Shop wash that may contain small amounts of petroleum is directed through drains into a retention pond where oil is separated from the water and the water is allowed to be discharged (TMI 1981 et seq.).

Another major waste stream is utility waste that is comprised of flyash, bottom ash, and scrubber sludge from the Craig Station. These utility wastes are generated from the burning of coal and are collectively referred to as CCRs. CCRs are placed into pits during backfilling or placed and encapsulated into spoil piles. The CCRs placement pits are located outside of the Project Area but represent a potential indirect effect as a result of the mining operation. An annual average of 507,000 tons of CCRs has been disposed at the mine since 1999 . The placement of CCRs into mine pits is regulated by rules of various agencies including the CDRMS, CDPHE, Moffat County, and the CSLB (TMI 1981 et seq.). The CDPHE has primacy from the USEPA for implementation of the RCRA rules. In order to conduct mine-filling, the CDRMS requires that applicants conduct a baseline groundwater study to describe the hydrologic setting, define the chemical and physical characteristics of the CCRs and overburden, and assess the leaching potential of the CCRs. The CCRs at Trapper Mine were subjected to leach testing and determined to present a low potential for toxic metals to be leached from the materials (TMI 1981 et seq.). An assessment of the percolation rate of the groundwater also was conducted to determine the potential for the movement of contaminants if leaching of the material were to occur. The percolation analysis indicated that movement of any leached contaminants to groundwater would be very slow. In addition, the material would be less likely to leach because of relatively low permeability of the CCRs.

Regulations require that the CCRs be isolated from surface and groundwater. The CCRs must be placed above the expected post-mining groundwater level and no less than 50 feet (15 meters) horizontally from surface drainages. The CCRs must be covered with a minimum of 6 feet (2 meters) of cover. Groundwater monitoring is required before and after CCRs are placed into pits.

The USEPA revised disposal regulations for CCRs in 2015 and determined that CCRs would be regulated as non-hazardous waste under Subtitle D versus a hazardous waste under Subtitle C. Although CCRs will not be regulated as a hazardous waste, the USEPA has issued new requirements for existing CCRs landfills regarding certification, operating criteria, groundwater monitoring and corrective action, and closure and post-closure care. However, according to the USEPA, “the final rule does not apply to CCRs placed in active or abandoned underground or surface coal mines, consistent with the approach in the proposed rule” (USEPA 2015b). Management of the placement of CCRs in surface coal mines will be handled through separate regulatory actions by the DOI and USEPA, but the agencies are expected to work cooperatively to develop regulations that are protective of public health and the environment.

TMI submits Toxic Release Inventory (TRI) reports to the USEPA each year mainly because of power plant CCRs that are disposed within the SMCRA permit boundary. The TRI reporting is required under Section 313 of the Emergency Planning and Community Right-to-Know Act Toxic Chemical Release Inventory. CCRs contain constituents that exceed, on an annual basis, the threshold reporting values for metallic compounds (USEPA 2015a). TMI falls under the “otherwise use” category of TRI reporting that includes on-site landfilling of CCRs and must report any TRI compound or chemical that is present in quantities that exceed 10,000 pounds, with the exception of mercury (which has a threshold reporting limit of 100 pounds) (USEPA 2000). Land disposal, even in a permitted landfill, is considered a release to the environment and therefore reportable under TRI. Other minor contributors to releases at the mine are particulate emissions to the air *from the CCR hauling and placement which are discussed in Section 3.3*.

3.19 Noise

The USEPA defines environmental noise as the amplitude, duration, and the character of sounds from all sources. Noise can be considered objectionable based on intermittence, beat frequency, shrillness, and level. Noise is measured in a logarithmic unit called the decibel (dB), and is most often measured in A-weighted decibels dB(A). A-weighted decibels are most closely related to human perception of noise due to the removal of low frequency sound that is less perceivable to human auditory senses.

Many factors affect outdoor noise propagation and reception including manmade features, environments, and terrain. Vegetation can play a noticeable role in how efficiently sound travels in open environments. Dense trees and large shrubs can reduce noise levels substantially, while lakes and ponds can enhance acoustical propagation over long distances. Terrain that is flat with hard groundcover allows sound to travel relatively unobstructed. Hilly terrain and soft ground cover can reduce sound levels over distance. Barriers and berms can be constructed to reduce noise associated with highways and some types of industrial, mining, and power generating activities.

Ambient noise is the noise present in any given environment and is often unnoticed. Noticeable noise levels can be considered a nuisance, such as traffic or loud music, especially if the noise interferes with or disrupts noise-sensitive activities, such as sleep, learning, entertainment, or enjoyment of outdoor activities. Noise can become damaging at levels exceeding 85 dB(A). At this level, noise can cause a loss of hearing if exposure occurs over extended periods. If noise levels reach 150 dB(A), eardrums can rupture. Example noise levels are outlined in 10 dB(A) intervals in **Table 3-22** (CDOT 2015).

Table 3-22 Example Noise Sources and Sound Levels

Noise Source	Sound Level dB(A)	Noise Source	Sound Level dB(A)
Threshold of Hearing	0	Freeway Traffic at 50 feet	70-80
Remote Outdoor Location (no wind)	20-30	Heavy Truck/Motorcycle at 25 feet	85-95
Living Room	35-45	Shouting at 5 feet	95-105
Quiet Neighborhood	45-55	Commercial Jet	110-120
Conversational Speech at 5 feet	55-65		

The State of Colorado has a noise statute that outlines the maximum permissible noise levels for land use zoning as shown in **Table 3-23**. In addition to these levels, noise can exceed the maximum sound levels by 10 dB(A) for up to 15 minutes in a 1-hour period. Periodic, impulsive, or shrill noises are considered a nuisance when the dB(A) level is 5 dB lower than the levels in **Table 3-23** (CRS 25-12-103).

Table 3-23 Colorado Maximum Permissible Noise Levels

Zone	Maximum Sound Level dB(A)	
	7:00 AM to 7:00 PM	7:00 PM to 7:00 AM
Residential	55	50
Commercial	60	55
Light Industrial	70	65
Industrial	80	75

Ambient noise for the Project Area includes environmental natural sources such as wind and wildlife as well as manmade noise sources such as existing mining activity, nearby roads, rail lines, and aircraft overflights. In addition, the Project Area is used for oil and gas production activities which contribute to ambient levels. Current mining activities that contribute noise include pit and surface types of mining, haul road traffic, and reclamation activities. The nearest sensitive noise receptor is an individual home that is 0.46 mile (0.74 km) from the major haul road and 0.86 mile (1.4 km) from the L Pit and most recent reclamation areas. The next closest sensitive receptor is more than one mile (1.6 km) from the Project Area.

Major noise emissions from the Project would be equipment associated with surface mining and reclamation activities. Such equipment is listed in **Table 3-24** with the associated noise levels. Equipment noise includes scraping and dumping of materials, backup alarms, blast warning sirens, and large engines. Not all equipment operates in tandem and additional noise sources are present including impulsive noise from blasting within the mine pit.

Table 3-24 Open Pit Mining Equipment Noise Levels

Noise Source	Noise Level dB(A)[1]	Noise Source	Noise Level dB(A)[1]
Draglines	92	Water Trucks	68
Overburden/Parting Drills	84	Fuel and Lube Trucks	68
Track Dozers	99	35-ton Crane	97
Rubber Tired Dozers	85	Backhoe	80

Table 3-24 Open Pit Mining Equipment Noise Levels

Noise Source	Noise Level dB(A)[1]	Noise Source	Noise Level dB(A)[1]
Motor Graders	85	Service Truck	65
Scrapers	85	Pickups/SUVs	55
Hydraulic Excavators	84	Farm Tractors	84
Front-end Loaders	79	Tractor and 200-ton Lowboy Trailer	91
Coal Drills	98	Compactor	80
Haul Trucks (240-, 95-, and 55-ton)	84		

[1] Federal Highway Administration 2015; Sensogut 2007; Suter 2002.

Trapper Mine and the Project Area are located in a nonresidential, undeveloped area. This area has hilly terrain with small valleys becoming flat to the north. To the south and east, large hills and valleys occur for miles, and the Yampa River is approximately 4.5 miles (7.2 km) south. Directly west of the Project Area, reclamation exists from past mining and occurs on slopes. Reclamation vegetation consists mainly of grasses and small shrubs.

Noise levels within the Project Area would increase with proximity to active mining areas. The degree of increase at any one location would depend on the distance from the source, ambient noise levels, and factors influencing acoustical propagation, such as obstructions or acoustically absorptive ground cover. The various stages of the mining process require different equipment to be in use. The type and number of equipment used at any one time would produce varying noise levels. Mining noise transmission also would be limited by the mining activities. The depth of mining within the pit creates a barrier for noise as mining activities go deeper creating a natural wall between active mining and the environment. Reclamation is being performed on the western side of the mine as extraction opportunities move eastward. These activities include contouring the land surface, replacing topsoil, grading, and reseeding. Reclamation occurs at grade and contributes to mining noise. Traffic from haul roads also contribute to noise production in the area.

3.20 Livestock Grazing

There is minimal active livestock grazing within the Project Area or within the active mining areas of the SMCRA permit boundary. Private livestock grazing does occur on TMI-owned lands which have had Phase 3 bond release within the SMCRA permit boundary and on TMI-owned lands outside and adjacent to the SMCRA permit boundary.

The BLM is responsible for managing portions of public lands for livestock grazing by permitting animal unit months in designated grazing allotments. One of the primary land uses within the LSFO is livestock grazing. Sheep and cattle have historically grazed along north-facing slopes where the vegetation is more plentiful due to greater soil moisture relative to soil on south-facing slopes. There are no BLM administered grazing allotments within the Project Area; however, three allotments are immediately adjacent to the permitted boundary. They are the South Big Bottom, East Ute Gulch, and the Upper Castor Gulch allotments. The South Big Bottom Allotment supports four cattle during the month of May on 80 acres, the East Ute Gulch Allotment supports 19 cattle from late May through October 31 on 1,462 acres, and the Upper Castor Gulch Allotment supports 12 cattle from early June to mid-November on 468 acres (GeoCommunicator 2015).

Surface disturbance would not affect any of the adjacent BLM allotments or their animal unit month production as mining activities would not occur within the allotments. The prevailing wind direction is from the southwest; therefore, fugitive dust emissions would be blown away from the allotments to the northeast the majority of the time. Because of the lack of public grazing lands within or adjacent to the Project Area, grazing was not carried forward for further analysis in this EA.

3.21 Prime Farmlands

The CSCMRA (CRS 34-33-101 et seq.) requires surface coal mining and reclamation applicants to conduct a reconnaissance inspection within the SMCRA permit area for the existence of prime farmland historically used for cropland and submit the results to the U.S. Soil Conservation Service. Prime farmland is defined by the USDA as land that has the most beneficial combination of physical and chemical characteristics for the production of food, feed, fiber, and oilseed crops and is available for use (USDA 2015). The physical and chemical characteristics typically include acidity/alkalinity, sodium content, soil moisture and permeability, erosion potential, slope, and length of the growing season (USDA 2015).

In the Proposed Decision and Finding of Compliance for the Trapper Mine PR07 (CDRMS 2015) the CDRMS determined that no areas of prime farmland currently exist within the SMCRA permit area including within the Project Area. Therefore prime farmlands were not carried forward in this EA.

3.22 Alluvial Valley Floors

The CSCMRA (CRS 34-33-101 et seq.) defines alluvial valley floors (AVFs) as unconsolidated stream-laid deposits holding streams where water availability is sufficient for subirrigation or flood irrigation agricultural activities. This does not include upland areas overlain by colluvial deposits composed chiefly of debris from sheet erosion, deposits by unconcentrated runoff or slope wash, together with talus, other mass movement accumulation, and wind-blown deposits. The CSCMRA prohibits surface coal mining operations from interrupting, discontinuing, or precluding farming on alluvial valley floors that are irrigated or naturally subirrigated, excluding undeveloped range lands which are not significant to farming on said alluvial valley floors and those lands upon which the Colorado Mined Land Reclamation Board finds that the farming which would be interrupted, discontinued, or precluded is of such small acreage as to be of negligible impact on said land’s agricultural production. The CSCMRA further prohibits surface coal mining operations from materially damaging the quantity and quality of surface water and groundwater systems that supply alluvial valley floors. These prohibitions do not apply to those surface coal mining operations which in the year preceding August 3, 1977, either produced coal in commercial quantities and were located within or adjacent to alluvial valley floors or had obtained permit approval to conduct surface coal mining operations within said alluvial valley floors. The CSCMRA further requires that surface coal mining and reclamation operations preserve throughout the mining and reclamation processes the essential hydrologic functions of alluvial valley floors. The CSCMRA allows surface coal mining and reclamation permit applicants that propose to operate in or adjacent to a valley holding a stream or any streams to request the regulatory authority to submit a written alluvial floor determination with respect to the valley floor. The determination is based on available data, field studies, or a combination of available data and field studies.

In the Proposed Decision and Finding of Compliance for the Trapper Mine PR07 (CDRMS 2015) the CDRMS determined that there are two alluvial valleys that meet the AVF criteria: the Yampa River in the Big Bottom area and the Williams Fork River near its confluence with the Yampa River. Due to a lack of adequate available water for crop production, the Flume, Johnson, No Name, and Pyeatt gulches have been determined to not have AVFs. This also applies to a 20-acre portion of the upper Flume Gulch that was previously determined to contain an AVF.

Impacts to the Yampa River AVF were determined to be negligible by the CDRMS. Drainages that flow from the SMCRA permit area to the Yampa River AVF contribute very little surface water to the Yampa River (approximately 0.07 cfs per square mile) and the groundwater contribution is so minor that it is undetectable (CDRMS 2015). The greatest contributor of water to the Yampa River AVF is the Yampa River, which loses water to the AVF as it flows past the Trapper Mine. Additionally, surface disturbing activities associated with the Trapper Mine occur at least one mile (1.6 km) from the southern boundary of the AVF. For these reasons the CDRMS determined that no activities within the Trapper Mine permit boundary would impact farming on the Yampa River AVF.

Impacts to the Williams Fork River also were determined to be negligible by the CDRMS. The Williams Fork River is located to the south of the proposed permit area. Surface water that flows from the Trapper Mine is limited almost exclusively to spring snowmelt. Any discharge from sediment ponds would flow down the drainages and infiltrate the permeable Twentymile Sandstone outcrop, which dips northward away from Williams Fork River and underneath Trapper Mine leaving almost no chance for surface or subsurface flow to reach the Williams Fork River (CDRMS 2015). Additionally, water in the sediment ponds is typically evaporated. Therefore, the CDRMS determined that no activities within the Trapper Mine SMCRA permit boundary would impact farming on the Williams Fork River AVF. Because neither AVF would be affected by the Trapper Mine, AVFs were not carried forward in this EA.

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4.0 Environmental Consequences[1]

4.1 Introduction

This chapter discusses the potential direct and indirect effects of Alternative A - the Proposed Action, and Alternative B - Disapproval of the Mining Plan Modification by the ASLM. Alternative C - the No Action Alternative, is not evaluated in detail because the environmental consequences of Alternative C would fall within the range of impacts described for Alternative A and Alternative B, depending on when Alternative C is implemented. Each of these alternatives is described in Chapter 2.0. The information about the existing condition of the environment from Chapter 3.0 was used as a baseline to measure and identify potential impacts from the project. Mitigation measures also were considered and incorporated, including current mitigation measures being practiced by TMI, as well as potential future mitigation measures, as appropriate.

Direct impacts are defined as those impacts that are caused by the action and occur at the same time and place (40 CFR 1508.8(a)). 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 (40 CFR 1508.8(b)).

An impact, or effect, is defined as a modification to the environment brought about by an outside action. Impacts vary in significance from no change, or only slightly discernible change, to a full modification or elimination of the resource. Impacts can be beneficial (positive) or adverse (negative). Impacts are described by their level of significance (i.e., major, moderate, minor, negligible, or no impact). For purposes of discussion and to enable use of a common scale for all resources, resource specialists considered the following impact levels in qualitative terms.

- Major Impact: Impacts that potentially could cause irretrievable loss of a resource; significant depletion, change, or stress to resources; or stress within the social, cultural, and economic realm.
- Moderate Impact: Impacts that potentially could cause some change or stress to an environmental resource but the impact levels are not considered significant.
- Minor Impact: Impacts that potentially could be detectable but slight.
- Negligible Impact: Impacts in the lower limit of detection of an effect, that potentially could cause an insignificant change or stress to an environmental resource or use.
- No Impact: No discernible or measurable impacts.

Impacts can be short-term meaning these impacts generally occur over a short period during a specific point in the mining process and these changes generally revert to pre-disturbance conditions at or within a few years after the ground disturbance has taken place. Long-term impacts are defined as those that substantially would remain beyond short-term ground-disturbing activities. Long-term impacts would generally last the life of the Project and beyond.

The impact analysis applies quantitative thresholds when available, to determine the level of significance. Some resource areas are more conducive to quantification than others. For example, impacts on vegetation can be characterized partly using acreage, and air quality can be measured against air quality standards. Evaluations of some resources are inherently difficult to quantify 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.

exactitude. In these cases, levels of impact are based on best available information and professional judgment.

Several resource topics that were discussed in Chapter 3.0 are not discussed in this chapter because these resources do not occur in the study area or are not affected by the alternatives. These resource topics include Environmental Justice, Recreation, Livestock Grazing, Prime Farmlands and Alluvial Valley Floors. For additional information on these resources refer to **Table 3-1** and the resource-specific discussions in Chapter 3.0. Cumulative effects of the alternatives are discussed in Chapter 5.0.

4.1.1 Summary of Direct and Indirect Environmental Impacts

Table 4-1 summarizes and compares the potential direct and indirect environmental impacts associated with Alternative A, the Proposed Action and Alternative B, Disapproval of the Mining Plan Modification by the ASLM. Alternative C, the No Action Alternative is also shown on the table with the range of potential impacts.

Table 4-1 Comparison of Direct and Indirect Impacts

Resource	Alternative A – Proposed Action	Alternative B – Disapproval of the Mining Plan Modification by the ASLM	Alternative C – No Action
Topography	After reclamation, direct impacts to topography would be negligible in the long term. There would be no indirect impacts to topography.	Same as Alternative A.	Same as Alternative A.
Air and Climate Resources			
Direct mining criteria emissions	In the worse-case mining year (Year 2020) direct mining emissions are below NAAQS standards for PM_{10}/$PM_{2.5}$ and combustion emissions (NO_X, SO_2, CO, and VOCs) and impacts to air quality would be short-term during the life of mining and negligible.	Direct mining emissions would be reduced by approximately 40 percent based on the expected reduced mining rate and would continue to be below the standards. Impacts to air quality would be short-term during the life of mining and negligible.	Direct mining emissions would range from those outlined for Alternative A to a reduction of approximately 40 percent based on the reduced mining rate of Alternative B. These impacts would be short-term during the life of mining and negligible.
Direct GHG emissions	GHG emissions from mining would be approximately 482,014 metric tons CO_2e in the worst-case year (2020). *When compared to state and national GHG emissions, the direct GHG emissions would represent less than 0.4% of the 2010 Colorado GHG emissions and less than 0.007% of the 2007 nationwide GHG emissions.* GHG impacts would be *negligible* and long-term but *additional*	Direct GHG emissions would be reduced by an estimated 40 percent based on the expected reduced mining rate. GHG impacts would be *negligible* and long-term but *additional contributions* would *cease* after mining ceases.	GHG emissions would range from a maximum of 482,014 metric tons CO_2e to approximately 40 percent less than that number based on a reduced mining rate of Alternative B. These impacts would be *negligible* and long-term but *additional contributions* would *cease* after mining ceases.

Table 4-1 Comparison of Direct and Indirect Impacts

Resource	Alternative A – Proposed Action	Alternative B – Disapproval of the Mining Plan Modification by the ASLM	Alternative C – No Action
	contributions would *cease* after mining ceases.		
Indirect coal combustion criteria emissions	Emissions from Craig Station attributable to *Trapper Mine coal would be 97.8 tpy PM_{10}, 60.9 tpy $PM_{2.5}$, 1,567 tpy SO_2, 7,445 tpy NO_X,* 650 tpy CO, and 78 tpy VOCs. Following installation of improved emissions controls for NO_X expected emissions attributable to Trapper Mine would be 1,145 tpy. *Craig Station is currently in compliance with all applicable emission standards.* The emissions attributable to Trapper Mine would be short term occurring over the life of the mine and would be negligible.	Emissions from Craig Station attributable to Trapper Mine coal would be reduced by an estimated 40 percent based on the expected reduced mining rate; however, overall emissions from the Craig Station would remain unchanged. The emissions attributable to Trapper Mine would be short term occurring over the life of the mine and would be negligible.	Indirect coal combustion emissions attributable to Trapper Mine coal would range from those outlined in Alternative A to an estimated 40 percent reduction based on the reduced mining rate of Alternative B. The emissions attributable to Trapper Mine would be short term occurring over the life of the mine and would be negligible.
Indirect combustion emissions from transport and placement of CCRs	Emissions from transport and placement of CCRs from Craig Station at *Trapper Mine would be 12.80 tpy PM_{10}, 2.30 tpy $PM_{2.5}$,* 12.1 tpy NO_X, 1.5 tpy SO_2, 5.15 tpy CO, and 0.7 tpy VOCs. The emissions attributable to Trapper Mine would be short term occurring over the life of the mine and would be negligible.	Combustion emissions attributable to the transport of CCRs from Trapper Mine coal would be reduced by an estimated 40 percent based on the reduced coal delivery rate; however, overall combustion emissions from CCRs transport would remain unchanged. The emissions attributable to Trapper Mine would be short term occurring over the life of the mine and would be negligible.	Indirect coal combustion emissions from the transport and placement of CCRs attributable to Trapper Mine coal would range from those outlined in Alternative A to an estimated 40 percent reduction based on the reduced mining rate of Alternative B. The emissions attributable to Trapper Mine would be short term occurring over the life of the mine and would be negligible.
Indirect combustion GHG emissions	Indirect GHG emissions from coal combustion and transport of CCRs to placement location would be 5,342,951 tpy which represents approximately 4.1 percent of total Colorado GHG emissions based on 2010 data and 0.07 percent of national	Indirect GHG emissions attributable to combustion of Trapper Mine coal and transport of CCRs would be reduced by an estimated 40 percent based on the reduced mining rate, but overall GHG emissions from Craig Station would	Indirect GHG emissions from the combustion of Trapper Mine coal and transport and placement of CCRs would range from those outlined in Alternative A to an estimated 40 percent reduction based on the reduced mining rate of

Table 4-1 Comparison of Direct and Indirect Impacts

Resource	Alternative A – Proposed Action	Alternative B – Disapproval of the Mining Plan Modification by the ASLM	Alternative C – No Action
	emissions based on 2007 data. *GHG impacts would be negligible* and long-term but *additional contributions* would *cease* after mining ceases.	continue at the same rate. *GHG impacts would be negligible* and long-term but *additional contributions* would *cease* after mining ceases.	Alternative B. The emissions attributable to *Trapper Mine would be negligible* and long-term but *additional contributions* would *cease* after mining ceases.
Indirect coal combustion mercury emissions	Indirect mercury emissions from coal combustion at the Craig Station attributable to Trapper Mine coal would be 8.23 pounds per year (lb/yr) at the maximum mining rate of 2.6 mtpy. Impacts as a result of these mercury emissions are discussed below under indirect impacts to the yellow-billed cuckoo and Colorado River fish.	Indirect mercury emissions from combustion of Trapper Mine coal would be reduced by an estimated 40 percent due to the reduced mining rate but overall mercury emissions from coal combustion at the Craig Station would remain unchanged. Impacts as a result of these mercury emissions are discussed below under indirect impacts to the yellow-billed cuckoo and Colorado River fish.	Indirect mercury emissions from the combustion of Trapper Mine coal would range from those outlined in Alternative A to an estimated 40 percent reduction based on the reduced mining rate of Alternative B. Impacts as a result of these mercury emissions are discussed below under indirect impacts to the yellow-billed cuckoo and Colorado River fish.
Geology and Minerals	Negligible to minor long-term impact to the overall geologic column by eliminating the column in the pit areas; no impact to mining of other minerals.	Same as Alternative A.	Same as Alternative A.
Water Resources			
Direct Surface Water Impacts	Negligible short- and long-term potential for direct impacts to surface water from changes in mine drainage patterns, sediment releases, spills, release of iron, selenium, and TDS.	Same as Alternative A.	Same as Alternative A.
Indirect Surface Water Impacts	Indirect impacts to the Yampa River from mercury releases from the Project Area and from coal combustion emissions cannot be determined based on existing information. Water diversion for use at Craig Station would have a negligible to minor long-	Same as Alternative A.	Same as Alternative A.

Table 4-1 Comparison of Direct and Indirect Impacts

Resource	Alternative A – Proposed Action	Alternative B – Disapproval of the Mining Plan Modification by the ASLM	Alternative C – No Action
	term impact on instream flows in the Yampa River.		
Direct Groundwater Impacts	Negligible short- and long-term impacts to groundwater aquifers as a result of disruption during mining; negligible long-term impacts to water quality or quantity of springs in the Project Area vicinity; avoidance of impacts to senior water users through implementation of a water augmentation plan for water uses within the Project Area.	Same as Alternative A.	Same as Alternative A.
Indirect Groundwater Impacts	Negligible long-term impacts to groundwater as a result of placement of coal combustion residuals within the SMCRA Permit Boundary. Negligible indirect impacts to the Yampa River from discharges of sediment or iron from the Project Area.	Same as Alternative A.	Same as Alternative A.
Soils	Negligible long-term impacts to soil resources upon completion of reclamation activities.	Same as Alternative A.	Same as Alternative A.
Vegetation	Impacts to vegetation would be minor and long-term until reclamation is complete.	Same as Alternative A.	Same as Alternative A.
Wetlands	No additional wetlands disturbance would occur.	The N Pit has been previously disturbed so there would be no new wetlands disturbance from re-mining in that pit. Detailed wetlands mapping has not occurred within the I Pit area so impacts to wetlands are unknown.	There would be no impacts from ongoing activities in the Project Area. If the approval is vacated, impacts from mining outside the Project Area in the I Pit are not known as detailed wetlands mapping has not occurred for this area.
Fisheries and Wildlife			
Direct Wildlife Impacts	Impacts to wildlife would be mitigated by contemporaneous reclamation, enforcement	Same as Alternative A.	Same as Alternative A.

Table 4-1 Comparison of Direct and Indirect Impacts

Resource	Alternative A – Proposed Action	Alternative B – Disapproval of the Mining Plan Modification by the ASLM	Alternative C – No Action
	of posted speed limits, and in the case of some species, the limited habitat available within the Project Area. Short-term negligible impacts to big game and migratory birds; short-term, minor impacts to raptors, small mammals, and reptiles		
Direct Fisheries Impacts	No direct impact to fisheries since there are no fish present in Project Area streams.	Same as Alternative A.	Same as Alternative A.
Indirect Fisheries Impacts due to mining	Indirect impacts to fisheries from water quality discharges from the Trapper Mine would be short- and long-term and negligible based on the existing sediment control system and spill prevention and mitigation measures. Indirect impacts to Colorado River fishes as a result of mercury and selenium emissions cannot be quantified based on the available data.	Same as Alternative A.	Same as Alternative A.
Special Status Species			
Direct Impacts	No or negligible short-term impacts to state and BLM listed special status species including northern leopard frog, golden eagle, burrowing owl, ferruginous hawk, Brewer's sparrow. Minor short-term impacts to Columbian sharp-tailed grouse due to loss of production area within the Project Area. In the long-term reclamation will improve Columbian sharp-tailed grouse habitat over the pre-mining conditions.	Same as Alternative A.	Same as Alternative A.
Indirect Impacts to Colorado River Fishes	It is not possible to quantify the amount of mercury which endangered fish would be exposed to or the	Although the emissions attributable to Trapper Mine coal would be reduced based on the	The mercury emissions attributable to Trapper Mine coal would range from current levels to

Table 4-1 Comparison of Direct and Indirect Impacts

Resource	Alternative A – Proposed Action	Alternative B – Disapproval of the Mining Plan Modification by the ASLM	Alternative C – No Action
	impact as a result of that mercury exposure.	reduced mining rate, it is assumed that Craig Station would continue to operate at current levels, obtaining coal from another source. It is not possible to quantify the amount of mercury which endangered fish would be exposed to or the impact as a result of that mercury exposure.	levels based on a reduced mining rate of Alternative B. It is not possible to quantify the amount of mercury which endangered fish would be exposed to or the impact as a result of that mercury exposure.
Indirect Impacts to Yellow-billed cuckoo	It is not possible to determine the severity of impacts to yellow-billed cuckoos from either mercury or selenium emissions from coal combustion due to lack of information.	Coal combustion emissions would continue under Alternative B but the amount attributable to Trapper mine would be reduced based on the reduced mining rate. The impacts cannot be quantified at this time due to lack of information.	Emissions from coal combustion would range from current emissions attributable to Trapper Mine coal to a reduced emissions based on the reduced mining rate of Alternative B. The impacts cannot be quantified at this time due to lack of information.
Cultural Resources	As long as TMI complies with recommendations for the Rock Art Site mitigation, no impacts are anticipated to cultural resources.	The area of the N Pit has been previously disturbed so there would be no new impacts. Due to the lack of detailed mining plans for the I Pit, impacts cannot be fully quantified,	There would be no impacts from continued mining within the Project Area as in Alternative A. For mining in areas outside of the Project Area as in Alternative B, there would be no new impacts from mining in the N Pit but the area of impact for the N Pit has not been fully defined and impacts cannot be quantified.
Socioeconomics	There are beneficial socioeconomic impacts locally, regionally and state-wide from continued mining at the Trapper Mine over the 10-year life-of-mine.	Mining would continue in areas outside of the Project Area so socioeconomic benefits also would continue until mining ceases but would be reduced due to the reduced mining rates and reduced timing for completion of mining (three to four years).	The beneficial socioeconomic impacts would continue over the life-of-mine for the Project Area, estimated at 10 years. If mining does not continue within the Project Area, under Alternative B mining would continue to provide socioeconomic benefits but these benefits would be reduced by six to seven years due to the

Table 4-1 Comparison of Direct and Indirect Impacts

Resource	Alternative A – Proposed Action	Alternative B – Disapproval of the Mining Plan Modification by the ASLM	Alternative C – No Action
			reduced mining rate and reduced timing for completion of mining.
Visual Resources	Negligible to minor short-term visual impacts over the life of the mine. Lighting from mining activities creates a minor short-term impact over the life of the mining operation.	Same as Alternative A.	Same as Alternative A.
Paleontology	Negligible, long-term impacts due to loss of paleontological resources There could be beneficial impacts from exposing paleontological resources for discovery.	Same as Alternative A.	Same as Alternative A.
Access and Transportation	No changes to current access and transportation.	Access and transportation numbers could be somewhat reduced due to the reduced mining rate. The reduction would be short-term and minor during mining operations.	Impacts could range from no change if the existing mining operations continue as in Alternative A, to short-term minor impacts if mining ceases in the Project Area and mining outside the Project Area as in Alternative B results in a reduced mining rate with associated reduction in employees and deliveries.
Solid Waste			
Direct Impacts from Solid Waste Generation and Disposal	No direct impacts from solid waste disposal.	Same as Alternative A.	Same as Alternative A.
Indirect Impacts from Placement of CCRs	Negligible long-term impacts with placement in accordance with approved plans and reclamation upon completion of placement in an area.	Same as Alternative A as CCRs placement would continue at the Trapper Mine.	Same as Alternative A.
Noise	Depending on the location of the mine pit, the closest residence ranges from 0.46 to 0.7 mile (0.7 km to 1.1 km) from mining activities. Short-term, negligible impacts, until reclamation is complete	Closest residence to the proposed I Pit is approximately 0.66 mile (1 km). Impacts would be the same as Alternative A, until reclamation is complete and heavy equipment is	The closest residence would vary depending on when mining ceases, however, impacts would be the same as Alternative A.

Table 4-1 Comparison of Direct and Indirect Impacts

Resource	Alternative A – Proposed Action	Alternative B – Disapproval of the Mining Plan Modification by the ASLM	Alternative C – No Action
	and heavy equipment is no longer operating in the area.	no longer operating in the area.	

4.2 Topography

4.2.1 Alternative A – Proposed Action

4.2.1.1 Direct Impacts

Approximately 257 acres of previously undisturbed lands would be disturbed within the Project Area, and 11 acres of previously disturbed and reclaimed land would be re-disturbed within the Project Area, disrupting the existing topography during mining. In addition, there are 1,053 acres of currently disturbed land within the Project Area. All areas previously disturbed and to be disturbed in the future would be contemporaneously reclaimed through backfilling and grading to the approved post-mining topography and establishment of surface drainage patterns per the approved reclamation plan. After reclamation has been completed, the long-term impacts to topography would be negligible.

4.2.1.2 Indirect Impacts

There would be no indirect impacts to topography under Alternative A.

4.2.2 Alternative B – Disapproval of the Mining Plan Modification by the ASLM

4.2.2.1 Direct Impacts

Under Alternative B, mining in the Project Area would cease and closure and reclamation would be initiated. The additional 257 acres of new disturbance and 11 acres of re-disturbance would not occur. The existing 1,053 acres of disturbance would be reclaimed to the approved post-mining topography. It is anticipated that mining would occur in areas outside of the Project Area in the N and I pits. This mining would occur over a time period of three to four years which is shorter than the proposed Project life-of-mine of approximately 10 years. The short-term impacts to topography would occur in a different area within the SMCRA permit boundary but would be similar to those under Alternative A. Under Alternative B mining would cease and final reclamation would occur earlier. After reclamation has been completed, the long term impacts to topography would be negligible.

4.2.2.2 Indirect Impacts

There would be no indirect impacts to topography under Alternative B.

4.2.3 Mitigation Measures

No mitigation measures would be necessary for topography.

4.3 Air and Climate Resources

4.3.1 Alternative A – Proposed Action Alternative

The Trapper Mine EA addresses emissions associated with mining activities that are ongoing. As such, ongoing air quality and climate impacts are reflected in the baseline data described in the Affected Environment (Chapter 3.0).

4.3.1.1 Direct Emissions from Surface Coal Mining

This section covers the direct air emissions associated with the proposed surface mining activities at the Trapper Mine within the Project Area. Direct emissions include the following:

- PM_{10} and $PM_{2.5}$ emissions associated with the Trapper Mine operations, including but not limited to, emissions from drilling, blasting, coal excavation and removal, overburden excavation and removal, and emissions from coal/overburden hauling on unpaved roads within the Project Area.
- NO_X, SO_2, CO, and VOC emissions associated with fuel combustion in mining equipment and haul trucks.
- Combustion emissions associated with blasting (i.e., NO_X).
- GHG emissions, including but not limited to fugitive CH_4 releases from the coal mining seams and GHGs associated with fuel combustion in mining equipment and haul trucks.
- Black carbon emissions associated with fuel combustion in mining equipment and haul trucks.

O_3 emissions and impacts are discussed in the Cumulative Impacts section (Chapter 5.0) as the contribution of individual source emissions to regional O_3 levels cannot be accurately quantified. However, emissions of O_3 precursors (NO_X and VOCs) are quantified in this section.

All calculated emissions used in the modeling of direct air quality impacts were quantified using the maximum allowable mining rate at the Trapper Mine based on TMI's air quality permit (i.e., 2.6 mtpy). For PM_{10} and $PM_{2.5}$, emissions were quantified for each year up to 2025 (when the coal reserves in the Project Area would be exhausted based on TMI's proposed mining plans). CDRMS has only approved detailed mining plans through 2017, and additional regulatory review and approval by CDRMS would be required prior to mining through 2025. Based on the calculated PM_{10}/$PM_{2.5}$ emissions, a worst-case year was selected and the emissions from other pollutants were then evaluated for the selected worst-case year. As documented below, the worst-case emissions year was determined to be 2020. *The Air and Climate Resources Technical Support Document (TSD) (Air Resource Specialists 2016) provides detailed information on the emissions inventory and modeling and is included as* ***Appendix B.*** *The TSD information is summarized below.*

<u>Particulate Matter</u>

Particulate matter emissions (PM_{10} and $PM_{2.5}$) occur from mining activities, as well as emissions associated with diesel fuel combustion in the mining equipment and trucks. Mining activities include drilling, blasting, coal and overburden removal and handling, and coal hauling by truck from the Trapper Mine to the adjacent Craig Station.

PM_{10} and $PM_{2.5}$ emission controls are imposed through the fugitive dust control plan contained in the Trapper Mine air emissions permit issued by the CDPHE on May 8, 2009 – Permit 11MF253-1, Modification 2 (CDPHE 2009). These emissions controls are summarized in the TSD (**Appendix B**).

Table 4-2 summarizes the PM_{10} and $PM_{2.5}$ emissions for each year through 2025 when the Trapper Mine coal reserves within the Project Area would be exhausted, based on the proposed mining plans and a peak production rate of 2.6 mtpy. Once the worst-case year was determined, the appropriate fuel combustion emissions were then added to the PM_{10}/$PM_{2.5}$ emission totals.

The emissions calculations used standard USEPA factors for western surface coal mines from USEPA's Compilation of Air Pollutant Emission Factors, or AP-42 (USEPA 2015a), combined with year-by-year projections of mine operations provided by TMI, to calculate the total PM_{10} and $PM_{2.5}$ emissions. *Details about the calculations are presented in the TSD (**Appendix B**).*

Table 4-2 Projected Trapper Mine PM_{10} and $PM_{2.5}$ Emissions through 2025

Mining Year	PM_{10} Emissions (tpy)	$PM_{2.5}$ Emissions (tpy)
2016	*533.88*	*79.75*
2017	*537.06*	*82.08*
2018	*526.23*	*80.25*
2019	*534.62*	*84.50*
2020	*603.51*	*93.25*
2021	*615.89*	*96.83*
2022	*569.46*	*88.21*
2023	*525.76*	*80.76*
2024	*450.35*	*69.22*
2025	*335.46*	*48.00*

***Table 4-2** includes indirect emissions from CCRs disposal. The total PM_{10} and $PM_{2.5}$ emissions including CCRs disposal were evaluated to select the worst-case year.*

Source: Air Resource Specialists 2016.

Based on **Table 4-2**, the peak PM_{10}/$PM_{2.5}$ emissions would occur in Calendar Years 2020 and 2021. In the TMI proposed mining plans, both 2020 and 2021 would be years with higher than average stripping ratios, so the overburden volumes to be handled and transported within the mine pit and the associated air emissions are greater. However, the magnitude of the emissions between 2020 and 2021 would be virtually the same.

The selection of the worst-case year also considered the relative location of the PM_{10}/$PM_{2.5}$ emissions based on TMI's anticipated mining plans. *Beginning in 2019, TMI's anticipated mining plans would include mining in the N Pit. Only a fraction of the N Pit lies inside the Project Area. For worst-case year (2020), TMI's anticipated mine plan would include mining in the N Pit outside of the Project Area and the associated N Pit emissions would primarily occur outside of the Project Area.* However, in 2020, there would be a higher concentration of emissions in the L Pit, which is the current active Trapper Mine pit. The L Pit also would be closer to the eastern SMCRA permit boundary in 2020 and the separation distance between the emissions location and ambient air would be less. For these reasons, 2020 was selected as the worst-case year for the air quality analysis as it would be likely to produce higher air quality impacts to nearby ambient air.

A more detailed PM_{10}/$PM_{2.5}$ inventory for the worst-case year (2020) is summarized in **Table 4-3** *based on emissions calculated in the TSD (**Appendix B**).*

Table 4-3 Worst-Case Year (2020) Trapper Mine PM_{10} and $PM_{2.5}$ Direct Emissions

Mining Operation	PM_{10} (tpy)	$PM_{2.5}$ (tpy)
Drilling: Coal & Overburden	*0.98*	*0.98*
Blasting: Coal & Overburden	0.06	0.003
Truck Loading: Coal	8.48	0.88
Bulldozing: Coal	30.93	2.53
Bulldozing: Overburden	35.70	19.62
Overburden Replacement	78.58	11.79

Table 4-3 Worst-Case Year (2020) Trapper Mine PM_{10} and $PM_{2.5}$ Direct Emissions

Mining Operation	PM_{10} (tpy)	$PM_{2.5}$ (tpy)
Dragline	111.55	9.60
Topsoil Removal: Scraper	2.15	2.15
Topsoil: Scraper Travel Mode	27.93	2.79
Topsoil Unloading: Scraper	1.48	1.48
Grading: Haul Roads	6.03	0.60
Coal/Overburden Truck Hauling	87.95	8.79
Light Duty Vehicle Traffic	2.05	0.20
Wind Erosion	196.84	29.53
TOTAL	*590.71*	*90.94*

Source: Air Resource Specialists 2016.

Combustion Emissions

Combustion emissions include NO_X, SO_2, CO, and VOCs from combustion of diesel fuel in mining equipment and trucks along with emissions associated with blasting.

*The combustion emissions calculations are included in **Appendix B** with the results documented in **Table 4-4**.* Calculations for HAP emissions associated with fuel combustion in the mining equipment and trucks are reported in **Table 4-5**.

Table 4-4 Direct Mining Emissions for Worst-Case Year (2020) Fuel Combustion and Blasting

Emissions Source	NO_X (tpy)	SO_2 (tpy)	CO (tpy)	VOCs (tpy)
Fuel Combustion: Mining Equipment & Trucks	987	52	378	72
Blasting	74	9	291	No Data
TOTAL	1,061	61	669	72

Source: Air Resource Specialists 2016.

Table 4-5 Direct Mining HAPs Emissions for Worst-Case Year (2020) – Fuel Combustion (tpy)

Benzene	Toluene	Xylene	1,3-Butadiene	Formaldehyde	Acetaldehyde	Acrolein	Napthalene
0.41	0.15	0.11	0.02	0.13	0.07	0.01	0.06

Source: Air Resource Specialists 2016.

Ozone

The contributions to O_3 emissions from direct mining activities and associated impacts are discussed in Section 5.4.2 of the Cumulative Impacts section (Chapter 5.0) as the contribution of individual source emissions to regional O_3 levels cannot be accurately quantified.

Mining-Related GHG Emissions

GHG emissions include CO_2, CH_4, and N_2O. The direct Trapper Mine GHG emissions are associated with the fuel combustion in mining equipment and trucks, and blasting. In addition, fugitive CH_4 emissions are released at surface mines from the coal seams. *Technical details about the calculation of GHG emissions are listed in the TSD (**Appendix B**).*

GHG emissions are reported on the basis of CO_2e. This accounts for the differences in the global warming potential (GWP) of the individual constituents. **Table 4-6** lists the estimated direct GHG emissions and the GWP for the individual GHG gasses. GHG emissions are shown in metric tons (MT) for consistency with international standards (1 MT = 1,000 kg = 1.1 tons US). For the N_2O estimates, if specific N_2O emissions data were not available, all NO_X emissions were assumed to be in the form of N_2O in order to provide for a worst-case assessment.

Table 4-6 Direct Mining GHG Emissions for Worst-Case Year (2020) (tons and MT per year)

	CO_2	CH_4	N_2O	CO_2e
Global Warming Potential	1	36 [1]	298	
Fuel Combustion (tons)	86,711	--	987	380,973
Blasting (tons)	291	3	74	22,364
Coal Seams (tons)	--	3,524	--	126,878
TOTAL (tons)	87,002	3,527	1,061	530,215
TOTAL (MT)	79,093	3,206	965	482,014

[1] USEPA lists the CH_4 GWP as a range of 28 to 36. The GWP of 36 was used for CH_4 in order to provide an upper bound on the GHG emissions estimate, see www3.epa.gov/climatechange/ghgemissions/gases/ch4.html.

Source: Air Resource Specialists 2016.

Black Carbon

Black carbon is a subset of the $PM_{10}/PM_{2.5}$ emissions associated with diesel fuel combustion. Black carbon is effective at absorbing light and has a disproportionally larger impact on visibility degradation compared to other forms of particulate matter. Some researchers also link black carbon emissions to climate-related air quality impacts.

Black carbon has been calculated as a percentage of the $PM_{2.5}$ emissions associated with diesel fuel combustion based on Cai and Wang (2014). The calculated black carbon emissions based on diesel fuel consumption from the worst-case year (2020) is provided in **Table 4-7**.

Table 4-7 Direct Mining Related Emissions for Worst-Case Year (2020) – Black Carbon (tpy)

$PM_{2.5}$	Black Carbon Ratio	Black Carbon Emissions
64 tpy	0.813	52 tpy

Source: Air Resource Specialists 2016.

4.3.1.2 Indirect Emissions Associated with Coal Combustion

Indirect emissions associated with coal combustion include combustion of coal at the Craig Station to generate electricity. Based on the CDPHE-issued Title V operating permit (Permit 96OPMF155, Issued May 1, 2005), the Craig Station includes three coal-fired EGUs, with a combined net electric generating capacity of 1,264 MW. Unit 1 was placed in service in 1980, Unit 2 in 1979, and Unit 3 in 1984. Coal from the Trapper Mine is used almost exclusively at Units 1 and 2 and coal from other sources is fired in Unit 3. *Where supported by available data, the indirect emissions discussed in this section are based on the emissions from combustion of TMI coal at Units 1 and 2.* The emission controls at the Craig Station are summarized in **Table 4-8**.

In addition, some of the Craig Station CCRs (e.g., fly ash and bottom ash) are used as backfill at the Trapper Mine. The remaining CCRs are recycled for beneficial uses. The emissions associated with the CCRs' transport and placement at Trapper Mine are included in the indirect emissions. This would include fugitive dust emissions (PM_{10} and $PM_{2.5}$) associated with the hauling of CCRs by truck to the placement site, and associated diesel fuel combustion emissions from the trucks, including GHG emissions.

Table 4-8 Summary of Air Emission Controls – Craig Station

	Unit 1	Unit 2	Unit 3
Capacity (Net)	428 MW	428 MW	408 MW
In-service Date	1980	1979	1984
Particulate Matter	Fabric Filter Baghouse	Fabric Filter Baghouse	Fabric Filter Baghouse
SO_2	Wet Limestone Scrubber	Wet Limestone Scrubber	Spray Dryer Absorber (Dry Scrubber)
NO_X	Low NO_X Burners with Overfire Air	Low NO_X Burners with Overfire Air	Low NO_X Burners with Overfire Air
	Add SCR by 2021 to meet emission limits of the Colorado Regional Haze SIP	Add SCR by 2018 to meet emission limits of the Colorado Regional Haze SIP	Add SNCR by 2018 to meet emission limits of the Colorado Regional Haze SIP
Mercury	Ancillary control provided by existing systems for other pollutants	Ancillary control provided by existing systems for other pollutants	Ancillary control provided by existing systems for other pollutants

Source: Air Resource Specialists 2016.

Criteria Pollutant Indirect Emissions from Electricity Generation (SO_2, NO_X, CO,VOCs, and PM_{10}/$PM_{2.5}$)

Coal combustion for generation of electricity produces air emissions. These emissions were estimated based on coal combustion at Craig Station Units 1 and 2 for the maximum coal production rate under TMI's air permit, or 2.6 mtpy.

As described previously, coal from the Trapper Mine is used almost exclusively at Craig Station Units 1 and 2. Where supported by reliable technical information, emissions data unique to Units 1 and 2 were used to estimate the Trapper Mine-related indirect emissions.

A summary of calculated emissions for the Craig Station is provided in **Table 4-9**. For SO_2 and NO_X calculations, unit-specific emissions data for 2014 were obtained for the Craig Station from the USEPA Air Markets Program Data (AMPD). *As explained in the TSD (**Appendix B**), the AMPD SO_2 and NO_X emissions data for Units 1 and 2 were then adjusted to reflect the contribution to these emissions from TMI coal at the maximum allowable coal production rate of 2.6 mtpy.*

Table 4-9 Indirect Coal Combustion Emissions (tpy)

	SO_2 Emissions			NO_X Emissions						
	Unit 1	Unit 2	Unit 3	Unit 1	Unit 2	Unit 3	CO	VOCs	PM_{10}	$PM_{2.5}$
Craig Station Emissions Total (2014)	799.02	963.36	2,000.90	3,768.07	4,603.28	5,367.91	--	--	119.0	68.5
Trapper Mine Coal Combustion Contribution (78.67%)	628.59	757.88	--	2,964.34	3,621.40	--	--	--	86.5	53.9
Trapper Mine Coal Combustion Contribution Adjusted to 2.6 mtpy	710.58	856.73	--	3,350.99	4,093.76	--	650.0	78.0	97.8	60.9

Note: PM_{10} and $PM_{2.5}$ emissions are the total from Units 1 and 2 as reported for Calendar Year 2014 on APENs filed with CDPHE.

Source: Air Resource Specialists 2016.

The USEPA AMPD database lists SO_2 and NO_X emissions; but not emissions for CO, VOCs, *and PM_{10}/$PM_{2.5}$.*

For CO and VOC, Craig Station emissions were based on AP-42 Section 1.1.1 (Coal Combustion). Also, for CO and VOC, the AP-42 factors (pounds per ton) were applied to the 2.6 mtpy maximum mining rate for Trapper Mine coal to derive the indirect emissions information. *PM_{10} and $PM_{2.5}$ emissions at Units 1 and 2 were taken from APENs filed with CDPHE by Tri-State Generation and Transmission Association, Inc. and adjusted to reflect the TMI coal contribution at the maximum mining rate of 2.6 mtpy.* For all pollutants, the indirect emissions are based on the maximum coal combustion of 2.6 mtpy and do not represent a specific future year.

Based on the above data, the Craig Station emissions associated with Trapper Mine coal at a 2.6 mtpy mining rate would be: SO_2 – 1,567 tpy, NO_X – 7,445 tpy, CO – 650 tpy, VOCs – 78 tpy*, PM_{10} – 97.8 tpy, and $PM_{2,5}$ – 60.9 tpy.*

The NO_X emissions estimates shown above do not include the expected future benefits of improved emissions controls at Craig Station. Both Unit 1 and Unit 2 are planning to install SCR for NO_X emissions control (see **Table 4-8**) to meet the emissions limits contained in the Regional Haze SIP (CDPHE 2014a). The SIP specifies the required NO_X emissions limits and the owner/operator (Tri-State Generation and Transmission) then selects the appropriate emissions control technology to achieve the required limits. The Unit 2 SCR is scheduled to be operational by 2018 and the Unit 1 SCR is scheduled to be operational by 2021. Based on the NO_X emissions limits contained in the Colorado Visibility and Regional Haze SIP (CDPHE 2014a), the projected NO_X reduction would be on the order of 80 percent at each unit, for a total reduction of about 8,000 tpy. The reductions attributable to Trapper Mine coal would be a portion of the total Unit 1 and 2 reductions, or about 6,300 tpy, leaving post-control indirect NO_X emissions attributable to Trapper Mine coal of 1,145 tpy.

The contribution of indirect emissions to regional O_3 is discussed in the Cumulative Impacts section (Chapter 5.0) as the contribution of individual source emissions to O_3 levels cannot be accurately quantified.

Mercury Emissions from Electricity Generation

The CDPHE has provided mercury emissions data for Craig Station for the 2014 reporting year (Tri-State Generation and Transmission Association, Inc. 2015). These Craig Station mercury emissions data are based on continuous emissions monitoring system equipment installed at each Craig Station unit.

The Craig Station is generally recognized to have one of the lower mercury emission rates for electric generating units in the United States. Based on 2009 mercury emissions data compiled by Environmental Integrity Project (2011), Craig Station was at the time ranked second-lowest among coal-fired power plants in the U.S. in terms of mercury emissions per unit of electricity generation, expressed as lb/GWh.

The 2014 mercury emissions data for Craig Station are summarized in **Table 4-10**. ***Table 4-11*** *summarizes the mercury emissions attributable to the Trapper Mine coal and reflects the contribution to the total mercury emissions from coal combustion at Craig Station Units 1 and 2 adjusted to the maximum TMI mining rate of 2.6 mtpy. Mercury released at Craig Unit 3 is not tied to combustion of TMI coal but instead comes from coal supplied by other mines. The calculations for the mercury emissions are documented in the TSD (**Appendix B**). The total mercury emissions derived here are consistent with the Craig Station mercury emissions listed in the 2014 USEPA TRI (USEPA 2014b).*

Table 4-10 Actual 2014 Craig Station Mercury Emissions (lb/yr) as reported by Craig Station to CDPHE

Unit 1	4.41
Unit 2	4.85
Unit 3	33.69
Total	42.95

lb/yr = pounds per year.

Table 4-11 Estimated Craig Station Mercury Emissions from Trapper Mine Coal (lb/yr)

	Mercury Emissions for Trapper Mine 2014 Combustion Rates (2.3 mtpy)	Mercury Emissions at Maximum Trapper Coal Combustion Rates (2.6 mtpy)
Unit 1	3.47	3.92
Unit 2	3.82	4.31
TOTAL	7.29	8.23

Source: Air Resource Specialists 2016.

CCRs Placement at Trapper Mine

The delivery and placement of CCRs at Trapper Mine is characterized as an indirect emission because placement is in areas outside of the Project Area. Trapper Mine receives a portion of the CCRs from Craig Station for placement, with the remainder recycled for beneficial uses. The emission calculations address the CCRs returned to Trapper Mine for placement, regardless of the origin of the coal. The CCRs volume returned to the Trapper Mine for placement is estimated at approximately 501,000 tpy. *The calculated indirect emissions associated with placement of CCRs at Trapper Mine is based on the projected volume and does not represent a specific year of operation. The technical details of the emissions calculations are documented in the TSD (**Appendix B**).*

PM_{10} and $PM_{2.5}$ emissions are principally fugitive dust from truck traffic carrying the CCRs from Craig Station to the placement site at Trapper Mine. Other sources of emissions include bulldozing and wind erosion at the placement site, and exhaust emissions associated with the diesel fuel combusted by the haul trucks. **Table 4-12** summarizes the indirect PM_{10}/ $PM_{2.5}$ emissions associated with the CCRs placement.

Table 4-12 Indirect PM_{10} and $PM_{2.5}$ Emissions from CCRs Placement at Trapper Mine

Emission Source	PM_{10} (tpy)	$PM_{2.5}$ (tpy)
CCRs Hauling: Truck Traffic	*7.85*	*1.38*
CCRs Bulldozing	1.16	0.35
Wind Erosion	3.80	0.57
TOTALS	*12.81*	*2.30*

Source: Air Resource Specialists 2016.

The fuel combustion for haul trucks that transport the CCRs to the Trapper Mine placement site also releases pollutants such as NO_X, SO_2, CO, and VOCs. These emissions were calculated using the USEPA MOVES2014 model (USEPA 2014a) and estimated operating time for the trucks (**Appendix B**). The relevant emissions are summarized in **Table 4-13**.

Table 4-13 Indirect Emissions for Worst-Case Year (2020) Fuel Combustion: CCRs Transfer by Truck to Trapper Mine

	NO_X (tpy)	SO_2 (tpy)	CO (tpy)	VOCs (tpy)
Fuel Combustion: CCRs Haul Trucks	12.1	1.5	5.15	0.7

Source: Air Resource Specialists 2016.

<u>Indirect GHG Emissions</u>

Indirect GHG emissions are associated with combustion of the coal provided to Craig Station by the Trapper Mine. Indirect emissions also are associated with diesel fuel combustion from the haul trucks, which carry the CCRs material back to Trapper Mine for final placement.

At the Craig Station, CO_2 emissions associated with coal combustion are listed in the AMPD database, so the CO_2 emissions estimates were handled in a manner similar to the SO_2 and NO_X emissions described previously. The total 2014 Craig Station CO_2 emissions were obtained from the AMPD and the portion derived from Trapper Mine coal at Units 1 and 2 was calculated. This value was then adjusted to the permitted maximum coal production rate of 2.6 mtpy.

Because the AMPD reports only CO_2 emissions, the total GHG emissions as CO_2e needed to be determined by including emissions of other GHG pollutants, specifically CH_4 and N_2O. Using the AP-42 emission factors (Section 1.1, Coal Combustion) and the GWP of each pollutant, a CO_2e factor was determined and compared to the CO_2-only emissions factor from AP-42. This ratio was then used to adjust the CO_2-only emissions reported in the AMPD for Craig Station Units 1 and 2. Because CO_2 dominates the GHG emissions for coal combustion compared to CH_4 and N_2O, the calculated adjustment factor was very small (0.5 percent) (**Appendix B**).

GHG emissions associated with the diesel fuel combustion in the trucks hauling CCRs to the placement site were calculated using the USEPA MOVES2014 emissions model (USEPA 2014a). MOVES2014 only lists data on CO_2 emissions; so other GHG emissions were not calculated for the CCRs placement. However, like coal combustion, GHGs from diesel fuel combustion are dominated by the CO_2 emissions and omitting the other GHG pollutants from the calculation does not introduce a significant error in the overall estimate. Also, the CCRs placement is a very small fraction of the overall indirect GHG emissions.

The indirect GHG emissions are shown in **Table 4-14**. GHG emissions are shown in MT for consistency with international standards (1 MT = 1,000 kg = 1.1 tons US).

Table 4-14 Indirect GHG Emissions reported at CO_2e for Coal Combustion and CCRs Placement

	GHG Emissions as CO_2e (MT per yr)	**Indirect Project Emissions as compared to State/National Totals**
Craig Station Units 1 and 2 Coal Combustion adjusted to maximum TMI Mining Rate(2.6 mtpy)	5,341,966	NA
CCRs Placement (transportation)	985	NA
Total Indirect GHG Emissions	5,342,951	NA
Colorado GHG Emissions (2010)	129.95 million	4.1%
Nationwide GHG Emissions (2007)	7,150.1 million	0.07%

Source: Air Resource Specialists 2016.

The indirect GHG emissions are shown in comparison to the state and national GHG inventories. The Colorado inventory is taken from CDPHE (2014b) and represents the statewide GHG inventory for Calendar Year 2010. The indirect emissions associated with combustion of 2.6 mtpy of coal at Craig Station Units 1 and 2 is about 4.1 percent of the statewide GHG inventory. The nationwide GHG inventory is described under the Section 3.3, Existing Environment and represents the nationwide GHG inventory for Calendar Year 2007. The project-related indirect emissions are 0.07 percent of the national GHG emissions.

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

- The region may experience warmer temperatures with less snowfall.
- *T*emperature *are expected to* increase more in the winter *than in the 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, recreationalists and others. In late summer, rivers, lakes, and reservoirs will be drier.*
- *More frequent, more severe, and possibly* longer-lasting droughts will occur.
- Crop and livestock production *patterns could shift northward; less soil moisture due to increased evaporation may increase irrigation needs*.
- Drier conditions *will reduce the range and health of* ponderosa and lodgepole pine forests, and increase the susceptibility to fire.

- Grasslands and rangeland *could expand* into previously *forested areas*.
- Ecosystem*s will be* stresse*d and wildlife such as* ~~s~~ mountain lion, black bear, long-nose sucker, pine marten, and bald eagle *could be further stressed*.

The climate impacts described above would potentially be long-term, but any contribution to climate change associated with direct/indirect emissions from Trapper Mine would be negligible and additional contributions would cease after the life of the mine.

Another approach to address climate change impacts is to calculate the "social cost of carbon" (SCC). The SCC protocol was developed for use in cost-benefit analyses for proposed regulations that could impact cumulative global GHG emissions (USEPA 2013). The SCC estimates economic damages associated with increases in carbon emissions and includes, but is not limited to changes in net agricultural productivity, human health, and property damages associated with increased flood risks.

The SCC is typically expressed as the cost in dollars per MT of emissions and there is a wide range of costs, with the greatest influence on costs caused by the discount rate. The discount rate is a measure to estimate the present value for costs/damages that may occur far out into the future. For 2020 emissions, the range in SCC presented by the USEPA is $13/MT to $137/MT, represented as 2011 dollars (USEPA 2013).

OSMRE has elected not to specifically quantify the SCC. First, there is no certainty that GHG emissions at Craig Station would actually be reduced if Trapper Mine coal from the Project Area was not mined given that Craig Station has alternative sources for coal, and the Trapper Mine also has non-federal coal reserves that could be mined (see Section 2.5). 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 (**Table 4-14**).

4.3.1.3 Air Dispersion Modeling Analysis

An air dispersion modeling analysis was conducted by Air Resource Specialists (2016) to assess the air quality impacts associated with Alternative A against the NAAQS. The modeling analysis was based on the emissions calculated for Alternative A for the worst-case year, 2020*. The modeling analysis is discussed in detail in **Appendix B** and summarized below.*

Modeling Overview

The air quality modeling analysis was conducted with the USEPA AERMOD dispersion model – Version 15181 (USEPA 2004). AERMOD is the standard air dispersion model recommended by the USEPA for use in regulatory actions such as permitting. The AERMOD modeling generally followed the recommendations in USEPA's Guideline for Air Quality Models (USEPA 2005a) and USEPA's current AERMOD Implementation Guidance (USEPA 2015b). Recommended USEPA regulatory defaults were used for all AERMOD model inputs unless noted otherwise in the discussion below.

One of the basic inputs to AERMOD is meteorological information (wind speed, wind direction, temperature, etc.). In the modeling analysis, the AERMOD modeling was performed using two different meteorological data sets. One data set was the on-site monitoring data collected at Trapper Mine for the period March through September 2015. However, as the Trapper Mine on-site data do not span a full 12-month period, a second more complete dataset also was used. The CDPHE was solicited to recommend the alternate meteorological data, and CDPHE provided data collected at the Colowyo Mine Gossard monitoring site during 2012 (CDPHE 2015a). The Gossard monitoring site is located at Latitude 40.313 North and Longitude -107.799 West at an elevation of 6,325 feet (1,928 meters) amsl.

Once the modeling was conducted, it was observed that the Gossard meteorological data consistently returned higher model predictions compared to the on-site Trapper Mine data.

AERMOD Modeling Results

The AERMOD modeling results for Trapper Mine emissions are summarized below and compare the predicted concentrations to the applicable NAAQS. Where the NAAQS is expressed in units of ppb or ppm, the NAAQS concentration value has been converted to µg/m^3 to allow for direct comparison against the AERMOD modeling results. The AERMOD modeling addresses the following regulated pollutants: CO, SO_2, NO_2, PM_{10}, and $PM_{2.5}$. *O_3 emissions and impacts are discussed in the Cumulative Impacts section (Chapter 5.0) as the contribution of individual source emissions to regional O_3 levels cannot be accurately quantified.*

The AERMOD modeling results *are discussed in detail in* ***Appendix B*** *and* summarized in **Table 4-15**. Only the worst-case modeling result from the two meteorological data sets (Trapper Mine On-Site versus Gossard) is shown in the results table. As noted above, for all pollutants and averaging times, the Gossard data provided the worst-case modeling result.

As demonstrated by **Table 4-15**, the predicted AERMOD concentration for each pollutant and averaging time, plus an appropriate background level to account for impact from emission sources not explicitly included in the modeling, demonstrates compliance with all applicable NAAQS. *Because the modeling demonstrates that the impacts are below the NAAQS, these impacts are defined as negligible. These impacts are short-term and would occur for the duration of mining under this alternative.*

Table 4-15 AERMOD Modeling Results – Trapper Mine (all concentrations in µg/m^3)

Pollutant	Averaging Time	Form[1] – AERMOD Modeled Concentration[2]	Background Concentration	Cumulative Impact (AERMOD plus Background)	NAAQS
CO	1-hour	2nd High – 3,791.54	1,145	4,936.54	10,000
	8-hour	2nd High – 907.4	1,145	2,052.4	40,000
SO_2	1-hour	4th High – 49.41[3]	2.62	52.03	195.6
NO_2	1-hour	8th High – 159.27	13.16	172.43	188
	Annual	1st High – 24.67	1.88	26.55	100
PM_{10}	24-hour	2nd High – 62.12	23	85.12	150
$PM_{2.5}$	24-hour	8th High – 12.78	14	26.78	35
	Annual	1st High – 3.94	3	6.94	12

[1] The AERMOD concentration shown is the concentration expressed in the form of the NAAQS. For example, because the SO_2 NAAQS is based on the 99th percentile daily maximum concentration, the 4th highest concentration value from AERMOD is reported (i.e., over 365 days, the highest three days are excluded to reach the 99th percentile concentration). Other pollutants are addressed similarly based on the form of the NAAQS.

[2] The Modeled Concentration was chosen as the higher value of the Gossard and On-Site Trapper modeling results for each pollutant and averaging period. The Gossard meteorological data provided higher results for every scenario.

[3] *For SO_2, only the 1-hour concentrations were reported in the dispersion modeling. There are 3-hour state and federal air quality standards for SO_2; however, the 1-hour standard is more stringent and compliance with the 1-hour average SO_2 NAAQS also assures compliance with the 3-hour state/federal SO_2 standards.* The 3-hour average SO_2 concentrations are listed in the TSD (**Appendix B**).

Source: Air Resource Specialists 2016.

Maximum Impact Locations

The location of the maximum modeled concentration described in **Table 4-15** varies between pollutants and averaging periods and depends largely on the emission distribution and the nature of the meteorology data. The dominant wind direction (south through southwest) resulted in all maximum modeled concentrations along either the north or east Trapper Mine SMCRA permit boundary.

For PM_{10} and $PM_{2.5}$, the emissions were dominated by mining activities in and near the mine pits. As such, the maximum modeled PM_{10} 24-hour concentration occurred along the Trapper Mine permit boundary to the northeast of the N Pit. This impact was believed to be dominated by mining-related emissions associated with the N Pit and also from emissions associated with the L Pit coal hauling where the haul road bypasses the N Pit on the north side. Even though N Pit had fewer emissions compared to the L Pit, the shorter transport distance from the N Pit to the SMCRA permit boundary plus the contribution from the coal hauling emissions contribute to the increase in the PM_{10} impacts in this area.

The maximum modeled $PM_{2.5}$ concentrations both occurred along the eastern SMCRA permit boundary. The maximum modeled $PM_{2.5}$ concentration occurred to the northeast of the L Pit. The worst-case $PM_{2.5}$ impact locations were the result of the relatively high concentration of emissions within the L Pit and the direction of the prevailing winds.

The maximum modeled NO_2 concentration occurred along the northeastern section of the SMCRA permit boundary to the north of the L Pit. These impacts were influenced by the high concentration of NO_X emissions from the truck and mining equipment in the L Pit.

For pollutants such as CO, annual mean NO_2, and SO_2 haul road truck traffic is the dominant source of emissions. For these pollutants, the maximum modeled impacts occur near where the coal haul road leading to the Craig Station passes through the SMCRA permit boundary of the mine. The impacts occur at this particular location because the transport distance to potential receptors is minimized at this location. The CO 1-hour and 8-hour, NO_2 annual, and SO_2 1-hour maximum modeled impacts were all located within a few hundred meters of where the coal haul road passes through the Trapper Mine SMCRA permit boundary.

4.3.1.4 Air Quality and Climate Impacts for Alternative A

The Trapper Mine EA addresses emissions associated with mining activities that are ongoing. As such, ongoing air quality and climate impacts are reflected in the baseline data described in the Affected Environment (Chapter 3.0).

O_3 emissions and impacts are discussed in the Cumulative Impacts section (Chapter 5.0) as the contribution of individual source emissions to regional O_3 levels cannot be accurately quantified.

Direct Impacts

Direct mining-related air quality impacts would include emissions associated with coal/overburden/ interburden handling and transfer and emissions from combustion of diesel fuel in trucks and mining equipment. *Although air emissions would be released into the environment from mining activities, air quality dispersion modeling demonstrated that NAAQS for PM_{10}, $PM_{2.5}$, NO_X, SO_2, and CO would not be exceeded in the worst-case year (2020). Impacts during other years would be less and would comply with the NAAQS.* As such, the direct air quality impacts would be negligible. Direct air quality impacts would be short-term and would occur throughout the life of Alternative A.

Direct GHG emissions include fugitive releases of CH_4 from the coal seams and GHG emissions from combustion of diesel fuel in the truck fleet and mining equipment. Direct GHG emissions from mining are expected to be approximately 482,014 metric tons CO_{2e} in the worst-case year (2020) and less than that number for other mining years. The direct GHG emissions from the mining operations would be less than

10 percent of the indirect emissions from coal combustion as described below. In addition, when compared to state and national GHG emissions, the direct GHG emissions would represent less than 0.4 percent of the 2010 Colorado GHG emissions and less than 0.007 percent of the 2007 nationwide GHG emissions. Climate impacts would potentially be long-term, but any contribution to climate change associated with direct emissions from Trapper Mine would be negligible and would diminish after the life of the mine when additional contributions to GHG are no longer occurring.

Indirect Impacts

Indirect air quality impacts would occur from combustion of Trapper Mine coal at Craig Station Units 1 and 2 and placement of CCRs at the Trapper Mine outside the Project Area. The coal combustion releases air emissions, most notably SO_2 and NO_X. Craig Station employs pollution abatement equipment to reduce these emissions and has plans to further reduce NO_X emissions in the 2018-2021 timeframe. *Emissions attributable to combustion of Trapper Mine coal would be 97.8 tpy PM_{10}, 60.9 tpy $PM_{2.5}$, 1,567 tpy SO_2, 7.445 tpy NO_X, 650 tpy CO, and 78 tpy VOCs based on the current emission controls for Units 1 and 2 at the Craig Station, Following installation of additional NO_X emission controls, the NO_X emissions from combustion of Trapper Mine coal are estimated to be 1,145 tpy. There would be no changes to the Craig Station operations as a result of Alternative A.*

Craig Stations currently is in compliance with all applicable emission standards. The indirect emissions associated with the transport and placement of CCRs at the Trapper Mine include dust from hauling of the CCRs, dust generated by equipment spreading the CCRs, wind erosion and fuel combustion for the haul trucks and spreading equipment. The indirect emissions from CCR hauling and placement would be 12.80 tpy PM_{10}, 2.30 tpy $PM_{2.5}$, 12.1 tpy NO_X, 1.5 tpy SO_2, 5.15. tpy CO, and 0.7 tpy VOCs. These emissions are included in the air quality modeling of direct impacts which showed compliance with the NAAQS.

The coal combustion is ongoing and there would be no changes that would result in exceedance of the current NAAQS. The indirect air quality impacts attributable to combustion of Trapper Mine coal would be short-term and negligible, and would cease after Trapper Mine ceases to provide coal to the Craig Station.

Given that coal to operate Craig Station would be available from sources other than the Trapper Mine, Craig Station emissions related to coal combustion would likely continue if Trapper Mine coal was unavailable. Craig Station emissions would continue in the long term.

The indirect air quality impacts associated with mercury emissions released during coal combustion are based on mercury emissions attributable to Trapper Mine coal combusted in Units 1 and 2 of the Craig Station. Mercury emissions would be 8.23 lb/yr at the maximum mining rate of 2.6 mtpy. These emissions would result in potential impacts to Colorado River fish and the Yellow-billed cuckoo. Impacts to these species as a result of the mercury emissions are discussed in detail Section 4.10, Special Status Species.

Indirect GHG emissions occur from coal combustion at Craig Station and from CCR transport and placement. Indirect GHG emissions would be 5,342,951 tpy which represents approximately 4.1 percent of the total 2010 Colorado emissions and 0.07 percent of the 2007 national emissions. There is concern that GHG emissions are a contributor to climate change, but the nature and magnitude of any such climate impact is uncertain and cannot be accurately quantified at present. Any climate impacts that may occur are difficult to assign to an individual emission source of GHGs such as Trapper Mine and Craig Station. *Climate impacts would potentially be long-term, but any contribution to climate change associated with indirect emissions from Trapper Mine would be negligible and additional contributions would cease after the life of the mine when indirect emissions attributable to the Trapper Mine coal combustion would no longer be occurring.*

4.3.2 Alternative B – Disapproval of the Mining Plan Modification by the ASLM

Under Alternative B, TMI would not mine any future coal within the Project Area. If Alternative B were selected, the most likely outcome would be that TMI would instead transfer its mining operations to other coal reserves within the SMCRA permit boundary that are located outside the Project Area. Under Alternative B, the maximum coal production rate is expected to decrease to an estimated 1.5 mtpy and these coal reserves would likely be exhausted within about three to four years.

O_3 emissions and impacts for Alternative B are discussed in the Cumulative Impacts section (Chapter 5.0) as the contribution of individual source emissions to regional O_3 levels cannot be accurately quantified.

4.3.2.1 Direct Mining Emissions

If mining were to be transferred to other coal reserves within the SMCRA permit boundary, the expected direct air emissions from the mining activities would be reduced based on the anticipated reduced mining rate of 1.5 mtpy. At the reduced mining rate, direct air quality impacts would be expected to be about 40 percent less than those described under Alternative A and these impacts would cease once mining for the other reserves was completed within about three to four years. However, some year-to-year variation in direct emissions would be expected depending on the specifics of the mine plan for these other reserves. For example, direct mining emissions might be higher or lower in any given year depending on the year-to-year variation in overburden stripping ratios. Also, because these other coal reserves are generally to the west of the Project Area, mining of these reserves would likely occur closer to the Craig Station, and the reduced coal hauling distances would be expected to result in lower emissions from this activity.

An increase in air emissions impacts, tied to cessation of mining activities in the Project Area, would result from reclamation activities that would need to commence at TMI's existing L Pit. Over the near-term, reclamation activities would be extensive as TMI worked to backfill the current mine pit and recontour/reclaim the existing land disturbance in the L Pit. Although reclamation plans have not been fully developed by TMI, it is expected that the necessary backfill material would need to come from the new pit operations outside of the Project Area, which would substantially increase overburden hauling distances in the near-term. As such, the extensive activities for reclamation at L Pit would be expected to cause additional air emissions over and above the Trapper Mine direct mining emissions for a period of a few years. Once the L Pit reclamation activities were completed, the direct mining emissions would only be related to mining activity in the areas outside the Project Area.

Under Alternative B, it also is expected that a short-term disruption in mining might occur as TMI transferred mining equipment from the current mine pit to the new coal reserves. Any disruption in coal supply from Trapper Mine might require Craig Station to seek alternative sources for coal until Trapper Mine's coal production started at the new mining pit. The reduced mining rate of 1.5 mtpy also would require Craig Station to seek coal from other sources in order to make up the deficit. Any alternative coal supply would need to come from a more distant mine and there would be an increase in air quality emissions associated with transport of any substitute coal from the more distant coal source.

4.3.2.2 Indirect Emissions Associated with Coal Combustion

Under Alternative B, Craig Station would receive coal mined at the Trapper Mine from reserves outside the Project Area. Any deficit in coal production at Trapper Mine under Alternative B would likely be replaced by coal from a more distant alternative coal supplier. As such, it is expected that there would be no change in the Craig Station operation and no change in the associated Craig Station air quality/climate emissions. *The emissions associated with coal transport to Craig Station could be different depending on the location of the alternative source for coal.* Otherwise, the indirect air quality impacts under Alternative B would be unchanged from those described for Alternative A. However, the TMI contribution to the indirect impacts from Craig Station emissions would decrease by approximately 40 percent.

4.3.2.3 Air Quality and Climate Impacts for Alternative B

Direct Impacts

Direct mining-related air quality impacts would include emissions associated with coal/overburden/ interburden handling and transfer and emissions from combustion of diesel fuel in trucks and mining equipment. Under Alternative B, emissions would be anticipated to be below the levels described under Alternative A by about 40 percent, based on the reduced mining rate for this alternative, and NAAQS would not be exceeded. As such, the direct air quality impacts under Alternative B would be negligible. Direct air quality impacts would be short-term and occur for the life of mining activities outside the Project Area, or three to four years, which is a shorter duration than the projected 10-year life-of-mine for Alternative A.

Direct GHG emissions include fugitive releases of CH_4 from the coal seams and GHG emissions from combustion of diesel fuel in the truck fleet and mining equipment. Direct GHG emissions from mining are expected to be approximately 40 percent below the levels described for Alternative A based on the reduced mining rate for Alternative B. As such, the direct GHG impacts would be negligible and could be long-term but would diminish after mining ceases and additional direct GHG emissions are no longer occurring.

Indirect Impacts

Indirect air quality impacts occur from combustion of coal mined by TMI at Craig Station Units 1 and 2 and placement of CCRs at the Trapper Mine as described for Alternative A. The *emissions from placement of CCRs within the Trapper Mine would remain unchanged from that described for Alternative A.* The coal combustion releases air emissions, most notably SO_2 and NO_X. Craig Station employs pollution abatement equipment to reduce these emissions and plans to further reduce NO_X emissions in the 2018-2021 timeframe. *Overall Craig Station emissions would be unchanged; however, indirect emissions attributable to the Trapper Mine coal would be approximately 40 percent below the indirect emissions of Alternative A. However, there would be additional impacts from emissions for coal transport from more distant sources to make up for the reduced Trapper Mine mining rate, should the Craig Station continue to operate at current levels.* The indirect air quality emissions attributable to Trapper Mine coal would be short-term, occurring for the life of mining activities, and would be negligible. Indirect emissions from Craig Station would continue for the long term.

The indirect air quality impacts associated with mercury emissions released during coal combustion are based on mercury emissions attributable to Trapper Mine coal combusted in Units 1 and 2 of the Craig Station. Mercury emissions attributable to Trapper Mine coal could be reduced by 40 percent from the mercury emissions outlined in Alternative A. These emissions would result in potential impacts to Colorado River fish and the Yellow-billed cuckoo. Impacts to these species as a result of the mercury emissions are discussed in detail Section 4.10, Special Status Species.

Emissions of GHGs attributable to combustion of Trapper Mine coal would be reduced by 40 percent as a result of the reduced mining rate of Alternative B. There is concern that GHG emissions are a contributor to climate change, but the nature and magnitude of any such climate impact is uncertain and cannot be accurately quantified at present. Also, any climate impacts that may occur are difficult to assign to an individual emission source of GHGs such as Trapper Mine and Craig Station. Climate impacts would be potentially long-term, but any contribution to climate change associated with indirect emissions from Trapper Mine would be negligible and would diminish after the life of the mine when Trapper Mine coal is no longer being combusted.

4.3.3 Mitigation Measures

No mitigation measures beyond those required by the Trapper Mine air quality permit would be required for air quality.

4.4 Geology and Minerals

4.4.1 Alternative A – Proposed Action

4.4.1.1 Direct Impacts

Alternative A would result in the removal of the recoverable coal seams in the N and L pits. At this time, CDRMS has neither received nor approved an application that includes detailed plans for mining the N Pit. The CDRMS would need to approve mining in the N Pit prior to initiating mining in this pit. The coal would be mined according to the methods described in Section 2.4.3. 19.1 million tons of coal would be mined through approximately 2025 (as indicated in Section 2.4). In addition to the coal, over the life of mining for the Project Area, mining would remove an estimated 150 million cubic yards of geological strata (overburden and interburden) above and between coals assuming a stripping ratio of 10:1 (10 cubic yards per ton of coal (Stubblefield and Fish 1991). The original character of the overburden and interburden would be permanently altered and the geological column would be permanently altered within the pit area. However, the Project Area represents a small portion of the overall geologic column and coal reserves associated with the Yampa coal field. Therefore, the effect would be negligible to minor, but would be permanent. At the end of mine life, the pit would be backfilled as part of closure and reclamation.

Coal mining was a contributing factor to the massive G Pit (now L Pit) landslide that took place in October 2006. There are many areas of naturally occurring landslides on the slopes of the Williams Fork Mountains indicating an inherent instability, which could be aggravated by mining. Several smaller mass wasting events occurred in the G Pit area in the years leading up to the October 2006 event (Agapito Associates, Inc. [AAI] 2008). Potential impacts due to mass movements include endangerment of personnel, loss of recoverable coal resources, and loss of equipment. In the case of the October 2006 incident, monitoring of ground conditions enabled areas to be evacuated prior to the catastrophic failure. PR06 was submitted to address the adverse conditions presented by the slide and enable safe recovery of much of the coal that could have been lost (CDRMS 2009). In addition, geotechnical monitoring of the slide area was implemented through revisions of PR05 and through implementation of Minor Revisions 212 and 213 and Technical Revision 99. The purpose of the monitoring was to measure the movement of the slide mass. The geotechnical monitoring was initiated in March 2008 and was accomplished by use of inclinometers in boreholes, piezometers (wells to measure groundwater levels), and benchmarks initially at 16 sites in and near the slide mass (TMI 2008). The most recent monitoring report indicated that there is a “minimal amount of movement” and that a new ground control plan would be submitted to CDRMS after approval of the PR07 (TMI 2015).

There is a potential that mining operations would preclude access to other mineral resources such as oil and gas within the Project Area. In areas leased and designated for coal mining, it may not be possible to extract other minerals during the mining operations. Such impacts would be relatively short-term because loss of access would be temporary and after mining is conducted, it would be possible to conduct oil and gas exploration and production. Additionally, because horizontal drilling may be the preferred method of recovery,mining operations would not necessarily prevent access to the deeper oil and gas resources.

Coal mining would not interfere with the mining of sand and gravel deposits located in major alluvial drainages like the Yampa River outside the Project Area. In addition, the mine has its own aggregate resources to partially supply aggregate needs at the mine lessening the burden on local aggregate supplies.

4.4.1.2 Indirect Impacts

After active coal mining has ceased, some material would be disturbed as a result of the reclamation activities. Natural processes of erosion and occurrence of landslides would continue in unmined areas. The potential for landslides would continue and would represent a long-term but moderate risk based on historic evidence of slope instability. It is expected that reclaimed areas would have a lesser risk of landslides due to reclamation design which would reduce slope instability.

4.4.2 Alternative B – Disapproval of the Mining Plan Modification by the ASLM

4.4.2.1 Direct Impacts

Under Alternative B, mining would cease within the Project Area and impacts to geological resources in the Project Area also would end. *An estimated 1.75 million tons of coal would be mined from July 1, 2015, to the assumed cessation date of April 30, 2016 (see Section 2.5). Alternative B would result in not mining an estimated 17.35 million tons of coal reserves and a shortened mine life.* Although the amount of coal involved is small compared to the overall coal resource in the Yampa coal field, the loss of the coal reserve would be long-term. Some mining of coal would continue within the SMCRA permit boundary outside of the Project Area. Therefore, the effect would be negligible to minor but would be permanent.

Alternative B would have similar impacts to Alternative A on the access and extraction of other mineral resources during mining activities outside of the Project Area.

4.4.2.2 Indirect Impacts

After active coal mining has ceased, some material would be disturbed as a result of the reclamation activities within the Project Area and for mining outside the Project Area. Natural processes of erosion and occurrence of landslides would continue in unmined areas. These natural processes represent a long-term but moderate risk for slope instability. It is expected that reclaimed areas would have a lesser risk of landslides due to reclamation which would be designed to reduce slope instability.

4.4.3 Mitigation Measures

No mitigation measures are recommended for geological resources or hazards. TMI would continue to monitor ground conditions as directed by CDRMS and provisions of the existing and future ground control plans. A new ground control plan would be amended by technical revisions or minor permit revisions as appropriate for changing ground conditions.

4.5 Water Resources

4.5.1 Alternative A – Proposed Action

4.5.1.1 Surface Water

Under Alternative A, the currently active L Pit on Lease No. C-079641 would continue to be mined from 2015 through 2025. Coal also would be mined from the N Pit, an open pit partially located on Lease No. C-07519, near the end of the life-of-mine for the Project Area (estimated at 2023). At this time, CDRMS has neither received nor approved an application from TMI to revise the Trapper Mine PAP to add the N Pit. However, for this analysis, it was assumed that the N Pit would be added to the PAP and the portion of the N Pit within the Project Area would be mined prior to the end of the life-of-mine for the Project Area in 2025.

Direct Impacts

Surface mining of the L and N pits would disturb a total of 148 acres in the Breeze Basin-Yampa River subwatershed, 94 acres in the Jeffway Gulch-Williams Fork subwatershed, and 16 acres in the Johnson Gulch-Yampa River subwatershed (**Figure 3-3**). In addition, approximately 11 acres of land previously disturbed and reclaimed in the Johnson Gulch-Yampa River subwatershed would be redisturbed for mining activities. The planned mining disturbance would physically alter the drainage characteristics of the landscape, and would remove some channel segments altogether. For example, eastward expansion of the L Pit would physically disrupt the uppermost channel reaches of Deacon Gulch and its headwater tributaries in the Breeze Basin-Yampa River subwatershed. The disturbed channels would cease to function for eight to 10 years until the L Pit was backfilled and re-contoured during reclamation. Other drainages in the Project Area that could be impacted by mining include the main channels and tributaries of Sage Gulch (N Pit), Oak Gulch (N Pit), Middle Flume Gulch (L Pit), East Flume Gulch (L Pit), and Deal Gulch (L Pit).

During mining, diversion ditches would be constructed to capture runoff from disturbed areas and route the water into sediment ponds. These sediment ponds would help maintain downstream water quality by controlling the sediment load in water discharged from the Project Area and the SMCRA permit area. In the short term, the system of diversion ditches and sediment ponds required for mining could alter the volume or timing of peak flows in Sage Gulch, Oak Gulch, Middle Flume Gulch, East Flume Gulch, Deacon Gulch, and Deal Gulch by impounding water that would have otherwise flowed downstream. This impact would be negligible because flow would only be impounded within a small upstream portion of the affected watersheds. The impacted drainages also are ephemeral streams that contribute relatively small amounts of flow to the Yampa River. Overall, impacts from altering the mine drainage patterns would be short term. Once mining is completed, the open pits would be backfilled and graded to approximate pre-mine drainage conditions.

Stream flow monitoring performed by TMI also supports the conclusion that peak flow impacts from the altered drainage patterns would be negligible. Downstream flow in the ephemeral gulches is maintained to some degree through permitted discharges at Trapper Mine's CDPS outfalls. Flumes installed at the outfalls also provide a relatively continuous record of flow measurements in the receiving drainages. At East Middle Flume Gulch, flow rates recorded at CDPS site 021 averaged approximately 0.15 cfs between January 2005 and December 2014 (Hydro-Engineering 2015). By comparison, the average baseline flow rate for this stream (recorded between 1981 and 1986) was 0.16 cfs, indicating that the flow rate has not discernibly changed during the period of active mining.

Surface mining operations represent a source of coal fines and sediment that is easily eroded by wind and flowing water. Without proper drainage protections, these eroded materials can impact surface water quality as they are transported downgradient and deposited in stream channels. The system of diversion ditches and sediment ponds implemented by TMI helps to prevent these types of water quality impacts. TMI's sediment ponds are designed to treat the runoff and settleable sediment load from a 10-year, 24-hour storm event (TMI 1981 et seq.). The mine also uses secondary sediment control structures called dozer basins to augment the function of designed sediment ponds. The dozer basins are constructed in disturbed areas, upstream of the sediment ponds, as excavations with a minimal embankment and a notched spillway. They are intended to be temporary structures that are either cleaned out periodically, or abandoned in place once they fill up with sediment. Overall, the combination of diversion ditches and primary and secondary sediment control structures would reduce potential water quality impacts from eroded sediment to negligible levels during the life of mine.

Other pollutants present in the mine area, such as fuel, oil, hydraulic fluid, and explosives, could impact surface water quality through accidental leaks or spills. Slow leaks that remain undetected for a long period of time could infiltrate to groundwater, creating localized contamination issues that may eventually discharge to surface water. Left untreated, accidental spills also could impact water quality if the chemicals are flushed into nearby streams. TMI reduces the potential for these types of impacts through implementation of a Spill Prevention, Control, and Countermeasures (SPCC) Plan. BMPs required under the SPCC Plan include berms and secondary containment structures around chemical storage areas, spill response training for workers, and stocking spill cleanup kits close to the work site. If any inadvertent leaks or spills occurred, they would be properly contained and cleaned up, with reporting to appropriate agencies as required. Furthermore, operational water quality sampling at the CDPS outfalls shown on **Figure 3-3** also would enable tracking of water quality to identify and address any unforeseen issues. With implementation of these BMPs, potential water quality impacts from accidental spills and leaks would be reduced to negligible levels during the life of mine.

Monitoring records from CDPS site 020 (**Figure 3-3**) indicate that TDS may have increased in Middle Flume Gulch compared to data from the 1970s. As discussed in Section 3.5, the average baseline TDS concentration in this stream was 1,180 mg/L from 1974 to 1977 (TMI 1981 et seq.). Recent data collected between 2005 and 2014 exhibit an average TDS concentration of 1,360 mg/L (Hydro-Engineering 2015). No analysis was made of whether this increase is statistically significant. However, the TDS concentration trend graph for CDPS site 020 shows a distinct jump in TDS concentrations after April 2008.

Increasing surface water TDS would be an expected consequence of mining mostly due to groundwater discharge from backfill material. The backfill contains the mineral pyrite, which oxidizes to produce sulfate ions in the presence of meteoric water. Increasing sulfate is a major contributor to higher TDS. Post-mining, groundwater and surface water TDS would be expected to increase to varying degrees across the site depending on the pyritic sulfur content of the backfill material, which typically ranges from 0.1 to 0.3 percent. These sulfur contents, while generally low for a coal mine, may result in elevated TDS and sulfate concentrations which could last for 300 years or more if the entire mass of pyrite in the backfill is oxidized (TMI 1981 et seq.). However, calculations presented in the PAP indicate that higher surface water TDS derived from the mine would have a negligible impact on the Yampa River over the long term, increasing the average TDS of the river by no more than one tenth of 1 percent (TMI 1981 et seq.).

The sulfur content of the coal mined by TMI also is relatively low at less than 0.5 percent (TMI 1981 et seq.). At the Trapper Mine, the sedimentary rock-dominated mine spoil material typically contains enough carbonate available for dissolution to effectively buffer acidic water generated by pyrite oxidation. This buffering capacity helps minimize acid drainage effects and also helps prevent trace metals from being mobilized into solution (TMI 1981 et seq.). *As such, surface water quality impacts from acid mine drainage and trace metals are not expected to occur.*

It also is unlikely that Alternative A would affect the iron impairment in the Yampa River in the short- or long-term. As discussed in Section 3.5, baseline surface water quality monitoring at the mine indicated that average iron concentrations were generally below the 1 mg/L water quality standard for the Yampa River. However, in some cases, individual sample results exceeded the standard even before mining was initiated. Discharges from the mine area are currently regulated under CDPS Permit CO-0032115. *Permitted outfalls directly downstream of the proposed Project Area mine pits include CDPS site 016 on Sage Gulch, CDPS sites 020, 021, and 023 on tributaries of Flume Gulch, and CDPS site 022 on Deal Gulch (**Figure 3-3**).* No flow has been recorded at CDPS site 016 since 1997, which suggests that the eastern portion of the N Pit is unlikely to produce measurable flow in Sage Gulch. The other four outfalls are permitted for a maximum 30-day average total recoverable iron concentration of 3 mg/L, and a daily maximum total recoverable iron concentration of 6 mg/L (TMI 2012). Over the past 10 years, average total iron concentrations recorded at these outfalls have typically been below the 3 mg/L standard, ranging from 0.32 to 0.80 mg/L (Hydro-Engineering 2015). These values also are below the water quality standard for the Yampa River.

The primary effluent limitation for total recoverable iron was exceeded at CDPS sites 020 and 021 on March 6, 2012, when the reported iron concentrations reached 4.03 and 10.6 mg/L, respectively (Hydro-Engineering 2015). These iron values were associated with higher than average flow rates and similarly elevated TSS concentrations. The reported iron concentrations were likely influenced by suspended sediment in the samples. It also should be noted that under TMI's CDPS permit, no specific effluent limit applies to iron in cases of large discharge volumes caused by precipitation or snowmelt events (TMI 2012). Overall, mining operations under Alternative A would be unlikely to affect the Yampa River's iron impairment. Total iron concentrations at permitted outfalls near the Project Area have remained similar to baseline conditions and have rarely exceeded primary effluent limitations except during large precipitation or snowmelt events.

Runoff from actively mined areas and groundwater discharge from backfill material could contribute elevated selenium concentrations to surface water drainages. TMI's CDPS permit does not include an effluent limit for selenium (TMI 2012). While the future potential for selenium impacts is difficult to quantify, baseline and recent water quality samples collected at the mine suggest that there is limited risk of selenium contamination. Baseline selenium concentrations reported for Flume Gulch and other mine drainages generally ranged from about 0.005 to 0.02 mg/L (TMI 1981 et seq.). TMI collected additional selenium data from its permitted outfalls after active mining began. From 2005 to 2014, average detected selenium concentrations at CDPS sites 020, 021, 022, and 023 were 0.005 mg/L, 0.002 mg/L, 0.001 mg/L, and 0.01 mg/L, respectively (Hydro-Engineering 2015). These averages were calculated using detected concentrations only (i.e., non-detect sample results were excluded), and are consistent with baseline values. As long as TMI's water quality compliance efforts continue to be effective, mining operations under Alternative A would pose negligible risk of increasing selenium concentrations in Project Area drainages during and after mining.

Mercury contamination would be another potential water quality issue associated with coal mining. TMI's CDPS permit does not include an effluent limit for mercury (TMI 2012). However, in 2014, TMI began sampling for mercury at several of the mine CDPS outfall locations. Although the results have consistently indicated mercury is below the detection limit, the analyses to date has not achieved a detection limit below the 0.01 microgram per liter mercury standard for the Yampa River (TMI 2015). Thus, it is not possible to determine the degree to which (if any) the mine has in the past or would in the future contribute mercury to the Yampa River.

Continued compliance with reclamation requirements and TMI's CDPS permit would help ensure that water quality is maintained throughout the reclamation phase and is suitable for designated uses prior to the release of the reclamation bond. Over the long term, final reclamation would further reduce the potential for water quality impacts. Mine pits that have been backfilled after mining would result in surfaces that would be consistent with the approved post-mining topography and that would be covered with topsoil and revegetated. During reclamation, drainage patterns would be re-established per the approved reclamation plan and the potential for water quality impacts would be further reduced in part because there would be less potential for erosion and spills.

Overall direct impacts to surface water would be negligible in both the short term and long term.

Indirect Impacts

Indirect surface water impacts from the mining of coal would be related to water usage at the Craig Station. The Craig Station adjacent to the Trapper Mine diverts surface water in much greater quantities than the mine, which would be considered an indirect impact because the mine supplies coal to the power plant. The water diverted by the Craig Station comes from the Yampa River, Elkhead Reservoir, Yamcolo Reservoir, and other sources as needed. The plant-related diversions averaged about 12,000 acre-feet per year between 1980 and 2014 (OSMRE 2015). During that same time period, the average annual flow of the Yampa River near Maybell, Colorado (USGS Station 09251000, downstream of the Craig Station and Trapper Mine) was approximately 1.1 million acre-feet per year (USGS 2015). Thus, the Craig Station appropriates about 1 percent of the total Yampa River flow upstream of Maybell. The Craig Station has valid water rights for its diversions and could continue using water from the Yampa River into the future even if Alternative A is not approved. The impact of these continued diversions would be mitigated to some degree by an instream water right (6-02CW106) on the Yampa River from Elkhead Creek to the confluence with the Green River (Colorado Water Conservation Board 2015). The instream water right is designed to maintain minimum flows in the Yampa to support fish populations and recreation (Colorado Water Court, Water Division 6 2005). The impact of water withdrawals from the Yampa River for use at the Craig Station would be long term and negligible to minor.

Another potential indirect impact from Alternative A would be atmospheric mercury deposition resulting from coal combustion, as the mine continues to supply coal to the Craig Station. Atmospheric mercury can affect surface water quality as it settles into streams and lakes through precipitation or dry deposition. The potential for mercury contamination through atmospheric deposition is extremely complex because atmospheric mercury can be derived from any number of local, regional, or global sources. Thus, it is not possible to determine how much mercury could be deposited in the Yampa River or Project Area drainages from continued operation of the Craig Station.

4.5.1.2 Groundwater

Direct Impacts

Under Alternative A, mining in the L and N pits would remove coal from the upper Williams Fork Formation. Although, as a whole, the upper Williams Fork Formation acts as an aquitard, individual sandstones and coal seams within the unit have been shown to produce water. These discrete water bearing zones would be permanently impacted where they are part of either the overburden, interburden, or coal removed during mining. Individual units that would be permanently impacted by mining in the L Pit include the Second White Sandstone Aquifer, the Third White Sandstone Aquifer, the HI Aquifer, and deeper coal units. Intervals planned for mining in the N Pit include the “L,” “M,” and “Q” coal seams. Consequently, future mining in the N Pit would permanently impact the KLM and QR aquifers.

The aquifers would be impacted as the geologic material that transmits groundwater is removed and replaced with backfill or mine spoils. TMI refers to these backfilled zones as “spoil aquifers.” The spoil aquifers would continue to store and transmit groundwater into the future, and would likely act as a single aquifer system, replacing the pre-mine condition of interbedded aquifers and confining units within the mine areas. Experience at the mine has shown that some surface water infiltration and re-saturation of the spoil aquifers would be expected to occur as evidenced by increasing water levels in backfill monitoring wells. Hydraulic conductivity values measured at monitoring wells completed in the spoil aquifer range from approximately 0.5 to 5 feet per day (15 to 152 cm per day). This range is comparable to native geologic material at the mine (TMI 1981 et seq.). Overall, it appears that TMI’s practice of backfilling former mine pits would create a more continuous permanent aquifer system with fewer confining layers. The hydraulic conductivity of the spoil aquifers may be similar to pre-mine conditions.

Alternative A would not disrupt the regional Twentymile Sandstone Aquifer or deeper aquifer units. The Twentymile Sandstone is approximately 500 feet (152 meters) deep beneath the SMCRA permit area, well below the base of the planned mine pits. Even in areas where mining extends to the deeper “Q” coal seam, there would still be another aquitard and aquifer zone (i.e., the “U” Aquifer) that would provide a buffer between mining and the top of the Twentymile Sandstone.

Alternative A could directly impact the Flume Gulch Alluvial Aquifer by removing upstream channel segments and alluvial sediments associated with the Flume Gulch drainage. Alluvial sediments that are removed to facilitate mining would not be restored during reclamation. Impacts to the Flume Gulch alluvium would be expected to be permanent but negligible because only a relatively short tributary segment of Flume Gulch would be removed during mining. The alluvium also tends to be thin or absent in upstream reaches of the Project Area drainages.

Spatial data provided by TMI shows that there are two springs in the Project Area: North Horse Gulch Spring and Fox Den Spring (**Figure 3-3**). No impacts would be expected to North Horse Gulch Spring because it is located outside of the previously disturbed area and over a mile from both the L and N pits. Conversely, the potential for impacts to Fox Den Spring would be higher because the spring is on the edge of the previously disturbed mine area, and only about 1,600 feet (488 meters) northeast of the N Pit (**Figure 3-6**). Fox Den Spring exists near the southern limits of the Third White Sandstone (a part of the upper Williams Fork member) and is thought to emanate from this unit. To date, mining in the area has had no obvious effects on flows from Fox Den Spring, and the spring flow is not expected to be impacted during post-mine conditions (TMI 1981 et seq.). Sulfate and TDS concentrations measured at Fox Den Spring are similar to levels documented in monitoring wells completed in the Third White Sandstone. Long term, the static water level of the spoil aquifer in this vicinity would be expected to be below the base of the Third White Sandstone, meaning there would be limited potential for groundwater in the spoil aquifer to mix with groundwater discharging from Fox Den Spring. Thus, the water quality of the spring likely would not be affected during post-mine conditions (TMI 1981 et seq.).

Post-mining, the spoil aquifer also might cause new springs to form as new preferential flow paths would be created. The flow regime through backfilled areas would likely be too complex to accurately predict where and how many spoil springs could form. However, TMI does not anticipate that spoil springs would develop in the Flume Gulch drainage, primarily because groundwater within the spoil aquifer in the eastern half of the Project Area would be able to drain into underlying permeable sandstone beds (TMI 1981 et seq.). If any spoil springs are identified post-mining, TMI would monitor the spring flows and water quality in accordance with the mine's approved monitoring plan and CDPS discharge permit.

Under Alternative A, groundwater would continue to be used for dust suppression and potable purposes. During water year 2014, TMI dewatered approximately 131 acre-feet of groundwater from its mine operations (Cummins 2015). The entire dewatering volume was pumped to an inactive mine pit and stored for later use as dust suppression water on the mine's haul roads and topsoil stockpiles. In addition to the dewatering water, TMI used another 195 acre-feet for dust suppression supplied from other inputs flowing into the inactive pit. These inflows included direct precipitation, runoff into the pit, groundwater discharge, and approximately 20 acre-feet of return flow from the Craig Station (Cummins 2015). Overall, dust suppression at the mine consumed 326 acre-feet during water year 2014. During that timeframe, TMI also pumped approximately 32 acre-feet of groundwater for potable use from its permitted water supply well in the Twentymile Sandstone (Cummins 2015). Water used for dust suppression and potable purposes represents a minor depletion of potentially non-renewable groundwater within the upper Williams Fork and Twentymile Sandstone aquifers. These depletions are conducted in accordance with Colorado water law under a court-approved augmentation plan decreed in Case No. W1178-77. By complying with this plan, groundwater and surface water depletions caused by mine operations would be effectively managed during mining to avoid impacts to senior water rights and downstream users.

Domestic wells within one mile of the Project Area are generally completed in the Third White Sandstone or deeper water-bearing units (TMI 1981 et seq.). Groundwater level drawdown resulting from mine dewatering could lower the static water levels in these wells. The potential for this impact was evaluated by reviewing groundwater hydrographs from monitoring wells installed in the vicinity of the L Pit. The monitoring wells in this area, shown on **Figure 3-5**, include GC-2 and GP-9 in the Third White Sandstone, GC-1 and GP-7 in the HI Aquifer, and GP-2 and GP-8 in the KLM Aquifer. The PAP suggests that mining would not significantly affect groundwater levels in the Third White Sandstone because the nearest Third White Sandstone well is approximately 6,000 feet (1,829 meters) north of the surface mine area (TMI 1981 et seq.). This statement is supported by hydrographs from wells GC-2 and GC-9, which reveal that water levels have actually increased in the Third White Sandstone over the past 15 years. In the HI Aquifer, water level trends have been inconsistent. A sharp increase in water levels has occurred in GC-1 since 2009, while water levels have gradually fallen in GP-7 since 2001, registering a total decrease of 14 feet (four meters). In contrast, large declines in the KLM Aquifer potentiometric surface began in the late 1990s to early 2000s. The total decreases observed in wells GP-2 and GP-8 were around 31 feet and 37 feet (nine to 11 meters), respectively (Hydro-Engineering 2015). The water levels in these wells have since rebounded to some degree and are approaching their static levels.

Groundwater drawdown typically diminishes with distance from a pumping or dewatering source. Most of TMI's monitoring wells are closer to the mining area than the nearest domestic water wells (**Figure 3-5**), so actual drawdown in the domestic wells is expected to be less than the changes observed in on-site monitoring wells. As such, based on recent water level trends, groundwater declines in the nearby domestic wells should be no more than about 30 feet (nine meters) in the KLM Aquifer, and no more than 14 feet (four meters) in the HI Aquifer. These impacts would be negligible because the private wells within one mile of the Project Area had on average 250 feet (76 meters) of available head at the time of installation (Colorado Division of Water Resources 2015). Any water level declines from mine-induced drawdown would be short term and minor and would not impact the long-term viability of these wells.

Accidental leaks or spills of chemicals used in the mining process would have the potential to impact groundwater quality without prompt action to clean up the spill and contaminated soil material. TMI would reduce the potential for these types of impacts through implementation of their SPCC Plan. Any inadvertent leaks or spills would be properly contained and cleaned up, with reporting to appropriate agencies as required. Furthermore, operational water quality sampling at monitoring wells shown on **Figure 3-5** would enable tracking of water quality to identify and address any unforeseen issues. With implementation of these BMPs, potential water quality impacts from accidental spills and leaks would be reduced to negligible levels.

Groundwater quality also would have the potential to be impacted by leachate from mine spoils and by infiltration of mine runoff. In areas where mine spoils contain pyritic sulfur, impacts from leachate would be discernible through changes in groundwater TDS and sulfate concentrations. **Table 4-16** presents baseline and recent TDS and sulfate concentrations for several monitoring wells near the Project Area. The well locations are shown on **Figure 3-5**. The table illustrates that as expected, average TDS values during the period of active mining (assumed to be the last 10 years) increased relative to baseline concentrations by as much as 40 percent. The trend of increasing TDS concentrations holds true for aquifers in both the upper Williams Fork member (i.e., the Third White Sandstone and HI interval) and the alluvial aquifer. Sulfate concentrations also increased over baseline values in three of the four monitoring wells, suggesting an influence from pyritic sulfur. Higher groundwater TDS and sulfate concentrations in mined and reclaimed areas would be expected and would likely persist for many years as pyritic sulfur in spoil material is slowly oxidized. These groundwater quality impacts are considered minor because they would be confined to localized areas around the mine spoils. To the extent that impacted groundwater from the mine discharges to surface water, it still would not contain enough dissolved solids to increase the TDS concentration of the Yampa River above predetermined material damage levels (CDRMS 2010).

Table 4-16 Summary of Groundwater Quality Data for Selected Constituents

Site ID[1]	Aquifer Interval	Sampling Period	Total Dissolved Solids (TDS)		Sulfate (SO_4)		Iron (Fe) (total recoverable)	
			n	mg/L	n	mg/L	N	mg/L
GC-1	HI	1974-1985 for TDS and SO_4, 1981-1985 for Fe	20	893.8	13	312.1	13	7.6
		2005-2014	20	1,027.4	10	359.0	10	0.8
GC-2	Third White Sandstone	1974-1985 for TDS and SO_4, 1981-1985 for Fe	15	728.0	9	419.0	1	11.2
		2005-2014	20	1,036.4	10	364.0	10	2.0
GC-3	Alluvium	1974-1985 for TDS, 1981-1985 for Fe, 1974-1985 for SO_4	19	1,077.3	12	347.2	15	50.5
		2005-2014	46	1,402.3	10	552.0	34	1.7
COY	Alluvium	1974-1985 for TDS, 1981-1985 for Fe, 1974-1985 for SO_4	3	1,690.0	3	815.7	7	13.8
		2005-2014	20	1,920.0	10	1,002.0	10	0.5

[1] See **Figure 3-5** for well locations.

n = Number of observations.

Grey highlighting represent the more recent sampling data.

Source: Hydro-Engineering 2015.

Indirect Impacts

Table 4-16 shows total recoverable iron concentration results for baseline and recent time periods. The iron data are important because they provide a measure of potential indirect impacts from iron mass loading as groundwater from the spoil aquifer discharges into Project Area drainages. In the small subset of wells presented in the table, total iron concentrations decreased markedly compared to average baseline values. It is difficult to pinpoint an exact reason for this decrease. However, the data suggest that native groundwater in the Project Area had high iron content prior to mining, and that mining would be unlikely to worsen this condition. Based on this information and discussion presented in Section 4.5.1.1, Alternative A would be unlikely to affect the iron impairment in the Yampa River.

CCRs produced at the Craig Station as part of the coal combustion process are hauled for CCRs placement at the Trapper Mine, outside of the Project Area. CCRs placement would be an indirect effect of Alternative A. The placement site is under the jurisdiction of the SMCRA permit and is approved to receive CCRs under a Certificate of Designation from Moffat County, with regulatory oversight from CDPHE. The placement site, CCRs placement requirements, design features, operating criteria, monitoring requirements, closure and post-closure monitoring standards, and record-keeping and reporting requirements are regulated under the SMCRA permit and through CDHPE. Further, groundwater monitoring at the site indicates that metals of potential concern in the CCRs material are present at low levels in site groundwater; however, limited permeability and infiltration has kept these concentrations within background ranges observed elsewhere at the mine. Therefore, the potential indirect impact to groundwater as a result of CCRs placement at the Trapper Mine would be long-term and negligible.

Overall, potential direct and indirect impacts to surface water and groundwater resources under Alternative A are expected to be negligible to minor and short- to long-term.

4.5.2 Alternative B – Disapproval of the Mining Plan Modification by the ASLM

4.5.2.1 Direct Impacts

Under Alternative B, mining in the Project Area would cease. There would be no further disruption of Project Area stream channels, and no further effects to downstream flows or water quality. Similarly, there would be no additional effects to groundwater springs or interception of groundwater within the Project Area. Alternative B would not, however, preclude mining in other portions of the SMCRA permit boundary outside of the Project Area. Mining would likely continue in the N Pit outside of the Project Area and in the I Pit in the western SMCRA permit area (**Figure 2-4**). Surface water and groundwater impacts from mining in these areas would be similar in nature to impacts from Alternative A.

The area of the anticipated N Pit has previously been mined to remove the “H” and “I” seams, and has been partially reclaimed. This area would be reopened under Alternative B to recover deeper coal intervals. This would essentially undo reclamation efforts at the N Pit and would alter the drainage characteristics of East Pyeatt Gulch. Runoff from the N Pit would be captured in diversion ditches and routed to a sediment pond associated with CDPS outfall 011. Flow rates in East Pyeatt Gulch could be impacted as runoff is captured in this pond, but a comparison of baseline and recent flow data from the gulch suggests that the impact would be negligible. The average flow rate in East Pyeatt Gulch was 0.36 cfs during the baseline monitoring period (1981 to 1986) and increased to 0.45 cfs during the previous 10 years of mining and reclamation (Hydro-Engineering 2015; TMI 1981 et seq.). No assessment was made of whether this change is statistically significant; the increase appears mainly to be driven by a period of high flows that occurred during the spring and summer of 2009. TMI also has a long period of water quality data available for East Pyeatt Gulch dating back to the mid-1970s. The data indicate that TDS concentrations in the gulch have not appreciably changed since the baseline period. The average baseline TDS concentration was 2,070 mg/L compared to recent TDS concentrations that averaged 1,910 mg/L over the past 10 years (Hydro-Engineering 2015; TMI 1981 et seq.). These data suggest that short and long term flow and water quality impacts to East Pyeatt Gulch would likely be negligible under Alternative B.

Construction of the anticipated I Pit would directly alter the drainage characteristics and watersheds of Coyote Gulch and No Name Gulch. The area of the I Pit in the western SMCRA permit boundary has not been previously mined, *but areas of No Name Gulch and Coyote Gulch upstream of the I Pit have been mined, and post-mining drainage flows into the No Name and Coyote Gulch ponds. Samples collected from the pond outfalls indicate that TDS concentrations associated with No Name Gulch and Coyote Gulch initially increased relative to baseline but are gradually decreasing post-mining as reclamation takes effect. For example, at No Name Gulch (CDPS outfall 002), the average TDS concentration has changed from 1,580 mg/L during the 1970s baseline monitoring period, to 1,930 mg/L between 1995 and 2004, and then to 1,850 mg/L between 2005 and 2014. TDS concentrations have trended similarly at Coyote Gulch (CDPS outfall 005), from an average of 340 mg/L during baseline, to 730 mg/L between 1995 and 2004, and back to 340 mg/L between 2005 and 2014 (Hydro-Engineering 2015). Hydrologic data collected from the No Name Gulch pond and the Coyote Gulch pond as well as near the L and N Pits suggest that implementation of TMI's CDPS Permit and drainage control measures would help limit surface water quality and quantity impacts to negligible levels in the short term and long term.*

Mining of the N and I pits under Alternative B would directly impact groundwater in the upper Williams Fork Formation by removing native water-bearing strata and replacing the strata with backfill or mine spoils. In the N Pit, this would affect the KLM and QR aquifers; water-bearing intervals above the "H" and "I" coal seam were already removed during the previous phase of mining. As the pits are backfilled, the footprint of the spoil aquifer would increase. This could have implications for development of spoil springs as new preferential flow paths develop through the spoil material. There is already a well-defined spoil spring on the western edge of the N Pit known as the East Pyeatt South Spring. In the 10 years since this spring has been monitored, TDS and sulfate concentrations have ranged from 2,200 to 3,300 mg/L and 980 to 1,630 mg/L, respectively (Hydro-Engineering 2015). These concentrations could increase through time as pyritic sulfur in the spoil material is slowly oxidized.

An important difference between Alternative A and Alternative B is the rate and duration of mining. Coal reserves in the N and I pits are smaller and would be depleted by 2020 after only three to four years of mining (available coal reserves are projected to last until 2025 under Alternative A). In the absence of additional reserves, final reclamation would be implemented across the mine after completion of mining in the N and I pits by backfilling open mine pits, grading the backfill to achieve the approved post-mining topography, removing buildings and structures, replacing topsoil, and reseeding the reclaimed areas. By re-establishing vegetation, reclamation would gradually reduce erosion from the Project Area, reduce sediment loads in runoff, and eliminate the need for runoff to be captured in sediment ponds. Final reclamation would occur five to six years earlier than Alternative A based on the currently identified coal reserves available under Alternative B.

Indirect Effects

Under Alternative B, the mine would continue to supply coal to the Craig Station until approximately 2020, albeit at an estimated reduced rate of 1.5 mtpy from reserves outside of the Project Area. There is currently no evidence that a diminishing coal supply from Trapper Mine would affect the Craig Station; if the mine stopped operating or reduced coal production, the plant would presumably obtain coal from another source. As long as the Craig Station continues to burn coal, it would continue to divert water for cooling, generate emissions, and produce CCRs. Indirect water resource impacts from these activities would be the same as Alternative A.

Overall, potential direct and indirect impacts to water resources under Alternative B are expected to be negligible to minor and short-term to long-term.

4.5.3 Mitigation Measures

No mitigation measures would be necessary for water resources.

4.6 Soils

4.6.1 Alternative A – Proposed Action

4.6.1.1 Direct Impacts

The proposed disturbance from July 2015, to the life-of-mine for the Project Area would affect approximately 257 acres (**Table 4-17**). As part of the mining process, topsoil would be removed using scrapers or similar equipment typically between May and October. The soil would typically be hauled directly to reclamation areas for immediate use or placed in stockpiles. If placed in temporary stockpiles, the stockpiles would be graded with 3H:1V outslopes and would be temporarily revegetated for stabilization. Topsoil would be salvaged during development of the pit, and during development of overburden stockpiles, temporary stockpiles, access roads and sediment ponds. A and upper B horizon soils would be removed for re-use, unless the soils are clayey or stony.

Table 4-17 Disturbance to Soil Types, Proposed Action Alternative

Soil Unit	Approximate Disturbed Acres
Adderton loam, 1 to 10% slopes	1.2
Bulkley silty clay, 3 to 12% slopes	20.4
Cochetopa loam, 12 to 25% slopes	52.8
Foidel loam, cool, 3 to 35% slopes	36.0
Foidel loam, 25 to 65% slopes	28.4
Hesperus fine sandy loam, dry, 2 to 15% slopes	1.4
Lamphier fine sandy loam, 3 to 25% slopes	70.5
Lamphier fine sandy loam, 25 to 65% slopes	10.1
Ustorthents, frigid-Borollis complex, 25 to 75% slopes	7.3
Winevada-Splitro complex, 3 to 25% slopes	29.3
Total	257

A horizon soils are generally high in organic matter but structurally weak, while upper B horizons have a moderately stable structure, but tend to be higher in clay near the C horizon interface. TMI would salvage the A and upper B horizon soils together where they become mixed. This mixing can serve to increase fertility of more sterile clay soils and help soils heavy in organic matter become more stable and resistant to erosion. The lower B and C horizons would not be salvaged due to their clayey nature that makes them infertile with weak soil structure. In areas where there is rocky ground or terrain, topsoil salvage is not always practiced. Where the terrain varies and topsoil salvage would be practicable, or where the horizon depths change, soils would be salvaged at varying depths within the profile. This can provide for a more loamy mixture or a slightly heavier mix with more clay.

Within the Trapper Mine Project Area soils would be used for reclamation to achieve a post-mining land use of rangeland and wildlife habitat. Rangeland and wildlife habitat dedicated reclamation areas would receive approximately 12 inches of topsoil. Where possible, soils would be moved from salvaging in new areas directly to reclamation sites to minimize impacts to the chemical, physical, and biological properties of the soil. Direct haul of soils would be the preferred method for reclamation practices due to the less disruptive, direct placement, and preservation of the natural components of the soil. Direct hauling prevents compaction and chemical changes that would otherwise occur during long periods in a stockpile.

Stockpiled soils would be vegetated with fast growing native species prior to winter months. These soils can lose fertility, organic matter content, and microbial activity during stockpiling or become compacted or lose their capacity to retain water. Should compaction occur, TMI would use methods to break up the soil (e.g., discing) once placed in reclamation areas to fluff the soil and aid with the seeding process.

Impacts to soil resources in the Project Area would be minor in the short term and negligible in the long term following reclamation. The process of salvaging the A and upper B horizons together mixes the soil horizons. *The net environmental effects of mixing horizons can be difficult to predict because it can make poor soils more productive and stable in areas that were unproductive before mining but also may have the effect of making previously productive areas less productive, leading to difficulty with revegetation of some species.* TMI's record of reclamation and bond release shows that the reclamation techniques practiced at the Trapper Mine are successful.

4.6.1.2 Indirect Impacts

There are no indirect impacts to soils under Alternative A.

4.6.2 Alternatives B – Disapproval of the Mining Plan Modification by the ASLM

4.6.2.1 Direct Impacts

Under Alternative B mining would cease and no new ground disturbance would occur within the Project Area. Reclamation activities would occur in the Project Area through backfilling and grading the existing disturbed area to the approved post-mining topography, topsoil replacement, and revegetation within the Project Area. Structures and equipment would be broken down and moved to new mining areas outside of the Project Area. These activities would last three to five years and proceed through the Phase III bond release, expected to be completed within an additional 10 to 15 years. Additional mining within the SMCRA permit boundary would cause disturbance to the soils within the N and I pit areas outside of the Project Area. The area of the N Pit has been previously disturbed and soils have been salvaged for reclamation. The I Pit soils have not been previously disturbed. Similar techniques for topsoil salvage and replacement would be practiced for areas outside of the Project Area.

Impacts to soil resources would be minor in the short term and negligible in the long term after reclamation activities.

4.6.2.2 Indirect Impacts

There are no indirect impacts to soils under Alternative B.

4.6.3 Mitigation Measures

No mitigation measures would be necessary for soils.

4.7 Vegetation

4.7.1 Alternative A – Proposed Action

4.7.1.1 Direct Impacts

Alternative A would remove approximately 257 acres of mountain shrubland through new disturbance over the next 10 years. Current disturbance of 1,053 acres exists in the Project Area. This previous disturbance also was mountain shrublands. Under the approved reclamation plan for the SMCRA permit, approximately 494 acres of previously disturbed mountain shrubland have been reclaimed to rangeland/wildlife habitat within the Project Area and approximately 178 acres of the reclaimed area has achieved Phase III bond release. The remainder of the current disturbance and future disturbance also would be reclaimed to rangeland and wildlife habitat, dominated by native perennial grasses and a mixture of native shrubs and forbs.

Mountain shrubland may not regenerate; previous reclamation areas have trended to establishment of a big sagebrush-grass community as it matures. The total time through Phase III bond release would be approximately 23 to 30 years. The total amount of impacted mountain shrubland vegetation (257 acres) would be small in comparison to that available in the region.

The potential for acid generating mine spoil underlying replaced topsoil and inhibiting plant growth has been evaluated by TMI on graded spoil throughout the SMCRA permit boundary. The test results have demonstrated that the Trapper Mine spoil is inert and will not inhibit plant growth. Based on past testing results, CDRMS no longer requires TMI to test spoil prior to topsoil placement and revegetation.

The direct impact to vegetation would be minor and long-term until reclamation is complete and vegetation has become established.

The additional disturbance increases the potential for the establishment and spread of noxious weeds. However, with implementation of established protocols to identify noxious weeds and TMI's current weed control practices, according to State regulations and CDRMS guidelines, the overall impact in the Project Area would be negligible.

4.7.1.2 Indirect Impacts

There are no indirect impacts to vegetation.

4.7.2 Alternative B – Disapproval of the Mining Plan Modification by the ASLM

4.7.2.1 Direct Impacts

Under Alternative B, all mining related activities in the Project Area would cease and closure and reclamation of the 1,053 acres of currently disturbed land would be initiated. The existing disturbance would be reclaimed to rangeland/wildlife habitat. There would be no further impacts related to future disturbance and conversion of plant communities from mountain shrubland to reclaimed rangeland habitat. The reclamation of previously disturbed lands would be conducted using native grasses, forbs, and shrubs planted with prescribed seed mixes. Additional vegetation disturbance would occur in the N and I pits outside the Project Area. The N Pit has been previously disturbed and reclaimed. The I Pit would be new disturbance. The mining activities outside of the Project Area would occur over three to four years, followed by reclamation. Overall the reclamation within the Project Area and mining and reclamation in other areas would take from 17 to 25 years, slightly less time than Alternative A. The impacts would be the same as described for Alternative A; minor and long-term until reclamation is complete and vegetation has become established.

4.7.2.2 Indirect Impacts

There are no indirect impacts to vegetation from Alternative B.

4.7.3 Mitigation Measures

No mitigation measures would be necessary for vegetation.

4.8 Wetlands and Riparian Zones

4.8.1 Alternative A – Proposed Action

4.8.1.1 Direct Impacts

Mining operations within the Project Area have resulted in the disturbance of 0.399 acre of wetlands. No additional wetlands disturbances would occur as part of Alternative A. The existing impacts to the disturbed wetlands have occurred from January 21, 1998, and would continue through the final mine closure. The wetlands disturbance was permitted under USACE Nationwide Permit 21, permit number 199875575. Nationwide Permit 21 covers the dredge and fill activities associated with wetland loss due to surface coal mining activities. The USACE determined that dredged and fill material released in waters of the U.S. would not impact threatened or endangered species. Wetlands mitigation would be conducted in accordance with TMI's reclamation plan. TMI would reestablish the approved post-mining topography contour within the Project Area. This contouring would replace the drainage bottoms approximately to their previous character, resulting in new fringe wetlands in accordance with SMCRA Permit C-1981-010. In addition, TMI has volunteered to take steps to protect 1.46 acres of wetlands created from past reclamation activities outside of the Project Area on CSLB-managed lands.

There would be no new impacts to wetlands under Alternative A.

4.8.1.2 Indirect Impacts

Indirect impacts to wetlands could occur from water quality impacts associated with Alternative A. As discussed in Section 4.5, impacts to water quality are expected to be negligible to minor and short-term to long-term.

4.8.2 Alternative B – Disapproval of the Mining Plan Modification by the ASLM

4.8.2.1 Direct Impacts

Under Alternative B no additional impacts would occur to wetlands, waters of the U.S., and riparian areas within the Project Area. Reclamation of the existing impacts to 0.399 wetlands within the Project Area would be the same as described for Alternative A. The reclamation measures currently in place would continue through the Phase III bond release ensuring the Project Area under Alternative B would be reclaimed in the same manner as under the life of mine plan of Alternative A. Reclamation includes re-contouring of land, revegetation, and erosion and sediment control.

New disturbance would occur outside of the Project Area within the SMCRA permit boundary. The N Pit area has been previously disturbed and new mining activities would result in no new wetlands disturbance. Prior to disturbance associated with mining in the I Pit, a new wetlands inventory would occur and, if wetlands are determined to be present, mitigation measures would be implemented. These mitigation measures would be designed to reduce wetlands impacts to minor to negligible. Overall impacts from Alternative B are expected to be negligible to minor and short- to long-term until completion of any needed wetlands mitigation and re-establishment of drainage patterns upon completion of mining and reclamation.

4.8.2.2 Indirect Impacts

Indirect impacts to wetlands could occur from water quality impacts associated with Alternative B. The indirect impacts under Alternative B would be the same as discussed for indirect impacts under the Alternative A.

4.8.3 Mitigation Measures

The proposed disturbance from July 1, 2015, to the life-of-mine within the Project Area would not affect additional wetlands. The existing 0.399 acre of impacts to wetlands was disturbed under current mining. Mitigation measures for these wetlands would occur during the reclamation process by restoring the area to the approximate original topography. No additional mitigation measures are necessary for wetlands.

4.9 Fish and Wildlife Resources

4.9.1 Alternative A – Proposed Action

4.9.1.1 Direct Impacts

Short-term impacts to wildlife, lasting a few minutes to less than five years, would occur primarily through gradual loss of habitat and disturbance by mining and human presence. These impacts, as described below, would be minor. Areas of habitat that are lost due to mining (257 acres) are less than 1 percent of available habitats in the region and the related activities within the Project Area would be reclaimed contemporaneously, as soon as mining has progressed beyond to the next mine pit and it is safe to begin reclamation. At the end of the Project, all disturbed mine land and support infrastructure would be reclaimed in accordance with the approved reclamation plan, which includes goals to replace or improve wildlife habitat. At the end of the Project, disturbance to wildlife as a result of noise (Section 4.17) and human activity would cease (10 years to completion of mining and an additional three to five years to complete reclamation activities). Full Phase III bond release would likely occur in the following 10 to 15 years. *The time required for development of a mature big sagebrush community is difficult to predict given the many factors which could affect the development of this community.*

Big Game

Within the Project Area, Alternative A would remove land that is coincident with big game ranges. Alternative A would remove 257 acres of mule deer summer range, and a smaller portion of winter range. Likewise, Alternative A would remove 257 acres of elk summer and winter range, with a small portion of that also being classified as winter concentration area. The disturbance also would remove 257 acres that are categorized as overall and summer range for moose, overall range and fall concentration area for black bear, production area for elk, and a small amount of habitat designated for the resident elk population. General habitat for mountain lions and pronghorn also would be impacted. The impact would be short-term, until contemporaneous reclamation is successful in reestablishing these habitats within the Project Area. With contemporaneous reclamation, impacts to these habitats would be negligible, primarily due to the focus on reclamation and revegetation for wildlife habitat.

Big game would tend to displace from areas being disturbed to areas outside of the Project Area and would avoid active mining sites and infrastructure. Based on observations at the existing mining operations, within the SMCRA permit boundary, both elk and mule deer have acclimated to the disturbance from mining operations and exist in proximity to the disturbance associated with mining. Herds are commonly found on previously and newly reclaimed areas that are adjacent to active mining operations. With foraging opportunities available, mountain lions and black bears could use the Project Area but may reduce use due to noise and mine activities. The overall impact due to displacement would be minor and short-term, lasting only during the active mining years and until contemporaneous reclamation activities are complete in any area within the Project Area.

Migratory Birds

Direct impacts to migratory birds within the Project Area could include mortalities and injuries to birds and eggs in unidentified nests. Disturbance to 257 acres of suitable habitat in mountain shrub vegetation could reduce nesting opportunities for species adapted to habitats in those areas. Migratory birds also would tend to be displaced from active mining areas; however, with contemporaneous reclamation, habitat would become available to birds adapted to grassland and early successional shrubland habitats within three to five years. Mountain shrubland habitats are more widely available outside the Project Area.

Noise produced by mining operations also may affect migratory birds. Noise can interfere with establishment of breeding territories for songbirds that vocalize during breeding, or interfere with alarm calls of birds and mammals (Larkin 1996; U.S. Department of the Interior 2003). These impacts would be localized and short-term in any active mining areas. The overall impact would be negligible due to the limited acres of disturbance at any one time, availability of habitat outside of the Project Area and contemporaneous reclamation.

Raptors

Direct impacts to raptors could result from vehicle strikes. However the possibility would be negligible due to implemented design features and speed control. Therefore, the primary impacts that may result to raptors under this alternative would be from loss of 257 acres of potential foraging habitat and disturbance to individuals perching within the Project Area. Foraging opportunities could return on contemporaneously reclaimed land in three to 15 years. Noise and human presence could disturb individuals that forage or perch in the area. Potential disturbance from mining and reclamation activities would end within three to 15 years, depending on the mining and reclamation schedule for each area.

Nesting habitat is limited in the Project Area and vegetation removal could reduce nesting opportunities to a minor extent. Nesting raptors are often sensitive to disturbance from human related activities, particularly prior to eggs being laid. Raptors may abandon nests with eggs or become less attentive to hatchlings, thus increasing the potential for mortality from predation or exposure. The amount of disturbance that an individual raptor will tolerate varies among species and individuals (CPW 2003) and the degree to which an individual has acclimatized to human activity. Impacts to nesting raptors could extend beyond the actual disturbance area up to 0.5 mile (0.8 km) away (CPW 2003). Only two known nest sites are within this disturbance range, and none are known from the proposed disturbance area within the Project Area. The known nests near the Project Area include a golden eagle nest and a prairie falcon nest; there are no nests that would be impacted directly by the Project. The direct impact to raptors would be minor and short-term due to the limited habitat lost relative to that available in the region, the limited duration of mining activities and contemporaneous reclamation allowing foraging opportunities to be regained.

Small Mammals and Reptiles

In addition to the loss of habitat for small mammals and reptiles, some mortality could occur from construction, mining activities, and vehicle operation. The loss of approximately 257 acres of mountain shrubland with possible habitat would be negligible compared to the existing available habitat in the region outside the Project Area. Habitat would develop on disturbed lands within three to 15 years for most species with contemporaneous reclamation. The direct impact would be short-term and minor.

Fisheries

Direct disturbance to aquatic habitat and species within the Project Area would be limited to ephemeral streams, which support macroinvertebrates when water is present. Some of these may be disturbed by mining over the next 10 years. Contemporaneous reclamation would return functional channels to the post mining landscape within a short period of time of completion of mining in any given area. Fish are not present in these streams due to the lack of water on a consistent basis. Direct impacts to fisheries would be short-term and negligible.

4.9.1.2 Indirect Impacts

Potential indirect impacts could occur in the Yampa River, located approximately 4.5 miles (7.2 km) north of the Project Area, as a result of potential discharges from the Project Area to the Yampa River or as a result of emissions from coal combustion at the Craig Station.

Surface disturbance increases the potential for localized sediment input to ephemeral streams. However, sediment control structures, sediment ponds, and diversion ditches would be used as part of project design features, which would reduce the amount of sediment that could potentially be carried downstream. In addition, mining activities near streams would pose a risk of petroleum product or hazardous material spills. As part of the project design features, a SPCC Plan would be implemented to reduce risk of a spill and the potential to affect aquatic habitat and macroinvertebrates. The potential impacts to water quality are discussed in Section 4.5. The potential effects of mine dewatering and water use and emissions from the Craig Station on fish species in the Yampa River are discussed in Section 4.10, Special Status Species. The indirect impacts to fisheries could be short-term and long-term and would be negligible due to the controls implemented to prevent impacts to off-site water quality and habitat degradation.

4.9.2 Alternative B – Disapproval of the Mining Plan Modification by the ASLM

4.9.2.1 Direct Impacts

Under Alternative B, all mining-related activities in the Project Area would cease and closure and reclamation would be initiated on the existing disturbance within the Project Area. There would be no further impacts as a result of habitat loss related to the proposed 257 acres of additional disturbance. The reclamation of wildlife habitat and the cessation of noise and human disturbance would occur earlier in the Project Area than under Alternative A, but would have the same overall short-term, negligible to minor impacts as Alternative A until reclamation activities cease and reclamation is successfully established.

However, mining would continue in areas outside of the Project Area. As a result, direct impacts would continue until reclamation activities have ceased and reclamation has been successfully established in areas within and outside of the Project Area. Impacts similar to those described for Alternative A would continue to occur in areas outside the Project Area until mining ceases at Trapper Mine.

4.9.2.2 Indirect Impacts

Reclamation activities would continue for three to five years, during which a lower-level of impacts (described above) would continue to affect big game, raptors, migratory birds, small mammals and reptiles. There would be no additional indirect impacts to fisheries. Impacts would diminish appreciably upon completion of reclamation. Big game would eventually lose improvements to habitat in the disturbed areas, as reclaimed rangelands mature and develop a uniform structure, similar to the big sagebrush rangelands in the region.

4.9.3 Mitigation Measures

No mitigation measures would be necessary for wildlife.

4.10 Special Status Species

4.10.1 Alternative A – Proposed Action

4.10.1.1 Direct Impacts

Several special status species are known in the vicinity of the Project Area or have habitat within or in the vicinity of the Project Area. These species include BLM sensitive species and Colorado species of concern. Federally listed species do not occur within or near the Project Area but do occur in a wider analysis area and are discussed for potential direct and indirect impacts.

Northern Leopard Frog

The northern leopard frog has not been observed within the Project Area but is known to occur in the vicinity. Alternative A would have *negligible* direct impact on the northern leopard frog *since it does not occur in the Project Area*.

Golden Eagle

Golden eagles are known to use the Project Area for foraging, and there is a known golden eagle nest within 0.5 mile of the Project Area. Golden eagles could be impacted by noise and mine activity under Alternative A. This could result in individuals avoiding or flushing from foraging areas or perch sites in the Project Area. A total of about 257 acres of vegetation removed through mine activities would impact habitat for rabbits, hares, and ground squirrels – the staples of the golden eagle diet. This would directly result in lower foraging opportunities for golden eagles in the Project Area when vegetation is cleared, but the area is small compared to the total foraging habitat surrounding the Project Area. There is a small possibility for golden eagles to collide with vehicles operating in the Project Area, but the potential is small due to the limited occurrence of golden eagles in the Project Area and enforcement of speed limits within the Project Area. Direct impacts to this species would be negligible due to the limited amount of foraging habitat that would be affected (less than 1 percent) compared to that available in the region and the limited possibility of direct mortality.

Burrowing Owl

Burrowing owls have not been documented within the Project Area but have been documented on reclaimed lands to the west of the Project Area. Alternative A would have little direct impact on the burrowing owl. No potential habitat would be removed for mining operations. There is a small possibility that burrowing owls could be struck by moving vehicles during the course of normal operations. Overall, direct impacts to this species would be negligible due to no disturbance of suitable habitat, lack of a documented presence of the species within the Project Area and the unlikelihood of direct mortality due to enforcement of speed limits.

Ferruginous Hawk

Ferruginous hawk habitat exists within the Project Area, but this species has not been documented in the Project Area. Alternative A would have little direct impact on the ferruginous hawk because of its lack of documented presence. Foraging habitat for the species exists in reclaimed rangeland and the big sagebrush-grass community. No big sagebrush-grass vegetation and only a small amount (11 acres) of reclaimed rangeland may be re-disturbed. Potential foraging opportunities for ground squirrels and rabbits in the Project Area would remain intact. Noise and mine activity under Alternative A could result in individuals avoiding or flushing from foraging areas or perch sites in the Project Area if these were used in the future. There is little to no possibility that ferruginous hawks could be struck by moving vehicles during the course of normal operations due to the lack of their documented presence within the Project Area and the enforcement of speed limits. Overall, the direct impacts to this species would be negligible due to the limited amount of habitat for the species in the Project Area and the unlikelihood of individuals using the Project Area in the next nine to 10 years.

Peregrine Falcon

American peregrine falcon habitat is limited within the Project Area, and this species has not been documented within the Project Area. Alternative A would have little direct impact on the peregrine falcon. Foraging habitat for the species exists in native habitats and on reclaimed rangeland. Vegetation cleared for mine activities would remove about 257 acres of mountain shrubland and habitat for small birds; thus, reducing potential foraging opportunities for peregrine falcons. There is little to no possibility that peregrine falcons could be struck by moving vehicles during the course of normal operations due to the lack of their documented presence within the Project Area and the enforcement of speed limits. Overall, the direct impacts to this species would be negligible due to the limited amount of habitat for the species in the Project Area and the unlikelihood of individuals using the Project Area in the next nine to 10 years

Brewer’s Sparrow

Brewer’s sparrow is unlikely to experience direct impacts from Alternative A. It is unlikely to occur in the 257 acres of mountain shrubland vegetation that will be disturbed in the next nine to 10 years. It has the greatest potential to occur in reclaimed rangeland vegetation and native sagebrush shrublands in and near the Project Area (22 acres of big sagebrush-grass vegetation; 494 acres of reclaimed rangeland). It is anticipated that a very small amount of reclaimed rangeland (11 acres) would be re-disturbed by re-mining in the N Pit. As a result, there would be short-term, negligible direct impacts to this species during mining activities that re-disturb reclaimed rangeland.

Columbian Sharp-tailed Grouse

Columbian sharp-tailed grouse habitat has been created on reclaimed lands to the west of the Project Area and the use of these reclaimed lands by the grouse is well-documented and increasing. The entire Project Area is within Columbian sharp-tailed grouse overall range and winter range. Approximately 410 acres of designated production areas for this species are located within the northwest corner of the

Project Area. This species is known to occur within the Project Area, although no leks are known to occur. Alternative A has the potential to directly affect the Columbian sharp-tailed grouse by removing 257 acres of native mountain shrubland vegetation. There is a potential for individual mortality due to vehicle collisions related to normal mine operations; however, the likelihood is small with the enforcement of speed limits within the Project Area. The overall direct impacts to the Columbian sharp-tailed grouse would be *short-term and* minor due to the small amount of habitat affected by Alternative A relative to the availability of habitat in the region, the lack of documented leks in the proposed disturbance area, and the small potential for direct mortality to individual grouse due to enforcement of speed limits. *Completion of the reclamation and revegetation will provide improved habitat for the Columbian sharp-tailed grouse compared to the pre-mining conditions.*

Colorado River Watershed Fish

The closest habitat for the Colorado River endangered fish species is the Yampa River located approximately 4.5 miles (7 km) north of the Project Area (**Figure 3-13**). There is no habitat or designated critical habitat for the Colorado River fish in or adjacent to the Project Area. Direct impacts to the Colorado River fish are related to water depletions from Trapper Mine water usage. In the BA issued for RN06, the net annual water depletion was estimated at 94.8 acre-feet (OSMRE 2013). The USFWS determined in the subsequent Biological Opinion (BO) that the Trapper Mine's net water depletions fit under the Programmatic Biological Opinion on the Management Plan for Endangered Fishes in the Yampa River Basin (Yampa River Programmatic Biological Opinion). The Yampa River Programmatic Biological Opinion states that in order for actions to fall under the umbrella of the document and rely on a Recovery Implementation Program Recovery Action Plan (RIPRAP) to offset depletions, 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 for new depletion projects greater than 100 acre-feet per year.
3. Re-initiation stipulations will be included in all individual consultations under the umbrella of this program.
4. The USFWS and project proponent will request that discretionary federal control be retained for all consultations under this program.

TMI and the USFWS signed a RIPRAP that identifies actions believed to be required to recover the endangered fish in the most expeditious manner (USFWS 2013). TMI agreed to a one-time contribution based on its share of the costs of the Recovery Implementation Program to fund recovery actions (USFWS 2013). No additional depletions would occur under Alternative A and no further actions are needed for depletions.

Colorado River watershed habitat for endangered fish also could be affected by sediment loading, and releases of mercury and selenium. The Trapper Mine lies approximately 4.5 miles south of the Yampa River. Mining activities under Alternative A could increase sediment loading in streams being carried offsite and eventually reaching the Yampa River in the short term as indicated in Section 4.5. However mitigation measures would greatly decrease the likelihood of sediment reaching the Yampa River. The impact of selenium discharges from the mine reaching the Yampa River are considered to be long-term and negligible based on the analysis in Section 4.5.1.1. Based on available water monitoring data, it is unknown if mining activities are contributing to mercury levels in the Yampa River.

Yellow Billed Cuckoo

The yellow-billed cuckoo is described as an occasional, localized breeder along the Yampa River near Craig (USFWS 2014). The species was last documented in that area in 2008 but breeding was not confirmed. Proposed critical habitat for the species occurs along the Yampa River from approximately

8 miles (13 km) east of Hayden to approximately 5 miles (8 km) west of Craig. As discussed above for the Colorado River Watershed Fish, the impact of selenium discharges and sediment loading is expected to be long-term and negligible. Based on available water monitoring data, it is unknown if mining activities are contributing to mercury levels in the Yampa River.

4.10.2 Indirect Impacts

Indirect impacts from Alternative A to the Colorado River endangered fishes (Colorado pikeminnow, humpback chub, bonytail chub, and razorback sucker) are related to coal combustion at the Craig Station. Combustion of coal releases mercury into the atmosphere which may be deposited directly into habitat for the endangered fish in the Colorado River watershed or may wash into the Colorado River or its tributaries after being deposited on land. The indirect effects area for the Colorado River watershed fish is the airshed boundary and the area between the Yampa and White rivers to their confluences with the Green River to the east (**Figure 3-1**).

Aquatic systems receive mercury by direct deposition from the atmosphere and from overland transport from within the watershed (U.S. Environmental Protection Agency [USEPA] 1997). Mercury primarily enters aquatic systems in an inorganic form where it can adsorb to suspended solids and settle to the bottom (USEPA 1997). It also can be photo-reduced in the upper few centimeters of the water's surface and escape into the atmosphere. Reactive gaseous mercury at the sediment water boundary can be transformed into methylmercury by sulfate-reducing bacteria; however, this is a reversible reaction that can transform methylmercury back to reactive gaseous mercury, depending on site-specific conditions. The most important areas for methylation are anoxic areas of the aquatic environment, such as wetlands or surface waters that remain stratified.

Most mercury that bio-accumulates in fish tissue is in the form of methylmercury (USEPA 1997). Rates of methylation processes and bioaccumulation typically vary and depend on many factors. The effects of mercury on fish are numerous. Lusk (2010) describes the potential affects as:

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. *Reduced gonad size and function, reduced gamete production*
    c. *Altered ovarian morphology, delayed oocyte development*
    d. *Reduced reproductive success*
    e. *Transfer of dietary mercury of the maternal adult during oogenesis and into the developing embryo*
3. *Inability to grow new brain cells or significantly reduce brain mercury.*

The specific impacts to the Colorado River fish from mercury in the Yampa and White rivers is highly uncertain. It is not known to what extent the level of mercury in these systems may be impacting these species at a population level. Additionally, given the longer life of the Colorado pikeminnow and its position higher in the food chain as a top predator, mercury would likely affect this species to a greater degree than the razorback sucker, bonytail chub, or humpback chub. This is due to the fact that the pikeminnow would have a greater chance to bio-accumulate higher concentrations of mercury during its lifespan. In contrast, the bonytail chub and humpback chub are middle feeders and the razorback sucker is a bottom feeder that feed on organisms lower in the food chain with potentially lower concentrations of mercury.

Mercury emissions have been previously described in Section 4.3.1.2 with the amount of mercury emissions attributable to combustion of Trapper Mine coal at the Craig Station estimated to be 7.29 lb/yr (3.31 kilograms per year) for the average mining rate of 2.3 mtpy, and 8.23 lb/year (3.73 kilograms per year) for the maximum mining rate of 2.6 mtpy. These rates represent approximately 17 percent and 19 percent, respectively, of the total mercury emissions from Craig Station.

No current data or modeling is available to indicate how much of the mercury that is emitted by the Craig Station is deposited annually within the airshed used in this assessment. However, a recent BA conducted for the Four Corners Power Plant and Navajo Mine Energy Project (FCPP & NMEP) (OSMRE 2014) included detailed modeling of the emissions and deposition of mercury produced at the FCPP. In those models, it was determined that approximately 95 percent of all mercury emitted by the FCPP rises high enough into the atmosphere to be carried by prevailing wind currents out of the area analyzed in that BA. It is important to note that it is unknown if this modeling accurately reflects the conditions at the Craig Station, because environmental conditions in the Four Corners region are different from those in Craig, Colorado.

The Mercury Deposition Network (MDN) has a system of receptors that monitor levels of mercury. The nearest receptor to the Trapper Mine is the Buffalo Pass-Summit Lake site east of Steamboat Springs, which is approximately 45 miles (72 km) east of the Trapper Mine and the Craig Station. These monitoring stations measure the levels of mercury that are deposited in precipitation events (i.e., wet deposition). Data from this station in 2013 indicated that there was an annual deposition of 9.757 micrograms per square meter (µg/m^2) of mercury at that location (National Atmospheric Deposition Program 2015). There are no other monitoring sites within the airshed; consequently, it would be speculative to accurately determine how much mercury is being deposited throughout the airshed due to the spatial variability of the deposition on an annual basis. It should be noted that the MDN clearly indicates that deposition can vary spatially across regional airsheds.

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/m^2 of mercury is equally distributed throughout Yampa and White river watersheds (a combined total of 13,267 square miles [21,351 square km]); an annual deposition of 739.14 pounds of mercury is calculated. The entirety of the Colorado River Fish indirect effects evaluation area is within these two watersheds and is 4,059 square miles (6,532 square km). Therefore, assuming an even distribution of mercury deposition, there would be a total of 226.17 pounds of mercury dropped annually over the entire indirect effects area. However, if the results of the FCPP & NMEP model are used, then only 5 percent of the mercury deposited would be emitted from local sources; and the other 95 percent would come from global or other distant sources. This would indicate that the proportional amount of mercury deposited annually that comes from the Craig Station and the Hayden Station, the two local generating stations, is 11.3 pounds (5 percent from local sources) across the entire indirect effects evaluation area.

The proportion of local mercury attributable to the Craig Station can be estimated by comparing the ratio of coal that is combusted between the Craig Station and the Hayden Station, both located within the indirect effects evaluation area. The Craig Station consumes coal at a rate of 4.8 mtpy, and the Hayden Station uses coal at a rate of 1.75 mtpy. Using these numbers, the Craig Station would contribute 8.3 pounds annually (0.733 x 11.31 pounds) of local mercury to mercury deposition within the evaluation area; and the Hayden Station would contribute 3.02 pounds of local mercury (0.267 x 11.31 pounds).

Applying percentages to the sourced coal that is consumed in the three units at the Craig Station estimates TMI's contribution to locally deposited mercury. Trapper Mine sourced coal that is combusted in Units1 and 2 contributes 19.16 percent of the mercury emitted from the Craig Station, and other coal that is consumed in Units 1, 2, and 3 contributes 80.84 percent of the mercury emissions. Applying these ratios to the local mercury deposition from the Craig Station (8.3 pounds) would indicate that Trapper

Mine coal results in 1.6 pounds (0.1916 x 8.3 pounds) of locally deposited mercury; and other coal results in 6.7 pounds (0.8084 x 8.3 pounds) of locally deposited mercury. Therefore the mercury deposited over the study area attributable to Trapper Mine would be 1.6 pounds annually at the maximum mining rate of 2.6 mtpy.

The assumption of an even deposition of mercury is impracticable because the prevailing winds from the southwest to the northeast likely result in higher amounts of deposition east of the Craig Station than other parts of the affected area. However, barring further detailed modeling into the analysis of mercury deposition, precise estimates of local deposition are unavailable at this time.

The actual amount of mercury deposited annually would vary based on the chemical speciation of the mercury in the atmosphere, as well as the climatic conditions, and the amount of coal combusted to meet regional electricity needs. Therefore, the amount of mercury annually deposited in the affected area that may be attributable to the combustion of coal from Trapper Mine could vary yearly.

It is important to note that the calculations above refer to wet deposition of mercury. Some research has shown that dry deposition can be equal to or greater than wet deposition. Dry deposition occurs when mercury settles out of the air, and wet deposition occurs when mercury is deposited in rain or other types of precipitation. Research has shown this rate to be anywhere from 0.8 to 4.8 times higher in the central and eastern U.S. (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). The USFWS applied this ratio 2.5:1 in the BO for the Mining Plan Modification for the South Taylor/Lower Wilson Area at the Colowyo Coal Mine (USFWS 2015). Applying this factor to the Trapper Mine coal that is combusted at the Craig Station provides a total mercury deposition of 4 pounds annually over the entire indirect effects area from Alternative A. *This translates to a depositional rate of 0.01575 ounces per square mile per year (0.1726 grams per square kilometer per year) in the study area.*

In addition to impacts to Colorado River fish alone, impacts also could occur to critical habitats of the four Colorado River fish species in the study area. Mercury from the combustion of Trapper Mine coal at the Craig Station that is deposited either directly or indirectly into the critical habitats for these species would have the potential to adversely impact critical habitats. This would occur primarily by increasing the amount of contaminants present in those areas. Bio-accumulation of methylmercury could degrade food resources for the species.

It is difficult to quantify the level of these impacts to critical habitats as a result of Alternative A given the lack of information on the origin of mercury in the indirect effects area. However, if it is assumed that only 5 percent of the mercury generated at the local generating stations is deposited into the area, the impact from Alternative A may be small. However, when added to the other regional and global sources of mercury deposited into the area, Alternative A may result in cumulatively adverse impacts (Chapter 5.0).

Of the amount of mercury annually deposited in the indirect effects 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 methylmercury and, thereby, has the potential to adversely affect the Colorado River fish. However, due to a lack of data on mercury transport within the study area, it is not possible to quantify the amount of mercury that would enter the Yampa and White rivers, or be converted to *methylmercury*. Therefore, at this time it is not possible to accurately predict the full impact to the Colorado River fish or their critical habitats.

Due to the uncertainties in how mercury is potentially affecting the Colorado River fish species, it is difficult to draw a conclusion on the indirect impacts from Alternative A as some of the data appear to be contradictory. In a recent study, Colorado 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). Conversely, Colorado pikeminnow in the White River had high levels of mercury concentrations but the population has been increasing (Osmundson and Lusk 2012). The increase in the Colorado pikeminnow population in the White River was attributed to upstream movement of juvenile Colorado 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 the Colorado River fish species and critical habitats in the Yampa and White rivers before a specific conclusion can be drawn between Alternative A and impacts to the Colorado River fish and their critical habitats.

The types of impacts from mercury accumulation in the Colorado River fish could include a number of factors. Mercury can affect an individual fish's central nervous system, alter their behaviors (e.g., reduced predator avoidance), and disrupt the endocrine system resulting in reduced reproductive success (Lusk 2010). Given that the Colorado pikeminnow is a top predator in its ecosystem and is longer-lived, it would be expected that the impacts from mercury exposure would be more pronounced than in the bonytail chub, razorback sucker, or humpback chub. 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 2011). For the Colorado River fish, Beckvar et al. (2005) determined that survival, growth, reproduction, and behavior begin to be affected by mercury at 0.2 micrograms per gram (µg/g) in the whole fish. In the 1960s, Colorado pikeminnow in the Yampa River Basin had a median level of mercury per fish weight of approximately 0.6 µg/g. In 2010, that level had dropped to approximately 0.5 µg/g (Lusk 2010). The USFWS has hypothesized that this level of mercury exposure may be leading to reproductive impairment in a majority (64 percent) of Colorado pikeminnow (USFWS 2011).

In addition to mercury, impacts to the Colorado River fish from increases in selenium from the combustion of coal at the Craig 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 eggs 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, 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. *Hamilton et al (2005a) observed a significant positive correlation and possible causal linkage to elevated levels of selenium in adult razorback suckers and percent hatch, egg size, and embryo deformities in developing eggs. Hamilton et al. (2005b) also documented deformities and rapid mortality in razorback sucker larvae exposed to elevated dietary selenium. The results indicate an impact to the razorback sucker that lowers reproductive success at a population-level.*

Combustion of coal at the Craig 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 or absorbs onto alkaline fly ash that is subsequently removed by a fabric filter baghouse (Electrical Power Research Institute 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.

Consultation on the potential effects of Alternative A has been conducted with the USFWS under Section 7 of the ESA. The BO issued by the USFWS on March 22, 2016 found that the Project is not likely to jeopardize the four endangered fish, nor is it likely to destroy or adversely modify their critical habitat. The BO requires a number of conservation measures that would aid in improving the scientific knowledge and preservation of these species in the Yampa and White river basins. The mitigation measures approved as part of the BO are described in Section 4.10.4.1 and ***Appendix C****.*

Yellow-Billed Cuckoo

The yellow-billed cuckoo could be indirectly impacted by coal combustion and mercury in the environment. For the yellow-billed cuckoo, mercury bio-accumulates through the ingestion of aerial insects emerging from benthic life stages that develop in aquatic environments with mercury or from predatory spiders that eat these (Buckland-Nicks et al. 2014; Cristol et al. 2008; Edmonds et al. 2012; Evers et al. 2012; Gann et al. 2014). Dietary mercury concentrations associated with adverse effects to birds are normally greater than 0.1 mg/kg wet weight (DOI 1998). Once ingested, *methylmercury* rapidly moves into the bird's central nervous system, resulting in behavioral and neuromotor disorders (Scheuhammer et al. 2012, 2007; Tan et al. 2009). The developing central nervous system in avian embryos is especially sensitive to this effect, and permanent brain lesions and spinal cord degeneration are common (Bryan et al. 2003; DOI 1998; Heinz et al. 2009; Scheuhammer et al. 2007; Young 1998). Therefore, adverse effects are described for the eggs, embryos, nestlings and fledglings due to elevated mercury burdens in the female parent.

Uptake of mercury by birds usually has been shown to impact fish-eating birds more severely than insectivorous birds (Boening 2000; Zolfaghari et al. 2009). Additionally, Howie (2010) found that the lateral extent of elevated mercury levels in birds and invertebrate prey species varied from approximately 250 to 650 meters (820 to 2,133 feet) from an affected water body. After this distance, mercury levels in the blood and feathers could not be distinguished from background levels, indicating that only those individuals that forage adjacent to affected water bodies show signs of bioaccumulation of mercury.

No information is available on the levels of mercury found in invertebrates in the Yampa River or elsewhere within the indirect effects area. However, it could be assumed that given the levels of mercury that currently exist in the Yampa River, that the aquatic invertebrates may contain elevated levels of mercury. However, the amount of mercury that may be present would vary depending on the water temperature and its hardness (Boening 2000).

Any yellow-billed cuckoos present in the area would be at risk for mercury contamination. However, that risk would be minor considering that the primary food sources for the cuckoo largely are not aquatic, but individual cuckoos could occasionally consume lizards that are higher in the food chain and that may have consumed insects of an aquatic origin. Under this scenario, the concentration of *methylmercury* would magnify from the environment as it bioaccumulates from insect to lizard and eventually a cuckoo that consumes the lizard. Therefore, it is not possible to entirely discount the potential for yellow-billed cuckoos to bio-accumulate mercury from Alternative A; however, given the infrequency of this species within the area historically, it is unknown how many individuals would have the potential to be affected. Furthermore, it is difficult to determine the level of impact given that there is no threshold information regarding mercury levels that adversely affect yellow-billed cuckoos or actual amounts of mercury in yellow-billed cuckoos that inhabit the area. Based on the low numbers of cuckoos that are thought to use the area, it would be difficult to obtain these data.

Because the yellow-billed cuckoo may not return to the same breeding areas in successive years, it is possible that if any individuals were impacted by mercury in one year, individuals may travel to a new location in subsequent years that are not impacted by mercury generated from the Craig Station. Also, because cuckoos are migrants that are present for only a few months each year, the potential for mercury exposure in the area would be lower than if the species were a year-round resident.

In addition to impacts to individual yellow-billed cuckoos, the proposed critical habitat for this species also may be impacted by Alternative A. The USFWS has proposed critical habitat for the western yellow billed cuckoo along the Yampa River.

The indirect effects of Alternative A would result in some level of mercury deposition in the area. Some of this mercury may affect the invertebrates that make up the cuckoo's prey base, thereby affecting the proposed critical habitat. Different orders of invertebrates often react to mercury differently, although the larval stages are usually 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). It should be noted, however, that aquatic insects are not the primary food source for cuckoos. It is unknown how much of the mercury deposited from Trapper Mine coal burned at the Craig Station would eventually enter into the bodies of yellow-billed cuckoos. Therefore, it is not possible to determine the severity of this impact.

Combustion of coal at the Craig Station could result in some amount of selenium being emitted and subsequently deposited. Impacts from elevated selenium in birds can affect reproduction in developing embryos by acting as a teratogen, lower body weight, decrease immune function, or result in histopathological lesions (Hamilton 2004). However, as is described in the previous section, there is a lack of information on the amount of selenium emitted or absorbed at the Craig Station from Alternative A. Therefore, it is unknown if the indirect effects of selenium are impacting the yellow-billed cuckoo or proposed critical habitat.

Consultation on the potential effects of Alternative A has been conducted with the USFWS under Section 7 of the ESA. The BO issued by the USFWS on March 22, 2016 concurred with OSMRE's findings in the BA that the Project is not likely to adversely affect the yellow-billed cuckoo and not likely to destroy or adversely modify the proposed critical habitat for the species. The BO requires actions to be taken to improve the scientific knowledge of the population of yellow-billed cuckoos that have been known to occur on the Yampa River. The mitigation measures approved as part of the BO are described in Section 4.10.4.2 and ***Appendix C****.*

4.10.3 Alternative B – Disapproval of the Mining Plan Modification by the ASLM

4.10.3.1 Direct Impacts

Under Alternative B, activities within the Project Area would cease and reclamation would occur. However, mining would continue in areas outside of the Project Area. As a result direct impacts would continue in the Project Area until reclamation activities have ceased and reclamation has been successfully established but impacts, similar to those described for Alternative A, would continue to occur in areas outside the Project Area until mining ceases at the Trapper Mine.

4.10.3.2 Indirect Impacts

Indirect impacts to the Colorado River fish and yellow-billed cuckoo would continue in the long term due to the coal combustion and emissions of mercury and selenium. Although these impacts would continue for as long as the Craig Station is operational, the portion attributable to combustion of Trapper coal would decrease based on the expected decreased mining rate for the three- to four-year life of mining outside of the Project Area. For reasons previously described, the exact indirect impacts based on coal combustion cannot be determined.

4.10.4 Mitigation Measures

4.10.4.1 Colorado River Fish

OSMRE has voluntarily developed a number of conservation measures in coordination with TMI and USFWS that would aid in improving the scientific knowledge and preservation of these species in the Yampa and White river basins. The objective of these conservation measures would be to help toward the recovery and ultimate goal of down listing or delisting these species in the future.

TMI would contribute funding toward active research projects in the Yampa and White River Basins to study mercury deposition and the uptake in fish species in these areas. TMI would provide funding in the amount of $45,000 for upcoming mercury deposition studies being conducted in the Yampa and White rivers by the USGS Water Quality Division, and investigation of *methylmercury* uptake in fish tissues to be conducted jointly by BLM and USGS Fort Collins Office in cooperation with CPW in the same river systems.

Additionally, TMI would contribute $10,000 of funding for recovery actions that are managed by the Upper Colorado River Endangered Fish Recovery Program. TMI would provide the funding to the National Fish and Wildlife Foundation to distribute to the Upper Colorado River Endangered Fish Recovery Program. The details of the specific activities that will be funded are described in the BO in **Appendix C**.

4.10.4.2 Yellow-billed Cuckoo

OSMRE has voluntarily developed a number of conservation measures in coordination with TMI and USFWS that would aid in improving the scientific knowledge about the population of yellow-billed cuckoos that have been known to occur on the Yampa River. TMI would provide $5,000 to fund a protocol survey during the breeding season in proposed critical habitat along the Yampa River. TMI would either conduct the survey itself or hire a permitted contractor to perform the survey. The results of the survey will be provided to USFWS. Further details of the specific activities that will be funded are described in the BO in **Appendix C**.

4.11 Cultural Resources

Surface-disturbing activities or construction of associated infrastructure may directly or indirectly affect cultural resources in the APE, including historic properties (i.e., NRHP-eligible sites), as well as those cultural resources that require additional information to determine eligibility (i.e., “needs data”). The sites categorized as needing additional data (the “needs data” sites) will be managed as if they are eligible for listing in the NRHP until further evaluation has been completed.

The direct effects area includes all associated mine-related disturbances and facilities, including topsoil stockpiles, overburden stockpiles, access roads, power lines, water lines, sediment ponds, and diversion ditches.

The indirect effects area, which encompasses those historic properties for which the setting is essential to their NRHP eligibility, is defined as the geographic area which is not planned for disturbance and lies within the Project Area. Indirect effects may include increased soil erosion and gullying, vibration from blasting, and dust from operations. In addition, enhanced access to now remote areas would increase the potential for illicit artifact collection and/or vandalism of cultural resources. Other indirect effects may include deterioration of the site setting, thereby diminishing those aspects for which nearby cultural resources are considered eligible for the NRHP.

One cultural resource site is located within the indirect APE (**Table 4-18**).

Table 4-18 Historic Properties Within Indirect APE

Site Number	Site Type	Cultural Affiliation	NRHP Evaluation	Relationship To Proposed Disturbance
5MF.948	Rock Art	Protohistoric	Eligible	Indirect APE, located approximately 700 feet south of L Pit disturbance limit

4.11.1 Alternative A – Proposed Action

4.11.1.1 Direct Impacts

No cultural resources sites eligible for listing on the NRHP are located within the direct effects area, so no direct effects to cultural resources would occur as a result of Alternative A.

4.11.1.2 Indirect Impacts

Alternative A includes the continued operation of the L Pit, which is located 700 feet north of site 5MF.948, a rock art site that is dated to the Protohistoric era (A.D. 1300-1881). The site was recorded in July 1980 by Archaeological Services of Laramie, Wyoming. Features noted on the site include pictographs made with red and yellow ochre; petroglyphs of shield, spears, bison, mounted horseman, and standing warriors; and a charred bone fragment. The rock art adorns the vertical face of a sandstone cliff, on private lands within Federal Coal Lease C-079641. The site has been determined eligible for listing in the NRHP and avoidance is recommended, especially if construction activity is anticipated within 50 feet of the site.

The site faces south and is found at least 200 feet below the lowest planned mining elevation, so direct mining activity would not disturb the site, and mining activities would not be visible from the site. In addition, given the aspect and position of the rock art panel, it would be protected from atmospheric and auditory effects such as fly rock and air blast. However, TMI plans to construct a sediment control pond directly below and within the viewshed of the site.

Concern has been expressed that the site could be damaged by nearby blasting operations in existing and planned mining areas. TMI has acknowledged this risk and engaged AAI to complete analysis of the potential for vibration damage to the site. AAI calculated the blasting vibration levels (measured as peak particle velocity or PPV) sufficient to cause spalling or cracking of the rock forming the cliff on which the rock art is depicted and have recommended that vibration levels not exceed PPV of two inches per second. If sufficient protection from rock fall is implemented, a maximum PPV of five inches per second may be more appropriate. Charge weights for blasting range between 3,000 and 5,000 pounds. A charge weight of 3,000 pounds could be used at distances greater than 1,330 feet, while a 5,000-pound charge weight could be used at distances greater than 1,720 feet. When the blast area is nearer than these limits, the charge weight must be reduced to maintain a safe vibration level that would not harm the rock art at the site (AAI 2015).

As part of the CDRMS mid-permit term review, TMI will be submitting the AAI report to the CDRMS and agreeing to abide by the recommendations of the report (Hinkemeyer 2015). If any mining or mining-related activity occurs within 50 feet of any historic property, then the location would be fenced. This commitment would apply to the rock art site. If TMI complies with the AAI recommendations and the fencing commitments, the site would not be adversely affected by Alternative A.

4.11.2 Alternative B – Disapproval of the Mining Plan Modification by the ASLM

4.11.2.1 Direct Impacts

Under this alternative, Alternative A would not be approved and the current mining operations in the Project Area would be terminated. No additional coal removal would occur within the Project Area. No additional disturbance beyond the existing disturbance footprint would occur and reclamation would be completed. Under these circumstances, no historic properties or “needs data” sites would be directly affected within the Project Area. The areas encompassed within the N and I pits were previously surveyed for cultural resources in the late 1970s and early 1980s and no cultural resources are known to exist in these areas.

Under Alternative B TMI would move to coal recovery outside of the Project Area in the N Pit and the I Pit. The area of the N Pit has been previously disturbed and re-disturbance of this area would not result in direct impacts to cultural resources.

TMI has indicated the pit boundary for the I Pit but has not yet completed design of the infrastructure that would be needed to mine that pit including the topsoil stockpiles, overburden stockpiles, roads, sediment ponds, power lines, water lines, so impacts to cultural resources as a result of construction of infrastructure to support mining in the N and I pits cannot be fully quantified.

4.11.2.2 Indirect Impacts

Any coal mined under Alternative B would be further away from site 5MF.948 and indirect impacts to that site would not occur. No additional known cultural resources would be indirectly affected by Alternative B.

4.11.3 Mitigation Measures

4.11.3.1 Unanticipated Discoveries

If a previously unidentified cultural resource is discovered in the Project Area, TMI would take measures to protect the find locality and provide written notice to the CDRMS and the OSMRE within 48 hours of the discovery. A Colorado-permitted archaeologist meeting the Secretary of the Interior's Professional Qualification Standards would, as soon as possible, evaluate the discovery, make a recommendation as to the NRHP eligibility of the resource, and provide written notice to the CDRMS and the OSMRE within 48 hours. The CDRMS and OSMRE would then consult with the SHPO and the BLM (for federally managed sites) on the NRHP eligibility determination(s) and develop appropriate measures necessary to mitigate any adverse 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, the tribe(s) with an interest would be notified and consulted as appropriate. When agreement is reached among all of the involved parties, the appropriate mitigation, if necessary, would be implemented. The tribes, OSMRE, CDRMS, SHPO, and the surface landowner must agree to any proposed treatment measures.

4.11.3.2 Human Remains

If human remains are exposed during mining activities, mining activities would be halted immediately near the discovery. The remains would be appropriately covered and stabilized, and access to the immediate area would be blocked by flagging and/or temporary fencing. All mining operations would cease within a radius of 100 feet around the discovery site.

Unmarked burials located on private or state land would be treated under CRS 24-80-411 and CRS 24-80 Part 13. TMI would contact the county sheriff, the county coroner, and the appropriate land managing agency official to notify them of the discovery. The coroner would conduct an on-site inquiry within 48 hours of notification and may enlist the assistance of specialists to determine if the remains are of forensic interest. If the remains are not of a forensic interest, the coroner would contact the State Archaeologist. Before further disturbance, the State Archaeologist would have a qualified archaeologist examine the human remains and determine whether or not they are more than 100 years old and to evaluate the integrity of their archaeological context. If the on-site inquiry discloses that the human remains are Native American, the State Archaeologist would notify the Colorado Commission of Indian Affairs to formulate a treatment plan within 10 days of the discovery. The State Archaeologist and Colorado Commission of Indian Affairs would coordinate Native American tribal notifications and subsequent consultations. If the remains are verifiably non-Native American, the county coroner would convey the remains to the Colorado State Anatomical Board for proper disposition.

For unmarked Native American burials identified on federally managed lands, the requirements of the Native American Graves Protection and Repatriation Act would apply in accordance with 43 CFR 10, Subpart B.

4.11.4 American Indian Concerns

Several tribes were contacted in 2015 regarding Alternative A (**Appendix D**). *The Hopi Tribe and the Southern Ute Indian Tribe were consulted related to the rock art at site 5MF.948 (Section 6.3).* No other concerns have been raised regarding any religious or sacred sites near the mine.

4.12 Socioeconomics

4.12.1 Alternative A – Proposed Action

Under Alternative A, mining operations at the Trapper Mine would continue within the Project Area from July 1, 2015, through the life-of-mine, estimated to be approximately 2025 or later depending on coal delivery requirements. The coal would be mined at the current mining rates which average approximately 2.3 mtpy with a maximum production rate of 2.6 mtpy.

4.12.1.1 Direct Impacts

Trapper Mine currently employs approximately 191 workers. Employment levels would stay approximately the same under Alternative A until closure activities begin within the Project Area. In 2014, TMI spent approximately $19.7 million in gross wages including benefits. This amount rose to $20.3 million in 2015. This direct beneficial impact to TMI workers would continue until closure activities begin within the Project Area or potentially longer as TMI moves to other areas of coal within the SMCRA permit boundary. Direct support of industries that supply services to the Trapper Mine also would continue. This includes the Craig Station, which receives Trapper Mine coal and would continue to operate at or near its current level, assuming that its coal supply from multiple sources remains relatively constant. Additionally, industries such as welding, fabrication, and equipment rental would continue to directly benefit from the continuation of mining operations at the Trapper Mine until the completion of mining and reclamation. Payments of local, state, and federal taxes also would continue. Trapper Mine paid $3.9 million in federal Abandoned Mine Land fees; $4.8 million in severance tax ($1.2 million of which was distributed to local governments and impact grant funds); as well as $8.0 million in property tax and $36.9 million in royalties between 2010 and 2015. Local services would continue to benefit from the local distribution of 50 percent of the State of Colorado's share of severance taxes. These payments would continue at approximately the same amount until mining is completed for the Project Area.

TMI has been involved in the community in a number of ways. TMI community involvement has included, but is not limited to, construction and donation of a fitness center in Craig, donation of labor, equipment and funds to the construction and subsequent operation of local athletic facilities, construction of a portion of the Yampa Valley golf course at no cost to the community, and participation in hunting programs for disabled individuals. Local community participation and the resulting community benefit would continue to be associated with the Project Area until mine closure activities would begin in 2025.

Overall socioeconomic benefits from Alternative A would be beneficial and last for the life of the mining and reclamation operations within the Project Area.

4.12.1.2 Indirect Impacts

Indirect beneficial impacts, such as support by TMI employees of the retail and accommodation industries, as well as local real estate, would continue from the continuation of mining operations at the Trapper Mine until closure. Indirect beneficial impacts also include local purchases, salaries and benefits to local workers at the Craig Station, which receives Trapper Mine coal.

4.12.2 Alternative B – Disapproval of the Mining Plan Modification by the ASLM

Under Alternative B, TMI would terminate the current mining operation in the Project Area. Coal reserves identified in areas outside of the Project Area include the N and I pits as shown on **Figure 2-4**. The expected coal to be mined from these pits would be approximately 4.5 million tons at an anticipated reduced mining rate of 1.5 mtpy, resulting in the potential of three to four years of continued mining on a reduced level.

4.12.2.1 Direct Impacts

Under this alternative, direct employment of approximately 191 workers would be reduced, along with the subsequent payment of $20.3 million in gross wages and benefits as reported for 2015. A reduction in employment and subsequent gross wages and benefits would occur starting at cessation of mining within the Project Area, with further reductions after the three to four years of mining in areas outside of the Project Area and assuming no additional reserves are identified. Local, state, and federal tax payments would markedly decrease based on the reduced mining rate and would end at mine closure. It is estimated, based on 2010-2015 averages, approximately $174.5 million in gross wages and benefits, $5.9 million in Abandoned Mine Land fees, $7.2 million in severance tax, $55.4 million in royalties, and $12.0 million in property tax revenue from mining within the Project Area would be eliminated if mining did not continue. This reduction in revenue would be partially offset by the mining in other areas of the SMCRA permit boundary. The loss of direct employment income as well as local, state, and federal tax revenue would have substantial effects on a region that has strong economic ties with the mining sector. Although the effect to the State of Colorado from a reduction in severance tax collection would likely be minor, local areas would not receive the 50 percent disbursement of these funds, resulting in an adverse impact to the ability of local areas to provide services such as law enforcement and health care. Industries that directly contribute to the mine would potentially incur a large decline in business and associated revenue as well as employment. These industries include welding, fabrication, and equipment rental businesses. The housing industry also could potentially incur an adverse impact as those directly employed by Trapper Mine may leave the area. Local school enrollment also could be adversely affected as directly employed workers and their families leave the area.

Under Alternative B, community involvement by TMI, which has ranged from funding of local sports fields and fitness centers to support of disabled hunter programs, would likely be reduced.

Overall impacts from Alternative B would be beneficial during the shortened life of the mining operations outside the Project Area and adverse once mining operations cease.

4.12.2.2 Indirect Impacts

Industries to which the mine contributes indirectly would potentially incur a large decline in business and associated revenue as a result of the reduced mining operations and shortened mine life. Indirect employment levels also would likely be reduced. These industries include the retail and accommodation industries in Craig and vicinity. The real estate industry also could potentially incur an adverse impact as those indirectly supported by TMI may leave the area. Local school enrollment also could be affected as indirectly employed workers and their families leave the area. Indirect impacts also potentially include a reduction of availability of goods and services to local workers from the Craig Station, which receives Trapper Mine coal.

4.12.3 Mitigation Measures

No mitigation measures have been identified for socioeconomic resources.

4.13 Visual Resources

The mining of the Project Area would create a visual intrusion to the landscape from points where it is visible. It would create a noticeable change to the continuity of color, form, line and texture of the landscape. There also may be a certain amount of exhaust and dust emissions released into the air above the mine areas that may be visible; however, TMI has controls in place to limit these emissions in accordance with the air permit. Although the mine is not located on federally managed lands, OSMRE requires evaluation under the BLM visual resource management objectives and activities should conform to BLM Class IV (see Section 3.14).

4.13.1 Alternative A – Proposed Action

4.13.1.1 Direct Impacts

Under Alternative A, mining in the Project Area would continue and is visible from certain locations until reclamation allows the area to successfully blend with the natural surroundings which could take 20 to 30 years. The Project Area is located at approximately 6,900 feet (2,103 meters) amsl and topography and vegetation block the view of the mine from many locations. The Project Area cannot be seen from the west or the south. Visibility from the south is blocked by the Williams Fork Mountain ridgeline. Views from a small amount of higher elevation areas (7,500 feet [2,286 meters] amsl) to the east in the Williams Fork Mountains look upon the Project Area. The majority of the mine viewshed is to the north and mostly in the eastern portion of Moffatt County. The mine is visible from the town of Craig but not from Hayden. Some portions of Highway 13 north of Craig (paralleling Fortification Creek) also are within the mine viewshed. Because mining within the SMCRA permit boundary has occurred since the 1970s, it is unlikely that the residents of Craig notice it as a visual intrusion, but visitors to the region might notice the visual intrusion. The mine is visible from portions of the Yampa River extending approximately 5 miles (8 km) east of Craig and intermittently 13 miles (21 km) west (most of the western visibility would only include the draglines).

Overall, the visual impacts from the Project would be negligible to minor and short-term. These impacts would meet the BLM Class IV objectives.

TMI does operate throughout the night and uses lighting systems that are visible from the City of Craig. Lighting at the Trapper Mine is minimal and is kept to only that lighting necessary for operator safety. The lighting is directed downward to minimize the light cast outward. The Craig Station lighting is far more visible and overshadows the Trapper Mine lights. As a result, the visibility of the mine lights is minor and would last for the duration of mining operations.

4.13.1.2 Indirect Impacts

There would be no indirect impacts to visual resources as a result of Alternative A.

4.13.2 Alternative B – Disapproval of the Mining Plan Modification by the ASLM

4.13.2.1 Direct Impacts

Under Alternative B, OSMRE would not recommend approval of continued mining to the ASLM and the ASLM would not approve continued mining. TMI would cease mining activities in the Project Area and begin reclaiming the disturbed areas. Operational visibility and nighttime lighting would persist as mining continues in other areas of the SMCRA permit boundary. Final reclamation within the Project Area would be similar to Alternative A; however the reclamation would occur once mining operations cease. Visual intrusions as a result of mining would continue for areas outside the Project Area for an additional three to four years due to ongoing mining within the SMCRA permit boundary. Overall, the visual impacts from these continued mining activities would be negligible to minor and short-term. These impacts would meet the BLM Class IV objectives.

4.13.2.2 Indirect Impacts

There would be no indirect impacts to visual resources under Alternative B.

4.14 Paleontological Resources

4.14.1 Alternative A – Proposed Action

4.14.1.1 Direct Impacts

As the Project Area lies within a PFYC Class 5 zone, there is the potential that the ground disturbing activities would adversely affect fossils. If any such fossils of paleontological interest are located in the

Project Area, ground disturbing and overburden removal activities could damage the fossils and the information that could have been gained from them would be lost. Activities under Alternative A also could pose a beneficial impact to paleontological resources by increasing the chances for discovery of scientifically important fossils within the Project Area. Surface coal mining and related activities could have a permanent adverse impact on paleontological resources. Paleontological resources not identified and transported prior to or during mining operations would be permanently lost. Because the Project Area disturbance is small compared to the overall Williams Fork Formation, impacts to paleontological resources are expected to be long-term and negligible.

4.14.1.2 Indirect Impacts

There would be no indirect impacts to paleontological resources from Alternative A.

4.14.2 Alternative B – Disapproval of the Mining Plan Modification by the ASLM

4.14.2.1 Direct Impacts

Under Alternative B, mining would cease and closure and reclamation would be initiated. Additional disturbance would occur outside of the Project Area in the N and I pits. The N Pit has been previously disturbed so the discovery of paleontological resources would be unlikely, but the I Pit is new disturbance. Impacts to paleontological resources as a result of Alternative B would be similar to impacts from Alternative A.

4.14.2.2 Indirect Impacts

There would be no indirect impacts to paleontological resources as a result of Alternative B.

4.14.3 Mitigation Measures

The following protection measures for paleontological resources are taken from the BLM LSFO ROD and Approved RMP (BLM 2011):

- Proposed surface disturbing actions will be evaluated to determine inventory needs and identify sites that could be potentially impacted by such activities. Surface disturbing activities in PFYC Class 4 and 5 paleontological areas that are devoid of thick soils and vegetation and with steep, unsafe cliffs will be inventoried by a qualified paleontologist with a valid Colorado BLM paleontology permit who is approved by the authorized officer. Mitigation measures for specific locations will be identified on a case-by-case basis.
- If paleontological resources are discovered during mining operations on BLM managed lands, mine employees shall immediately notify the BLM and shall not disturb such discovered resources until the Field Office Manager issues specific instructions. Within five working days after notification, the Field Office Manager shall evaluate any paleontological resources discovered and shall determine whether any action may be required to protect or to preserve such discoveries.

Should paleontological resources be encountered as a result of the Project, BLM and OSMRE would be consulted as appropriate.

4.15 Access and Transportation

4.15.1 Alternative A – Proposed Action

4.15.1.1 Direct Impacts

Under Alternative A Trapper Mine employee commuter traffic would continue to and from the mine when shift changes occur. The 37,226 annual truck trips required for the transportation of coal from the Project

Area and CCRs from the Craig Station also would continue. AADT counts on U.S Highway 40 and SHs 13 and 394 would not change as a result of the proposed project.

Roads within the SMCRA permit boundary consist of haul roads and light use ancillary roads. In-pit routes of travel and ramps are not considered roads because they are temporary and frequently move to accommodate mining activities; however, they would continue to be constructed, used, modified, and moved until they are reclaimed. No new roads would be constructed under Alternative A. Roads and routes of travel would be watered to abate the effects of fugitive dust emissions as required by air quality standards. Overall there would be no changes to transportation and access as a result of Alternative A.

4.15.1.2 Indirect Impacts

There would be no indirect impacts to access and transportation as a result of Alternative A.

4.15.2 Alternative B – Disapproval of the Mining Plan Modification by the ASLM

4.15.2.1 Direct Impacts

Under Alternative B mining within the Project Area would cease and reclamation activities would begin. Traffic related to mining within the Project Area would be reduced as reclamation is completed (approximately three to five years). Heavy equipment operating within the Project Area would cease with the exception of equipment engaged in reclamation activities. Mining activity may still occur in other areas within the SMCRA permit boundary resulting in continued internal traffic although the rate of mining would decrease from an average 2.3 mtpy to approximately 1.5 mtpy. The 37,226 truck trips would be reduced as a result of the reduced mining rate, but the hauling of CCRs waste would not change assuming the Craig Station continued to operate at current capacity. Changes to AADT counts for U.S Highway 40 and SHs 13 and 394 would be short-term and minor and occur mostly from fewer employees and reduced delivery of supplies as a result of the reduced mining rate. Over the long term, once mining is completed, traffic rates to and from the mine would be reduced.

4.15.2.2 Indirect Impacts

There would be no indirect impacts to access and transportation as a result of Alternative B.

4.15.3 Mitigation Measures

No mitigation measures would be necessary for access and transportation.

4.16 Solid Waste

4.16.1 Alternative A – Proposed Action

4.16.1.1 Direct Impacts

Direct impacts may occur through the mishandling or improper disposal of solid waste. Those impacts may include contamination of soil and water resources and could be long term if leaks or sources of contamination are not discovered in a timely manner. Under Alternative A, impacts to the environment from the potential release of hazardous or solid waste are not anticipated to occur. Solid waste that may be generated during coal mining would be mainly non-hazardous materials which would be hauled off site or disposed in mined out pits. Waste that can be disposed in mined out pits consists of inert materials such as trash, lumber, concrete, scrap iron, and unsalvageable tires (TMI 1981 et seq.).

Construction sites and all facilities would be maintained in a sanitary condition at all times. Waste materials that cannot be disposed on-site would be disposed of promptly at appropriate off-site waste disposal facilities. All hazardous waste would be accumulated and disposed off-site according to applicable rules and regulations. Human waste from the mine facilities is transported through a flow line to the Craig Station sewage system. The sewage at work sites in portable toilets would be transported off-site for disposal.

Assuming TMI follows the procedures outlined above for waste disposal, including hauling all materials that are not inert to an appropriate disposal facility, there would be no impacts from disposal of solid waste within the mined out pits.

4.16.1.2 Indirect Impacts

A waste stream deposited outside of the Project Area but which could result in indirect impacts is CCRs from the Craig Station. Indirect impacts may occur if buried CCRs material becomes leached and regulated constituents are released to the environment.

The CCRs would continue to be placed into pits during backfilling or placed and encapsulated into spoil piles as long as the Trapper Mine is active. An annual average of 501,000 tons of CCRs have been placed at the mine since 1999 (TMI 2015). The placement of CCRs into mine pits is regulated by rules of various agencies including the CDRMS, CDPHE, Moffat County, and the CSLB (TMI 2015). In order to conduct mine-filling, the CDRMS requires that the applicant conduct a baseline groundwater study to describe the hydrologic setting, define the chemical and physical characteristics of the coal combustion residuals and overburden, and assess the leaching potential of the waste.

The CCRs were subjected to leach testing and determined to present a low potential for toxic metals to be leached from the materials (TMI 1981 et seq.). The leaching potential of toxic metal constituents was tested in order to determine whether the CCRs could be considered characteristic hazardous waste. CCRs were subjected to the Extraction Procedure (EP) Toxicity test and the leachate was analyzed for a number of metal constituents (TMI 1981 et seq.). Of concern regarding hazardous waste determination are the eight RCRA metals: arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver. Concentrations of the RCRA metals in the EP toxicity leachate were orders of magnitude below the toxicity limits. Given the EP toxicity results, the CCRs were shown to be a non-hazardous waste. The percolation rate of the groundwater was also evaluated to determine the potential for the movement of contaminants in the event leaching of the material were to occur. The percolation analysis indicated that movement of any leached contaminants to the groundwater table would be very slow, and the material would be less likely to leach because of relatively low permeability of the CCRs.

The CDRMS also requires that the waste be isolated from surface and groundwater. The waste must be placed above the expected post-mining groundwater level and no less than 50 feet (15 meters) horizontally from surface drainages. Also, the coal combustion residuals must be covered with a minimum of six feet (two meters) of cover. Groundwater monitoring is required before, during, and after the waste is placed into pits.

As discussed in Section 4.5.1.2 impacts to groundwater as a result of CCRs placement are expected to be negligible due to the groundwater monitoring and the limited permeability and infiltration of groundwater into buried CCRs. The CCRs placement locations will be reclaimed in accordance with the approved reclamation plan and long-term indirect impacts from CCRs placement are expected to be negligible.

4.16.2 Alternative B – Disapproval of the Mining Plan Modification by the ASLM

4.16.2.1 Direct Impacts

Under Alternative B, mining operations would cease. As part of closure/reclamation, all materials or products not necessary for closure or reclamation activities would be removed from the Project Area. *The removal of materials and products would considerably reduce the risks associated with spills and contamination of soil and groundwater. Solid waste would be hauled off-site or disposed on-site in accordance with the TMI solid waste permit issued by Moffat County and TMI's SMCRA permit. Inert materials that can be disposed in mine pits would be placed into pits during backfilling. When active reclamation is complete, the potential impacts of waste generation and disposal would be negligible.* Solid waste disposal could continue for mining-related solid waste as a result of mining in areas outside of the Project Area using the same practices as currently employed. As a result the direct impacts of solid waste disposal under Alternative B would be the same as those outlined for Alternative A.

Once all mining and reclamation activities are completed, no impacts from solid waste generation and disposal would be anticipated.

4.16.2.2 Indirect Impacts

CCRs placement and the associated indirect impacts would continue under Alternative B. As discussed in Section 4.5.1.2, impacts to groundwater as a result of CCRs placement are expected to be negligible due to the groundwater monitoring and the limited permeability and infiltration. As described above for Alternative A, the CCRs placement locations are subject to monitoring and operational requirements. As a result, the impacts from CCRs placement under Alternative B would be the same as described above for Alternative A.

4.16.3 Mitigation Measures

No mitigation measures would be necessary for solid waste since there are regulatory programs that govern the handling of waste materials.

4.17 Noise

4.17.1 Alternative A – Proposed Action

Project noise under Alternative A would remain consistent with current mining activities. TMI currently mines at an average rate of 2.3 mtpy with a maximum production rate of 2.6 mtpy. These production rates would not increase under Alternative A. In addition, TMI would use the same equipment as described in Chapter 2.0. Reclamation activities would continue as before occurring as the mining process moves eastward. Production and disturbance rates would continue 24 hours a day, 7 days a week through the end of the life of mine in 2025.

4.17.1.1 Direct Impacts

Currently the closest sensitive receptor is an isolated residence located approximately 0.46 mile (0.74 km) to the north of the disturbance area. As mining activities continue eastward, the nearest sensitive receptor would shift to a residence located 0.70 mile (1.13 km) north of the Project Area and L Pit. Operational noise associated with reclamation, haul trucks and the mine pit have not elicited any complaints for noise at the Trapper Mine. Given the topography and vegetative cover, it is likely that most noise would be attenuated before reaching any residences or receptors and noise related impacts would be short-term, during the life of the mining and reclamation operations, and negligible.

4.17.1.2 Indirect Impacts

Indirect impacts include noise associated with haul trucks carrying coal to the Craig Station or CCRs back to the Trapper Mine for placement. In addition, the noise associated with the activities at the Craig Station would be an indirect noise impact. No information is available to quantify the noise associated with the Craig Station; however, there are no residences within close proximity to the Craig Station so noise related indirect impacts would be negligible but would occur long-term over the life of the Craig Station.

4.17.2 Alternative B – Disapproval of the Mining Plan Modification by the ASLM

4.17.2.1 Direct Impacts

Under Alternative B, mining activities within the Project Area would be terminated. TMI would continue to mine within the SMCRA permit boundary outside of the Project Area. Reclamation within the Project Area would begin once mining ceased. Noise for this process would be directly related to tearing down and moving structures and equipment, backfilling and grading the land to the approved post-mining topography, topsoil replacement, and seeding activities. Reclamation activities within the Project Area are expected to be completed three to five years after closure with the impacts associated with these activities being similar to Alternative A. The closest residence to the activities in the N and I pits outside of the Project Area is located 0.66 mile (1 km) west of the I Pit.

Within the I and N Pit mine areas outside of the Project Area, mining would occur at a slower rate than the mining presently being conducted, resulting in less noise production. Direct impacts of Alternative B would be short-term and negligible.

4.17.2.2 Indirect Impacts

Indirect impacts under Alternative B would be the same as described for Alternative A.

4.17.3 Mitigation Measures

No mitigation measures would be necessary for noise.

5.0 Cumulative Impacts[1]

5.1 Introduction

This chapter discusses the potential contribution to cumulative impacts of Alternative A - the Proposed Action Alternative, and Alternative B - Disapproval of the Mining Plan Modification by the ASLM. Alternative C - the No Action Alternative is not evaluated in detail because the potential contribution to cumulative impacts of Alternative C would fall within the range described for Alternative A and Alternative B, depending on when Alternative C is implemented. Each of these alternatives is described in Chapter 2.0.

Cumulative impacts are those impacts that result from incremental effects of an action when added to other past and present actions, and reasonably foreseeable future actions regardless of what agency or other entity undertakes such other actions. Cumulative impacts occur over a given time period. The time period for cumulative effects includes the time period when the impacts of past and present actions and reasonably foreseeable future actions overlap with the time period when project impacts would occur (including construction, operation, and reclamation phases).

This section considers past and present actions and reasonably foreseeable future actions within a cumulative impact assessment area (CIAA) defined for each resource. The CIAA varies by resource and was determined based on the location, extent, and type of resource impacts as described in Chapter 4.0. The CIAA for each resource, and the time frame associated with each CIAA, are included on **Table 5-1**.

Table 5-1 CIAA and CIAA Time Frame by Resource

Resource	CIAA	CIAA Time Frame
Topography	SMCRA permit boundary	Until approved post-mining topography is achieved
Air Quality	Airshed boundary	Through the life-of-mine and *completion of* reclamation
Climate Change	*State of Colorado*	Through the life-of-mine and *completion of* reclamation
Geology and Minerals	SMCRA permit boundary	Through the life-of-mine and backfilling operations
Surface Water and Groundwater Resources	Yampa River and associated drainages from the confluence of Elkhead Creek to the confluence of the Williams Fork River, including the Williams Fork River and its tributaries *from the confluence of its South and East Forks to the confluence with the Yampa River*.	Through the life-of-mine and Phase III bond release
Soils	SMCRA permit boundary	Through the life-of-mine and completion of reclamation
Vegetation	SMCRA permit boundary	Through the life-of-mine and Phase III bond release
Wetlands and Riparian Zones	SMCRA permit boundary	Through the life-of-mine and Phase

[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.

Table 5-1 CIAA and CIAA Time Frame by Resource

Resource	CIAA	CIAA Time Frame
		III bond release
Small game and migratory birds, including raptors	SMCRA permit boundary	Through the life-of-mine and Phase III bond release
Big Game	Game Management Unit	Through the life-of-mine and Phase III bond release
BLM/State Sensitive species	SMCRA permit boundary plus 1-mile (1.6-km) radius around disturbed areas	Through the life-of-mine and Phase III bond release
Yellow-billed cuckoo	SMCRA permit boundary plus 2 miles (3.2 km) up and downstream of the Craig Station on the Yampa River	Through the life-of-mine
Colorado River Fish	Airshed boundary	Through the life-of-mine
Cultural and Historic Resources	SMCRA permit boundary plus 0.25-mile (0.4-km) buffer zone	Through the life-of-mine
Socioeconomics	Moffat, Routt, and a portion of Rio Blanco counties	Through the life-of-mine and completion of reclamation
Visual Resources	Viewshed for the Project Area	Through the life-of-mine and completion of reclamation
Paleontology	SMCRA permit boundary	Through the life-of-mine
Access and Transportation	Moffat, Routt, and a portion of Rio Blanco counties	Through the life-of-mine and completion of reclamation
Solid Waste	SMCRA permit area plus the Moffat County landfill and the Hayden Generating Station CCRs placement area	Through the life-of-mine and completion of reclamation
Noise	Project Area and 0.5-mile (0.8-km) buffer	Through the life-of-mine and completion of reclamation

For all resources, the CIAA for Alternatives A and B are the same because under Alternative B, mining at the Trapper Mine would continue in areas outside of the Project Area, and the other past and present actions and reasonably foreseeable future actions would remain the same. *The timing for completion of mining activities under Alternative A would be approximately 10 years, while the timing for completion of mining activities under Alternative B would be three to four years.*

5.2 Past and Present Actions

Past and present actions in Moffat, Routt, and the eastern third of Rio Blanco County, including the Colowyo Coal Mine and the town of Meeker, include coal mining, sand and gravel mining, power generation, livestock grazing, ranching, recreation, and oil and gas development. These activities have the potential to affect natural and human resources in the area.

Coal mining has been present in these three counties for decades. A number of mines that were active as of August 3, 1977, when SMCRA was enacted became permitted by CDRMS. Some mine operators chose not to seek permits and several mines that obtained permits from CDRMS have since been reclaimed and their permits terminated. Past and present coal mining includes mines categorized by CDRMS as presently active, inactive, mines in temporary cessation, and mines in permanent cessation.

Active coal sites include those that are producing, idled (not producing but not in temporary cessation), or are no longer producing and are in the process of conducting final reclamation. Active coal mining operations within the three counties include:

- The Colowyo Mine, operated by Colowyo Coal Company, is a producing surface coal mine located approximately 30 miles (48 km) southwest of the Project Area in Moffat and Rio Blanco counties.
- The Foidel Creek Mine, operated by the Twentymile Coal Company, is a producing underground mine located approximately 35 miles (56 km) southeast of the Project Area in Routt County.
- The Peabody Sage Creek Mine, operated by Peabody Sage Creek Mining, LLC, is an idled underground mine located in Routt County adjacent to and immediately north of the Foidel Creek Mine.

The Williams Fork Mine is a site located in Moffat County that is in temporary cessation (CDRMS 2015). Coal sites in temporary cessation have facilities on the ground but have temporarily stopped producing pending the possibility of obtaining new coal contracts. The Hayden Gulch Loadout, the Seneca II-West Mine and the Yoast Mine are coal sites in Routt County in permanent cessation (CDRMS 2015). Permanent cessation sites are those that are no longer producing and whose reclamation is a few years old, but whose reclamation has not progressed to the point that site-wide Phase III bond release has been achieved. Coal exploration has occurred in the past and continues in the region with approximately ten active coal exploration permits in the three counties described above (CDRMS 2015).

Other active mining operations within Moffat, Routt, and the eastern third of Rio Blanco County include sand, gravel, and crushed stone material operations (aggregate mining).

There are two power generating stations in the general vicinity of the Project Area:

- Craig Station located northwest and adjacent to the Project Area is operated by Tri-State Generation and Transmission Association; approximately 300 people work at the 1,264-MW plant (Tri-State 2015). Plant construction began in 1974 with the first operating unit completed in 1979. The plant site covers 1,120 acres. Its main water source is the Yampa River with supplemental allocations from nearby reservoirs. Craig Station receives its coal supply primarily from two sources: Trapper Mine and the Colowyo Mine sited about 30 miles (48 km) southwest of Craig Station. Trapper Mine delivers coal to the plant via 100-ton haul trucks from the mine site. Colowyo Mine delivers coal to the Craig Station daily by train. The station also augments these two sources of coal with spot coal purchases from other mines in northwestern Colorado (OSMRE 2015).
- The Hayden Station, located approximately 21 miles (34 km) east of the Craig Station in Routt County, is a 446-MW plant operated by Xcel Energy. Construction began in 1962 with operation of Unit 1 in 1965 and a second unit in 1976. The Hayden Generating Station receives its coal from the Twentymile Coal Company's Foidel Creek Mine and occasionally the Colowyo Mine. Coal is delivered to the station via train (OSMRE 2015).

Historically, the Project Area and the vicinity have been used for ranching and livestock grazing, in particular cattle and sheep. In addition to livestock grazing, the area also supports wildlife including big game species. Hunting is the primary recreational activity in the area. Routt County includes a 2,965-acre ski area with an annual average of 350,000 to 400,000 visitors.

Other existing developments in the region include towns and connecting roads. U.S. Highway 40 is the major east-west highway located north of the Project Area connecting the towns of Hayden, Craig, and Maybell. SH 13 is located immediately west of the mine and runs from the northeast to the southwest of the western permit boundary and also runs north of the City of Craig. This is the main highway connecting Craig with Meeker and Rifle to the south and Wyoming to the north. Various county maintained and unmaintained dirt roads and two tracks are located within the CIAA.

Electric transmission lines of various capacities traverse the Project Area and vicinity. Wilson Reservoir is located approximately 30 miles (48 km) southwest of the Project Area, and Elk Head Reservoir is located approximately 17 miles (27 km) northeast of the Project Area.

Oil and gas operations have been occurring in the vicinity of the Project Area since the 1920s. Numerous oil and gas wells have been drilled within Moffat, Routt, and Rio Blanco counties. The COGCC database lists a total of 137 wells as producing within a 20-mile (32-km) radius of the Project Area; 6 wells in the drilling stage, 4 wells used for injection, 2 wells awaiting completion, and 51 wells listed as shut-in or temporarily abandoned. Potential impacts from oil and gas development are more dispersed over a larger area than for mining operations (COGCC 2015a).

5.3 Reasonably Foreseeable Future Actions

Reasonably foreseeable future actions in the general vicinity of the Project Area include additional coal mining, continued livestock grazing, ranching and recreational activities, and ongoing oil and gas operations.

It is reasonable to assume that coal mining will occur in the future. This may occur either as an extension of current mining operations or in new areas. Reasonably foreseeable future activities at the current mining operation within the CIAA include:

- The Colowyo Coal Company's Colowyo Mine is in the process of obtaining approval for the Collom Expansion through OSMRE, BLM, and CDRMS. The Collom Expansion would extend mining operations for approximately 20 to 40 years, depending on the mine production rate. A NEPA document is being prepared to address the Collom Expansion. Produced coal would likely be supplied to the Craig power plant as well as other customers throughout the country (OSMRE 2015).
- The Twentymile Coal Company's Foidel Creek Mine *was recently issued a 310 acre lease modification* by the BLM LSFO*, effective April 1, 2016*. The lease modification added 310 acres and about 340,000 tons of federal coal to the Foidel Creek Mine (BLM 2015). CDRMS is reviewing an application for a PR that would include the mining of these 310 acres of federal coal.

Supplies of coal to the Craig and Hayden stations from the mines described above are not exclusive contracts. In the absence of any data to the contrary, it is assumed that the Craig and Hayden stations would continue operating at current levels even if Trapper Mine, Colowyo Mine, and Foidel Creek Mine stopped supplying coal because the stations would purchase coal from other suppliers.

Ranching and livestock grazing operations in the area are expected to continue at current levels for the reasonably foreseeable future. Additionally, hunting and other recreational activities also are likely to continue at current levels into the reasonably foreseeable future.

According to the COGCC database, there are 67 oil and gas wells which are permitted through COGCC but have not yet been drilled within a 20-mile (32-km) radius of the Project Area (COGCC 2015a). 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. In 2014, 112 parcels comprising 86,423.66 acres within the LSFO were nominated for the February 2015 Competitive Oil and Gas Lease Sale (OSMRE 2015). 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. Additional lease parcels were nominated in 2015 for the 2016 sale, and future lease parcels are expected to become available in subsequent years (BLM 2015). Within the Project Area, oil and gas development may potentially occur after completion of coal mining and reclamation of the current and proposed mining areas is completed.

5.4 Cumulative Impacts

This section describes potential cumulative impacts to resources in the vicinity of the Project Area from the past and present actions and reasonably foreseeable future actions in conjunction with the alternatives. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR 1508.7). For each resource, the contribution to cumulative impacts in the CIAA is described. The CIAAs vary by resource, as shown in **Table 5-1**, and range in geographic size from the Project Area with a buffer (for noise impacts) to a watershed (water) and all or portions of three counties (socioeconomics and transportation). For the analysis of cumulative impacts, it is assumed that all design features and any applicable mitigation measures for Alternative A would be implemented.

5.4.1 Topography

The CIAA for topography is the SMCRA permit boundary. Overall, mining of the Project Area under Alternative A or outside the Project Area under Alternative B would result in a short-term contribution to cumulative impacts on topography during mining operations. The contribution to cumulative impacts under both alternatives would cease, once the approved post-mining topography is achieved.

5.4.2 Air and Climate Resources

The CIAA for air quality encompasses the airshed boundary (**Figure 3-1**). For air quality, the direct and indirect emissions associated with the Trapper Mine are already occurring in the local environment (Section 4.3). As such, any cumulative air quality impacts are reflected in the air quality monitoring data collected in western Colorado, and the cumulative air quality impacts are represented by the baseline air quality conditions described in Section 3.3.

5.4.2.1 Regional Air Emission Sources

Table 5-2 summarizes the air emissions from industrial and commercial sources located within the airshed boundary (**Figure 3-1**). These data were compiled from APENs submitted to CDPHE by the regulated air emission sources and are reported in the Colowyo South Taylor EA (OSMRE 2015). The APEN emissions inventory is dominated by the two coal-fired electric generating stations in the region: Craig Station and Hayden Generating Station.

Table 5-2 Air Emissions Inventory for EA Air Quality Study Area Compiled from CDPHE APEN Data

Pollutant	Emissions (tpy)
$PM_{2.5}$	837
PM_{10}	3,462
SO_2	5,609
NO_X	19,147
CO	3,350
VOCs	2,798

Source: OSMRE 2015.

Table 5-3 summarizes the county-by-county data for northwest Colorado as compiled by the 2011 USEPA National Emissions Inventory (OSMRE 2015). These data include the industrial/commercial emission sources listed in the previous table, plus non-industrial emissions sources such as mobile sources (automobiles and trucks).

Table 5-3 Air Emissions Inventory in tpy by County - 2011 National Emissions Inventory Data

County	CO	NO_x	PM_{10}	$PM_{2.5}$	SO_2	VOCs
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**

Source: OSMRE 2015.

5.4.2.2 Cumulative Direct and Indirect Air Emissions

Table 5-4 provides a cumulative summary of the direct and indirect emissions that would be associated with Alternative A. The direct/indirect emissions data are reported for the worst-case year (2020).

Table 5-4 Summary of Trapper Mine Direct and Indirect Air Quality Emissions and Contribution to Cumulative Total Emissions

	CO tpy	NO_X tpy	PM_{10} tpy	$PM_{2.5}$ tpy	SO_2 tpy	VOCs tpy	CO_2e MT/yr
Fugitive Dust	--	--	591	91	--	--	--
Fuel Combustion	378	987	66	64	52	72	380,973
Blasting	291	74	<1	<1	9	--	22,364
Coal Seams	--	--	--	--	--	--	126,678
CCRs Disposal	5	12	13	2	2	1	985
Craig Station	650	7,445	*98*	*61*	1,*567*	78	5,341,966
Trapper Mine Direct and Indirect TOTAL	**1,324**	**8,518**	***768***	***218***	**1,*630***	**151**	**5,872,966**
Contribution to Cumulative Total	2.3%	19.4%	3.0%	2.7%	22.7%	0.1%	4.1%

Also shown in **Table 5-4** is the relative contribution of the direct/indirect emissions to the cumulative county-wide emission totals described earlier, or in the case of the CO_2e emissions, the comparison is to the statewide 2010 GHG emissions inventory (CDPHE 2014). Generally, the direct/indirect emissions for the Trapper Mine would contribute about 2 to 3 percent to the emissions total from the four-county area (Moffat, Routt, Rio Blanco, and Garfield) of the airshed boundary. The exceptions would be the SO_2 and NO_X emissions, which are dominated by the coal-fired electric generating station emissions (Craig Station and Hayden Station). For NO_X and SO_2, the Trapper Mine contribution would be about 20 percent, primarily from the indirect emissions associated with combustion of coal from Trapper Mine at Craig Station. Overall, Alternative A's direct contribution to cumulative air quality impacts would continue throughout the life of the mine and *through completion of reclamation*. The indirect contribution to cumulative air quality impacts would continue *as long as Trapper Mine is contributing coal to the* Craig Station.

PM_{10}, $PM_{2.5}$, NO_2, and SO_2 Impacts

Direct emissions at Trapper Mine are dominated by the PM_{10} and $PM_{2.5}$ fugitive dust emissions. Fugitive dust emission impacts from surface mining operations tend to be localized. As a fugitive dust plume moves downwind, gravitation and other physical forces deplete the emissions plume and particle deposition occurs. The localized nature of fugitive dust emissions minimizes the potential for large-scale cumulative air quality impacts with other regional emission sources.

In the dispersion modeling studies described in **Appendix B**, the cumulative impacts have already been addressed through the incorporation of a "background" concentration for the pollutants modeled. Background represents the contribution to ambient air quality impacts from sources not explicitly included in the modeled emissions source inventory. As such, the air quality impacts reported in Section 4.3.1 would be representative of the expected cumulative air quality impacts for the areas immediately surrounding the Trapper Mine.

O_3 Impacts

Cumulative O_3 impacts would be best represented by air quality monitoring data within the airshed boundary. These data are summarized in **Table 5-5**. For the monitoring stations reported in **Table 5-5**, only the Lay Peak and Meeker monitoring stations occur within the airshed boundary. As the Trapper Mine direct and indirect emissions already exist and no changes to production at the Trapper Mine are proposed as part of the Project, any cumulative impacts associated with Trapper Mine-related emissions and other regional emissions are included in the O_3 monitoring data from these locations.

The measured O_3 concentrations were compared to the O_3 NAAQS adopted by USEPA in October 2015 (70 ppb). Based on the current (2014) O_3 monitoring levels representative of the airshed boundary (i.e., Lay Peak and Meeker monitoring stations), the O_3 levels in the airshed would comply with the more restrictive NAAQS adopted in 2015.

Table 5-5 Western Colorado O_3 Measurements Representative of Trapper Mine Air Quality Study Area Based on 2014 Monitoring Data

Monitor	Location (County)	2014 O_3 Concentrations (ppb)			NAAQS (ppb)
		1st Maximum	4th Maximum	3-year Average of 4th Maximum (2012-2014)	
Rifle	Garfield	62	61	63	70
Lay Peak	Moffat	67	62	64	70
Meeker	Rio Blanco	63	62	63	70
Rangely	Rio Blanco	66	62	74	70

Source: OSMRE 2015b.

The Colorado Air Resource Management Modeling Study (CARMMS) also is a useful tool for assessing projected cumulative impacts to O_3 levels. CARMMS was commissioned by BLM to track air quality across the different Colorado field offices, with a focus on addressing how potential future oil and gas development might affect air quality. CARMMS simulates the air quality effects of oil and gas development out to the year 2021, and simulates different levels of projected development. The "high" development scenario is based on reasonably foreseeable development scenarios developed by each local BLM field office. With the decline in oil prices in 2015, it remains to be seen whether the projections for new oil and gas development in western Colorado reflected by the BLM scenarios will occur.

The CARMMS information is most useful in the projections of future O_3 levels. The CARMMS modeling applied the Community Airshed Model with Extensions, which simulates pollutant emissions, transport, and dispersion using a four-km (2.5-mile) grid. The four-km grid spacing means that local features associated with the Trapper Mine would not be detected by the Community Airshed Model with Extensions, so the AERMOD modeling conducted for PM_{10}, $PM_{2.5}$, SO_2, and NO_2 is considered a more realistic depiction of the local impacts near the Trapper Mine (see Section 4.3.1.3). However, as O_3 was not modeled for the Trapper Mine, the CARMMS information is useful for tracking potential O_3 levels and is the only available information that would capture future emissions associated with expected oil and gas development in the region.

The CARMMS modeling output for the 4th highest daily maximum concentration was reviewed for the "high" development scenario. The area of Moffat County surrounding Craig showed projected O_3 levels from the CARMMS modeling generally in the 67 to 70 ppb range, which is within the updated NAAQS. Immediately near Craig and the Craig Station, the projected O_3 levels from the CARMMS modeling would be in the 65 to 70 ppb range. In close proximity to the Craig Station, the NO_X emissions from the power plant likely deplete the O_3 levels, and this effect appears in the CARMMS modeling.

In western sections of Moffat County and Rio Blanco County near Rangely, the projected O_3 levels would be 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 Trapper Mine airshed boundary. As stated previously, 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 Trapper Mine direct and indirect emissions.

Acid Deposition and Visibility Impacts

Acid deposition and visibility are of concern in designated Class I PSD areas. Downwind of the air quality study area, Class I areas include the Mt. Zirkel Wilderness located in the Park Range east of Steamboat Springs.

Acid deposition and visibility impacts are generally associated with SO_2 and NO_X emissions from coal-fired electric generating stations, which would include the Craig Station. The indirect impacts associated with combustion of coal from Trapper Mine are presented in Section 4.3.1.2. Other coal fired electric generating stations that could impact visibility and acid deposition at the Mt. Zirkel Wilderness include the Hayden Station (Hayden, Colorado), the Jim Bridger Station (northeast of Rock Springs, Wyoming), and the Bonanza Station (southeast of Vernal, Utah). The relative impacts to acid deposition and visibility from Jim Bridger are somewhat mitigated by the distance to the Mt. Zirkel Class I area, and the relative impacts from Bonanza are somewhat mitigated by the distance and small electric generating capacity of this unit.

Improved emission controls are expected at all nearby electric generating stations within the next five to 10 years. These improvements are intended to help mitigate any ongoing impacts related to visibility and acid deposition. Most of the future emission control improvements would reduce NO_X emissions. NO_X reductions would occur at Craig Station from installation of SCR at Units 1 and 2 and SNCR at Unit 3 to meet emission limits established by the Colorado Regional Haze SIP (see **Table 4-8**). These reductions are required at the Craig Station over the 2018-2021 timeframe. Similar emissions reductions are scheduled to occur at the other regional coal-fired electric generating stations in response to BART regulations and other requirements of the Colorado Regional Haze SIP rules. After these emission reductions occur, the visibility and acid deposition impacts to Class I areas such as Mt. Zirkel Wilderness should be reduced.

5.4.2.3 Cumulative GHG Impacts

As summarized in Section 4.3, the project-related direct and indirect GHG emissions would be dominated by the indirect emissions linked to combustion of the Trapper Mine coal at the Craig Station.

The indirect GHG emissions at Craig Station represent 4.1 percent of the Colorado GHG emissions total (2010 data) and 0.07 percent of the national GHG emissions total (2007 data) as shown on **Table 4-14**.

The GHG-related impacts from an individual emissions unit cannot be accurately quantified. Possible GHG impacts have already been described in Section 4.3.1.2, and these impacts represent the possible cumulative effects of all GHG emissions (USEPA 2015).

- The region *will* experience warmer temperatures with less snowfall.
- Temperature are *expected to increase more* in the winter months *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, recreationalists, and others. In late summer, rivers, lakes, and reservoirs will be drier.*
- *More frequent, more severe, and* possibly longer-lasting droughts *will occur*.
- Crop and livestock production *patterns could* shift northward*; less soil moisture due to increased evaporation may increase irrigation needs*.
- Drier conditions *will reduce the range and health of* ponderosa and lodgepole pine *forests;*~~)~~ and increase the susceptibility to fire.
- Grasslands and rangeland *could* expand into previously *forested* areas.
- Ecosystems *will be* stressed *and* wildlife, such as mountain lion, black bear, long-nose sucker, pine marten, and bald eagle *could be further stressed*.

5.4.2.4 Cumulative Air Quality and Climate Impacts – Alternative B

Alternative B is not expected to have substantially different cumulative air quality and climate impacts compared to Alternative A. Cumulative impacts in the airshed boundary would be dominated by non-project-related emissions, and these emissions and associated impacts would continue under Alternative B. Indirect impacts tied to coal combustion at the Craig Station would be expected to continue under Alternative B. TMI would mine alternative coal resources from lands outside the subject leases although the mining rate would be reduced. Craig Station could secure alternative coal sources to operate at or near current levels. Overall, the net result would be no substantial changes in the contribution to cumulative air emissions and impacts under Alternative B.

5.4.3 Geology and Minerals

The CIAA for geology and minerals is the SMCRA permit boundary. From 1978 to 2014, the Trapper Mine has cumulatively produced 78,740,532 tons of coal for an approximate average of 2.13 mtpy (TMI 2015). Under Alternative A, approximately 19 million tons of coal would be mined resulting in an additional increment of approximately 25 percent of the expected cumulative production by 2025 (or a total of 97,875,232 tons). The additional production would contribute an incremental removal of overburden and interburden which would be proportional to the amount of coal removed depending on the stripping ratio encountered during mining.

Cumulative coal production from 1864 to 2014 in Moffat and Routt counties (including the Colowyo and the Foidel Creek mines) is approximately 594 million tons (Carroll 2004; CDRMS 2015). The mining of an additional 19 million tons of coal under Alternative A would represent 3 percent of the total cumulative production from these counties. However, the additional 19 million tons of coal represents a tiny fraction of the coal resource in the Yampa Coal Field which was estimated at 7.6 billion tons of coal less than 500 feet deep (Brownfield et al. 2000). Overall, the contribution to cumulative impacts to geology during the life of the mine and backfilling operations would be negligible.

Under Alternative A, the contribution to cumulative effects on other mineral resources would be minimal because impacts would be short term and probably avoidable in case of oil and gas drilling.

It is not possible to assess the incremental cumulative effects of geologic hazards (landslides and slope instability) due to the proposed project because of widespread unstable conditions in the CIAA. Coal mining activities have contributed to slope instability (landslides) in the past. There also are naturally occurring landslides in the CIAA. Overall, given appropriate design and monitoring, geologic hazards are not expected to contribute appreciably to cumulative impacts in the CIAA.

Under Alternative B, coal mining would cease in the Project Area resulting in a permanent loss of approximately 17.35 million tons of coal. Mining for coal would continue in areas outside the Project Area, with a projected known resource of 4.5 million tons. The loss of 17.35 million tons of coal reserves would be minimal compared to the total estimated coal resource mined in the CIAA. Overall, the contribution to cumulative impacts would be similar to Alternative A. There would be no expected contribution to cumulative effects to other mineral resources under Alternative B. As with Alternative A, it is not possible to assess the cumulative incremental effects of geologic hazards (landslides and slope instability) because of widespread unstable conditions in the CIAA.

5.4.4 Water Resources

The CIAA for water resources is the Upper Yampa River watershed in Moffat County. This area encompasses the Yampa River and its tributaries from Elkhead Creek to the Williams Fork River, and the Williams Fork from the confluence of its South and East forks to the confluence with the Yampa River. Within the CIAA, the types of past and present actions and reasonably foreseeable future actions that could contribute to cumulative water resources effects include oil and gas development, aggregate mining, power production at the Craig Station, and livestock grazing.

The CIAA for water resources does not include other active coal mines in the Upper Yampa River watershed, most of which are located in Routt County. However, the analysis presented below does incorporate cumulative impacts from coal mining in the watershed by reference from the Yampa River Cumulative Hydrologic Impact Assessment (CHIA) completed by CDRMS (CDRMS 2010).

There are a number of active oil and gas wells in the analysis area. Activities during the production phase of oil and gas development mainly include visiting well sites to take measurements, collect hydrocarbons, and collect and dispose of waste material. In the CIAA for water resources there are limited opportunities to pump hydrocarbons directly into distribution lines, and most wells have separate tanks for oil and produced water. Accidental spills of these materials could result in cumulative surface water or groundwater quality impacts. If a spill should occur, these impacts would generally be confined to a localized area around the well pad and would be considered negligible at the scale of the analysis area.

Surface disturbance from future oil and gas exploration and development could contribute to cumulative water quality impacts through increased runoff and erosion as new well pads and access roads are constructed. In the short term, erosion from the disturbed areas could increase sediment loads in the Yampa River and its tributaries. However, during construction of oil and gas locations in Colorado, and prior to interim reclamation, oil and gas operations must be covered under a Stormwater Construction General Permit issued by the CDPHE. Once interim reclamation has been successfully completed, oil and gas sites are subject to water quality controls under COGCC regulations. With these controls in place, water quality impacts from oil and gas operations are expected to be negligible in the short term and long term.

Aggregate mining also could contribute to cumulative water quality and water quantity effects. Current aggregate mining operations are concentrated around the Yampa River near Craig. The proximity of these operations to the river increases the potential for water quality impacts. Aggregate mines also have the potential to form “gravel pits,” which may need to be dewatered during active mining. Dewatering pumping can lower water levels in nearby groundwater supply wells and also may result in surface water depletions. Post-mining, evaporative losses can increase as gravel pits fill with runoff and groundwater. Relative to the size of their operations, aggregate mines have the potential for greater impacts to groundwater and surface water supplies than Alternative A, mainly because the aggregate mines are located in closer proximity to the Yampa where groundwater is present at shallower depths.

Coal combustion at the Craig Station also could contribute to cumulative water resource effects. Some of these potential impacts, such as the amount of surface water diverted annually by the Craig Station, have already been discussed in Section 4.5 as indirect effects related to Alternative A. Other potential cumulative impacts from the Craig Station could result from runoff of oil, grease, sediment, or dissolved metals from operation areas and coal storage piles. The potential for these types of water quality impacts would (presumably) be managed through implementation of a CDPS permit and required routine monitoring of the Craig Station’s CDPS outfalls.

Even with the presence of oil and gas development, aggregate mines, and the Craig Station, much of the CIAA is still undeveloped rangeland used for grazing. Livestock grazing can increase erosion and sedimentation with potential impacts to water quality. However, grazing practices on public lands in the Project Area are managed by the BLM LSFO to protect other resources and resource uses. In the long term, water resource effects from grazing are expected to be minor.

The Yampa River CHIA (CDRMS 2010) identifies four main types of probable surface water consequences associated with surface and underground coal mining in the Yampa River Basin:

- Increased erosion from mine permit areas
- Temporary changes in the timing of runoff in nearby stream flow regimes
- Development of spoil aquifers
- Increased TDS concentrations in mine discharge

Of these effects, CDRMS indicates that increasing TDS concentrations in mine discharge pose the greatest risk of cumulative impacts to the Yampa River. To further evaluate this impact, the agency developed a salinity mass-loading model for the Yampa River using a modeling routine written by USGS. The model sums streamflow discharge and dissolved solids concentrations based on a node system created for the stream network. The CDRMS model has been divided into three separate modeling domains; two upstream domains that account for coal mine discharges in the eastern part of the Upper Yampa River watershed, and a downstream model of the Yampa River main stem to a point below Colowyo Mine. Calculated TDS results from the two upstream models are used as inputs in the main stem model, along with TDS inputs associated with the Trapper Mine area, Williams Fork River, Colowyo Mine, and Dry Creek.

The salinity model results provide an indication of the cumulative TDS increase from mining and a prediction of the average TDS concentration expected in the Yampa River at Maybell. The predicted TDS increase varies by month and by flow conditions in the river. For example, during the high flow month of June, mining discharges are expected to increase the average river TDS concentration by approximately 50 mg/L. However, prior to spring snowmelt in March, the TDS increase in the river could be as high as 200 mg/L. Predicted future TDS concentrations in the river at Maybell range from an average of 120 mg/L in June to 522 mg/L in March. Overall, this represents a 29 percent increase in the river TDS compared to baseline levels. Although this increase is entirely attributable to coal mining, it does not meet the material damage criteria for surface water quality established in the Yampa River

CHIA. As such, CDRMS concludes that cumulative surface water quality impacts from coal mining in the Yampa River watershed are not expected to be significant.

For groundwater, CDRMS defines several smaller cumulative impact analysis areas in the CHIA because of the structural and stratigraphic controls that help confine groundwater impacts to a smaller area relative to surface water. The cumulative impact analysis area encompassing Trapper Mine includes only one other coal mining operation; the Williams Fork underground mine (formerly the Eagle No. 5 and No. 9 Mine) that is in temporary cessation. Even if the Williams Fork Mine resumes operation, cumulative groundwater impacts are expected to be negligible, largely because the mine has historically extracted coal from stratigraphic intervals below the upper Williams Fork Formation mined by TMI.

There is some possibility for the two mines to create cumulative drawdown effects in the Twentymile Sandstone. Trapper uses the Twentymile Sandstone for its potable water supply, extracting 32 acre-feet of groundwater from the sandstone during water year 2014 (Cummins 2015). The Williams Fork Mine also may indirectly remove water from the Twentymile Sandstone by dewatering deeper formations. Groundwater level declines in the Twentymile Sandstone are predicted to reach 20 feet at a five-mile radius from the Williams Fork Mine and up to 60 feet at a one-mile radius from the affected area (CDRMS 2010). The additive effect of groundwater pumping and mine dewatering from the Twentymile Sandstone could lower groundwater levels in nearby private wells completed in this unit. Impacts are contingent upon resumed operations at the Williams Fork Mine and would likely be negligible.

Overall, the contribution from Alternative A to cumulative water resource impacts is expected to be minor. Federal and state regulations that apply to mining, oil and gas, and power generation facilities in the analysis area are designed to reduce water quality and water supply impacts to acceptable levels. The contribution to cumulative impacts would still occur to some degree through the life of the mine and Phase III bond release, particularly with respect to sediment erosion from disturbed ground, water depletions for power generation, and evaporative losses from inactive gravel pits. TDS concentrations in the Yampa River also are projected to increase by 29 percent as a result of coal mining, but no material damage to water resources would occur (CDRMS 2010).

Overall, the Project’s contribution to cumulative water resource impacts would be less under Alternative B because the rate and duration of mining at Trapper Mine would be reduced. Mining would shift away from the Project Area to other parts of the SMCRA permit boundary where coal reserves are only expected to last three to four years. Consequently, reclamation would be implemented sooner under Alternative B, shortening the length of time that mine operations would affect groundwater and surface water resources. Cumulative impacts from other past and present actions and reasonably foreseeable future actions in the CIAA would be the same as Alternative A and are not expected to result in material damage to water resources.

5.4.5 Soils

The SMCRA permit boundary is the CIAA for soils. Mined areas in the CIAA outside the Project Area have been subjected to ongoing reclamation activities. Under Alternative A, surface disturbing activities would continue within the permit boundary and would contribute to cumulative impacts to soils. Soil disturbance would be minimized by TMI’s reclamation efforts which help prevent erosion and compaction of soils. Placing topsoil directly into reclamation areas or temporary, vegetated stockpiles also would help reduce erosion and disturbance that occurs in the permit boundary. While mining activities occur within the SMCRA permit area, no other development (including oil and gas) would be permitted in the Project Area during mining, which would limit the cumulative impacts to surface disturbing activities. Overall, Alternative A would have a minor contribution to cumulative impacts to soils during the life of the mine. The Project’s contribution to cumulative impacts would cease following the completion of successful reclamation.

Under Alternative B, mining operations would be discontinued within the Project Area in exchange for immediate reclamation activities, including filling, contouring, grading of soils, topsoil application, and seeding. Mining would continue to occur in areas outside of the Project Area under Alternative B, so the contribution to cumulative impacts to soils would continue to be minor during the life of the mine and would cease following successful reclamation.

5.4.6 Vegetation

The CIAA for vegetation is the SMCRA permit boundary, and the duration is through the life-of-mine and Phase III bond release. Additional mining under Alternative A would impact vegetation in the CIAA. Mining under Alternative A would add to the past and present actions and reasonably foreseeable future actions in the SMCRA permit boundary, resulting in a minor contribution to cumulative impacts due to the removal of mountain shrubland for mining and the eventual reclamation to rangeland and wildlife habitat. This would ultimately convert 257 acres of vegetation through contemporaneous reclamation as mining is completed in the various parts of the Project Area and add to the current total of 494 acres that have been released from reclamation liabilities. Within the Project Area, 22 acres of big sagebrush shrubland and *597 acres of mountain shrubland would remain undisturbed*. In the long-term, Alternative A would increase the past and present disturbance and reclamation footprint within the Project Area by about *19 percent from 1,547 acres to 1,844 acres*.

As contemporaneous reclamation is implemented, an earlier seral stage plant community with a diverse mosaic of grasslands and grass-shrub rangelands would develop. The reclaimed lands provide a varied array of habitats that are productive for wildlife and livestock that forage in the Project Area. The change in vegetation could shift use patterns of livestock and big game in the CIAA to favor reclaimed sites with more productive forage. At moderate grazing levels, livestock and big game can help to maintain a diverse and healthy plant community. The overall contribution to cumulative impacts to vegetation under Alternative A would be minor due to the localized effects and the improved productivity on mined lands following reclamation.

Mining and reclamation under Alternative B would conclude earlier and affect a smaller footprint within the Project Area than under Alternative A. However, mining would continue within the SMCRA permit boundary outside the Project Area. This would contribute to cumulative impacts to vegetation in areas outside of the Project Area where non-federal mining continues. There would be some additional disturbance of reclaimed lands to support mine facilities in this portion of Trapper Mine. Overall, with disturbance continuing but in a slightly smaller area, the contribution to cumulative impacts for vegetation under Alternative B is considered minor to negligible.

5.4.7 Wetlands and Riparian Zones

The CIAA for wetlands and WOTUS is the SMCRA permit boundary for the Trapper Mine. Approximately 1.55 acres of wetlands and WOTUS have been identified in the SMCRA permit boundary, outside of the Project Area. Any past impacts to wetlands or WOTUS in the CIAA have been or will be mitigated (see Section 4.7). Impacts from construction activities that occur within the CIAA also are mitigated to prevent runoff into drainages and wetlands. Oil and gas permitting practices and leasing approvals generally include mitigation for wetlands and would not occur within the active mining area. Alternative A would not disturb additional wetlands within the SMCRA permit boundary*. Overall cumulative impacts to wetlands and riparian areas would be negligible with the implementation of mitigation measures*.

Under Alternative B, mining activities would cease within the Project Area, and reclamation activities would occur earlier than under Alternative A. Mining would continue outside the Project Area*. Any additional wetlands disturbance would be required to be permitted through the USACE including potential wetlands replacement or mitigation. Mining under Alternative B* could result in a minor to negligible contribution to cumulative impacts to wetlands and WOTUS within the SMCRA permit boundary during the life of the mine and Phase III bond release.

5.4.8 Fish and Wildlife Resources

The CIAA for fish and wildlife resources is the SMCRA permit boundary for small game, mammals, reptiles, and migratory birds. The CIAA for big game is the surrounding Game Management Unit.

Overall, mining in the Project Area would contribute to cumulative impacts to fish and wildlife species during the life of the mine and Phase III bond release; however, the contribution would be minor to negligible. In the long term, Alternative A would increase the footprint of productive reclaimed rangeland and wildlife habitat by about 17 percent in the Project Area from 1,548 acres to 1,805 acres, which could support more elk and deer and improve the quality of seasonal ranges within a small portion of the big game CIAA.

Other activities in the region have the potential to contribute to cumulative impacts to wildlife under Alternative A. Livestock can compete for forage with big game and other wildlife species. Livestock grazing at Trapper Mine within the SMCRA permit boundary is managed to avoid harmful impacts on reclaimed lands and native habitats. With these management practices, it is unlikely that livestock would displace big game or other wildlife within the CIAA. Oil and gas development in the vicinity of the Project Area would have the potential to displace wildlife species from developed areas for the life of those projects. Big game species would be particularly susceptible to this type of impact. However, oil and gas development on both federal and state leases is strictly regulated and subject to wildlife protection mitigation measures and best management practices to minimize disturbance to big game and other wildlife. Dispersed recreation may disturb individual animals and could result in minor and temporary displacement of big game from suitable habitats in the big game CIAA. Cumulative impacts from these activities would likely be negligible due to the short-term duration and localized area of impacts.

The additional surface disturbance under Alternative A in combination with dispersed recreation and oil and gas development increase the potential for sediment transport to occur and, therefore, may potentially impact fisheries downstream from the Project Area. However, with implementation of sediment control features in the Project Area, the additional potential for sediment transport under Alternative A would be negligible. As a result, the contribution to cumulative impacts to fisheries also would be negligible due to the lack of habitat and unlikelihood of impacts to this resource.

Mining and reclamation under Alternative B would conclude earlier and within a slightly smaller footprint within the Project Area than with Alternative A. However, mining would continue within the SMCRA permit boundary outside the Project Area. This would continue to disturb wildlife habitat in areas outside of the Project Area where mining continues. There would be some additional disturbance of reclaimed lands to support mine facilities in this portion of Trapper Mine. Overall, with disturbance continuing but in a slightly smaller area, the contribution to cumulative impacts to wildlife resources under Alternative B would be negligible.

5.4.9 Special Status Species

The CIAA for BLM and state sensitive species is the SMCRA permit boundary plus a one-mile radius around the disturbance areas. The CIAA for the federally listed yellow-billed cuckoo is the SMCRA permit boundary plus two miles (3.2 km) upstream and downstream of the Craig Station on the Yampa River. The CIAA for the federally listed Colorado River fish species is the topographic airshed boundary. 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.

The duration of the cumulative impacts for special status species would last through the life-of-mine and Phase III bond release. The duration of cumulative impacts to the federally listed species, for which the Project would indirectly contribute to cumulative impacts during the life-of-mine, would continue past the life of mine and Phase III bond release though the life of the Craig Station.

Overall, there would be a negligible to minor contribution to the short-term cumulative loss or degradation of habitat for the northern leopard frog, golden eagle, burrowing owl, ferruginous hawk, American peregrine falcon, Brewer's sparrow, and Columbian sharp-tailed grouse. Following reclamation, the contribution to cumulative impacts from these activities would be at negligible levels.

The Colorado River fish are of particular concern. Other activities that occur in the region would have the potential to result in water depletions, including other mining operations in the region. However, any future depletion(s) would be subject to the 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 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 also has included several conservation measures designed to mitigate cumulative impacts to the Colorado River fish species and western yellow-billed cuckoo.

Neither Alternative A nor B would be expected to directly contribute to cumulative impacts to the Colorado River fish species or western yellow-billed cuckoo through the life of the mine and Phase III bond release. However, indirect impacts from the combustion of Trapper Mine coal at the Craig Station would continue to release mercury and selenium as long as Trapper Mine coal is being combusted at the Craig Station. Some portion of this mercury is reasonably likely to end up in the Yampa River, which would contribute to cumulative impacts to the Colorado River fish and western yellow-billed cuckoo. It is reasonably foreseeable that combustion at the Craig Station would continue to occur if coal was not supplied by Trapper Mine. Therefore, while mining within or outside the Project Area would contribute to 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 as coal would be supplied from elsewhere. The level of cumulative impacts to these federally listed species is unknown due to the uncertainties related to the impacts described in Chapter 4.0.

Mining and reclamation under Alternative B would conclude earlier and within a slightly smaller footprint in the Project Area than with Alternative A. However, mining would continue within the SMCRA permit boundary outside the Project Area. This would continue to disturb potential habitat in areas outside of the Project Area where mining continues. Consequently, mining in these areas could contribute to cumulative impacts for the golden eagle, Brewer’s sparrow, and Columbian sharp-tailed grouse where suitable native habitats are disturbed. It is unlikely or uncertain whether the burrowing owl, ferruginous hawk, American peregrine falcon, or northern leopard frog would be impacted due to the limited distribution or limited potential to occupy undisturbed parts of the remaining SMCRA permit area. There would be some additional disturbance of reclaimed lands to support mine facilities in this portion of Trapper Mine. Overall, with disturbance continuing but in a slightly smaller area, the contribution to cumulative impacts to BLM and State sensitive species would remain negligible.

5.4.10 Cultural Resources

The CIAA for cultural resources encompasses the full SMCRA permit boundary plus a 0.25-mile (0.4-km) buffer. The 0.25-mile buffer is included because sites found in this area, especially those for which setting is a key element of their NRHP eligibility, could be indirectly affected by mining and mining-related activities.

Most cultural resources tend to degrade over time due to natural processes, but many can survive relatively intact for many years depending on the extent of erosion and deposition. 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 SMCRA permit area. The CIAA has been historically used for livestock grazing and recreational activities such as hunting, in addition to mining. All of these activities could have resulted in sustained impacts to extant historic properties (i.e., NRHP-eligible cultural resources) within the CIAA.

Continued use and/or development of the CIAA would have the potential to diminish the integrity of cultural resources directly through physical disturbance or indirectly through the degradation of the historic environmental setting. Increased use of the area also opens up areas that have not been previously disturbed or are more remote, which could increase the potential for collection or vandalism of cultural resources by mine employees and other visitors.

Previous studies conducted between 1970 and 2013, identified 32 cultural resources (14 sites and 18 IFs) outside the direct APE but within the SMCRA boundary plus a 0.25-mile (0.4-km) buffer. An unknown number of these sites have likely been impacted by past mining activities based on the fact that 6,895 acres have been disturbed by mining activities within the CIAA. On a beneficial note, further development outside previously surveyed areas would result in additional cultural resource studies. Assuming that established documentation requirements are followed, these new areas of development would be intensively surveyed, newly recorded or known cultural resources would be evaluated or re-evaluated for NRHP eligibility, and effects to any historic properties (NRHP-eligible sites) and "needs data" site would be assessed. Impacts to adversely affected historic properties would be appropriately mitigated. The information gained from any new cultural resources studies would expand knowledge and understanding of the regional culture history. The potential impacts of Alternative A would be avoided through implementing design features and mitigation measures described in Section 4.11.3. Similar measures could be implemented for other types of federal undertakings and also would limit additional impacts to cultural resources. Because no impacts to NRHP-eligible or "needs data" cultural resources have occurred or are predicted under Alternative A, overall there would be no contribution to cumulative impacts to cultural resources during the life of the mine.

Mining and reclamation under Alternative B would conclude sooner than Alternative A within the Project Area and disturb less area. Mining elsewhere in the CIAA could disturb known or unrecorded cultural resources. While sites may have been impacted by past mining activities, it is anticipated that cultural resource surveys and evaluation of identified sites would be conducted prior to development outside of previously surveyed areas in the SMCRA permit boundary that may be mined in the future. Therefore, the overall contribution to cumulative impacts to cultural resources under Alternative B would be similar to Alternative A.

5.4.10.1 American Indian Concerns

The CIAA for American Indian concerns is the SMCRA permit area plus a 0.25-mile (0.4-km) buffer. *The Hopi Tribe and the Southern Ute Indian Tribe have indicated an interest in the rock art site, 5MF.948 (Section 6.3). Neither Tribe has indicated any other concerns about cultural resources within the CIAA. If additional cultural resources are identified within areas proposed for mining, additional consultation will be initiated.* Cumulative impacts to areas of American Indian concerns is anticipated *to be negligible* under either Alternative A or B.

5.4.11 Socioeconomics

The socioeconomic CIAA includes Moffat and Routt counties, as well as a portion of Rio Blanco County including the town of Meeker. There are several active coal mines in the CIAA, including the Colowyo Coal Mine and Foidel Creek Mine; there are several other coal mines that are inactive and undergoing reclamation. There also are numerous active oil and gas wells within the CIAA, as well as aggregate mining activity. Furthermore, both the Hayden and Craig stations and the Yampa Valley Regional Airport are within the CIAA. The socioeconomic impacts of Alternative A would contribute, in addition to these additional mining and energy development activities, to the direct and indirect support of industries that supply services to these industries. This direct and indirect support would further support employment across a range of industries, resulting in sustained local income and a continuation of local spending. Steady employment in these industries also would assist in sustaining school enrollment as well as the local housing market. These cumulative activities combined with the incremental input from Alternative A also would continue to contribute to the federal, state, and local tax base, which in turn would provide continued support to local services such as health care, education, and law enforcement. This local and state economic contribution would continue until 2025 when mining would substantially decrease. Overall, the socioeconomic benefits from Alternative A would result in a beneficial contribution to cumulative impacts through the life of the mine and reclamation.

Under Alternative B, the socioeconomic impacts described above as well as under Alternative A, Section 4.12, would end within the Project Area in 2016. Mining in other areas within the SMCRA permit boundary could continue with appropriate approvals from regulatory authorities. The lack of mining within the Project Area would result in the estimated loss, based on 2010-2015 averages, of approximately

$174.5 million in gross wages and benefits, $5.8 million in Abandoned Mine Land fees, $7.2 million in severance tax, $55.4 million in royalties, and $12.0 million in property tax revenue over the proposed mining timeframe, although this would be partially offset by the potential for mining on private and state lands within the SMCRA permit boundary. Ultimately, mine revenue would cease at the end of reclamation activities. Any decreases as a result of a reduced mining rate or delay in moving into other areas would add to the socioeconomic impacts already caused by uncertain oil and gas prices, as well as the unclear future of the local ranching and agriculture industry and the Craig Station as proposed carbon emissions rules may be implemented (Jaffe 2015). Potential limitations on land use within Northwest Colorado Greater Sage-grouse breeding areas and habitat could further contribute to socioeconomic impacts, across a range of resources, including but not limited to oil and gas development and ranching and agriculture (Jaffe 2015). Under Alternative B, closure of the Project Area to future mining would contribute *negative* cumulative socioeconomic impacts at the state *and* local level, depending on the amount of coal reserves available in other areas. *Negative impacts at the local level would be higher than at the state level.* Overall, Alternative B would result in a beneficial contribution to cumulative socioeconomic impacts through the life of the mine and reclamation; however, there would be a reduction in the contribution to cumulative impacts as compared to the Alternative A as a result of the reduced life of the mine. This may be partially offset by potential mining on private and state lands within the SMCRA permit boundary.

5.4.12 Visual Resources

The CIAA for visual resources is the viewshed for the Trapper Mine Project Area. Due to topography, the mine is only visible from intermittent locations to the north and northeast; the Town of Craig, U.S. Highways 40, and SH 13 (north of Craig). Under Alternative A, the visual impact of the mine would contribute to the visual changes to the landscape along with other non-natural components of the environment. Incremental changes would be minimal, due in part to the fact that Trapper Mine has previously disturbed approximately 6,900 acres within the SMCRA permit boundary. Non-natural components that are located within the viewshed of the mine include the Craig Station to the northwest of the Project Area; the Town of Craig; U.S. Highway 40; SH 13; electric transmission lines; sand, gravel, and stone quarries; and oil and gas wells and infrastructure. Intermittent portions of the Yampa River to the east and west of Craig have views of the Trapper Mine, multiple quarries, and oil and gas development.

Other regional non-natural components not located within the viewshed of the mine include the Colowyo Mine, approximately 20 miles (32 km) southwest of the Project Area; the Foidel Creek, Sage Creek, Yoast, and Seneca II-West mines approximately 15 to 20 miles (24 to 32 km) to the east of the Project Area; and the Hayden Station, Town of Hayden, cities of Steamboat Springs and Craig, Yampa Valley Airport, highways and roads, electric transmission lines, and oil and gas wells and facilities.

The contribution to cumulative impacts under Alternative A would continue throughout the life of the mine and reclamation (up to 30 years) and contribute to the visual impacts within the CIAA until final reclamation is complete. Under Alternative B, Trapper would cease mining operations and begin reclamation activities on the Project Area, and the cumulative impact contribution of the project would be shorter in duration, by approximately 10 years. Final reclamation would leave no scars where the mining has occurred. This may not result in a noticeable reduction to cumulative impacts for an additional 3 to 4 years as mining would continue within the SMCRA permit boundary.

Overall, the contribution to cumulative visual impacts under both Alternative A and Alternative B would be negligible to minor and would cease following the completion of successful reclamation.

5.4.13 Paleontological Resources

The CIAA for paleontological resources is the SMCRA permit boundary. Mining under Alternative A could incrementally add to the potential impacts to paleontological resources in the CIAA. Other regional activities that may impact paleontological resources include future oil and gas development and additional mining. Future ground disturbing activities associated with mining within the Project Area would be subject to paleontological protection measures. Given the small area disturbed relative to the existing disturbance in the CIAA and the overall large land area of the region, as well as the limited number of surface disturbing activities other than mining that may occur, Alternative A's overall contribution to cumulative impacts would be negligible and would cease following the completion of mining.

Mining under Alternative B would create less surface disturbance then under Alternative A. Overall, the contribution to cumulative impacts would be negligible and would cease following the completion of mining.

5.4.14 Access and Transportation

The CIAA for access and transportation includes Moffat and Routt counties and the eastern third of Rio Blanco County, including the Colowyo Mine and the town of Meeker. Primary transportation routes in the CIAA are U.S. Highway 40 and SHs 13, 131, 317, and 394. Commuter and supply traffic to and from the mine is the only contribution to cumulative traffic rates in the CIAA. Transportation of coal and CCRs uses mine roads and has no effect to the local transportation network. Continued mining would contribute to the tax revenue generated for Moffat County that helps support road maintenance. Other projects that contribute to both negative (road use) and positive (tax revenue) impacts to transportation within the CIAA include the Craig and Hayden stations, Colowyo and Foidel Creek coal mines, stone and material quarries, and oil and gas development. The Steamboat Springs Ski Resort and Dinosaur National Monument also contribute to traffic volumes in the CIAA through visitation. In 2012 the Steamboat Ski Resort had 89,598 visitors (Yampa Valley Data Partners 2012) and Dinosaur National Monument had 261,643 visitors (National Parks Service 2012).

Implementation of Alternative A would not contribute any additional daily traffic to the transportation routes in the CIAA. Under Alternative B, mining would continue at Trapper Mine in areas outside of the Project Area; however, transportation and access impacts would be slightly reduced as compared to Alternative A due to the lower mining rate. Overall, the contribution to cumulative access and transportation impacts under both Alternative A and Alternative B would be negligible and would cease following the completion of mining and reclamation.

5.4.15 Solid Waste

The CIAA for solid waste is the SMCRA permit area plus the Moffat County landfill and the Hayden Station CCRs placement area. The Moffat County landfill is a municipal landfill located about two miles (3 km) south of Craig, Colorado, accessed by CR 107. Alternative A is not expected to change the amounts of non-hazardous solid waste that is disposed at the landfill.

The Hayden Station is located in Sections 7, 8, 17, and 18 in Township 6 North, Range 87 West about 21 miles (34 km) east of Project Area. The CCRs placement area is located south of the Hayden Station. The Hayden Station generated approximately 128,000 tons of CCRs in 2014 (U.S. Energy Information Agency 2015). Alternative A would not be expected to change the amount of CCR disposed by the Hayden Station.

Section 4.16 discusses the CCRs placement in the SMCRA permit area from the Craig Station. Alternative A would not be expected to change the amount of CCRs placed in the Trapper Mine SMCRA permit area.

Alternative B would result in a decrease in the amount of municipal solid waste that is disposed at the county landfill due to the decreased mining rate and earlier cessation of mining. Alternative B would have no effect on the generation or handling of CCRs because the Craig Station is expected to continue to operate at current rates.

Overall, the contribution to cumulative solid waste impacts under both Alternative A and B would be negligible and would cease following the completion of reclamation.

5.4.16 Noise

The CIAA for noise is the Project Area and a 0.5-mile (0.8-km) buffer surrounding the Project Area. Noise sources related to mining include haul trucks, excavation and drilling equipment, pre-blast/post-blast warning sirens, backup alarms on mobile equipment, and impulsive noises associated with infrequent blasting activities within the mine pit. Noise levels under Alternative A would remain consistent with current activities as production rates would remain the same. The majority of noise creating activities would occur within the mine pit area including loading trucks, excavation activities, and drilling and blasting below grade which would attenuate noise. Haul road traffic and reclamation work that occur at grade would likely produce the majority of noise traveling off site. The nearest sensitive receptor is a single residence 0.46 mile (0.7 km) north of the permit boundary. Topography around the permit boundary is hilly to the north and becomes mountainous to the south. These features provide noise attenuation, and it is likely that most noise is attenuated before reaching any residences or receptors; therefore, noise related impacts would be negligible. Overall, Alternative A, including future reclamation activities, would create no changes to the current contribution to cumulative noise impacts. The contribution to these impacts would cease following the completion of reclamation.

Under Alternative B, mining activities within the Project Area would cease and reclamation activities would begin. Noise generated under Alternative B would include filling and recontouring of the mine pit areas, distribution of topsoil, and seeding. Noise duration for this alternative would be shorter than Alternative A, but mining would continue in areas outside of the Project Area. Noise associated with these activities would involve the same sources as Alternative A in other areas of the SMCRA Permit boundary. Overall, Alternative B would result in no changes to the current contribution to cumulative noise impacts; however, the contribution to cumulative impacts would be shorter in duration than under Alternative A due to the decreased life of mine. This may be partially offset by potential mining on private and state lands within the SMCRA permit boundary.

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6.0 Consultation and Coordination[1]

The following individuals or organizations were notified of the Project and their input was requested. These individuals or organizations also were notified of the release of the EA and asked to provide any comments on the document.

- USFWS
- Colorado SHPO
- Eastern Shoshone Tribe
- Ute Mountain Ute Tribe
- Ute Indian Tribe
- Southern Ute Tribe
- Navajo Nation
- Hopi Tribe
- City of Craig
- Town of Hayden
- Landowners Adjacent to the SMCRA permit boundary
- WildEarth Guardians

6.1 Public Comment Process

Public comments were solicited through several methods. OSMRE published legal notices in the *Craig Daily Press* on October 14 and 21, 2015, and the *Rio Blanco Herald Times* on October 22, 2015 (**Appendix A**). The legal notice also was posted in public locations in Craig and Meeker. A public outreach letter describing the Project, announcing the public outreach meeting, and soliciting comments was mailed on October 16, to a total of 15 recipients, including city governments, adjacent landowners, and other interested parties. On October 27, 2015, a total of six letters were sent to American Indian tribes. The legal notices and letters invited the public to comment on issues of concern for the Project, and informed the interested citizens of the public outreach meeting.

OSMRE developed a Project website, which provided additional Project notice, Project information, and comment opportunities: http://www.wrcc.osmre.gov/initiatives/trappermine.shtm. The website was activated on October 16, 2015. The website provided the legal notices, outreach notices letters, outreach meeting materials, mailing address, and an email address for comments to be sent.

The public outreach meeting was held on October 29, 2015, from 4:00 PM until 8:00 PM at the Moffat County Fairgrounds, Pavilion Building, 640 Victory Way, Craig, Colorado 81625. Five hundred and one individuals signed in at the public meeting and 195 comment forms were completed during the meeting. *A total of 4,578 individuals or organizations submitted comments by the end of the comment period.* Ninety two comments were received after the comment period closed on November 12, 2015. Both comments received during the comment period and comments received after the comment period ended were evaluated for relevance in preparing this EA.

[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.

Public comments included the following issues:

- General support of the project;
- Concerns over impacts to air quality and climate change;
- Concerns over impacts to socioeconomics if the mine were to shut down;
- Community support and environmental stewardship activities completed by TMI; and

All comments received have been considered in the preparation of this document. A summary discussion of the issues raised during scoping is discussed in Section 1.6.

OSMRE released the EA and unsigned FONSI for public comment on January 25, 2016. The public comment period ran through February 19, 2016. Notice that the documents were planned for release, along with the release date, was published in the Craig Daily Press on January 21, 2016, and in the Meeker Herald Times on January 20, 2016. Once the documents were released, legal notice of availability was published in the Craig Daily Press on January 28, 2016, and in the Meeker Herald Times on January 27, 2016. The legal notice also was placed in public locations in Craig and Meeker. Copies of the EA and unsigned FONSI were placed in the following 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 202 Notice of Availability letters were sent directly to those who requested notification of the release of the EA during the public scoping period. Fifty-eight electronic DVD copies of the EA and unsigned FONSI were sent to adjacent landowners, nearby community leaders and other interested individuals. During the comment period a number of DVDs were returned for incorrect postage. As a result, OSMRE re-mailed all 58 DVDs and extended the comment period for the addressees through March 4, 2016.

Comments were accepted via mail and email. A total of 1,148 comment letters or emails were received. Revisions were made to the EA, as appropriate, and responses to comments prepared as part of the MPDD. The comment and response document is provided as **Appendix E**.

6.2 U.S. Fish and Wildlife Service Section 7 Consultation

On November 16, 2015, OSMRE reinitiated the Section 7 consultation process with USFWS when a draft BA was submitted. The BA requested to reinitiate the consultation process due to the indirect effects of mercury and selenium deposition on listed species. The final BA was submitted on December 9, 2015. *A BO was issued by the USFWS on March 22, 2016, and is included in* ***Appendix C****.*

6.3 American Indian Consultation

On October 27, 2015, OSMRE sent a letter to the following tribes explaining the project and requesting consultation under Section 106 of the NHPA (**Appendix D**).

- Eastern Shoshone Tribe
- Southern Ute Indian Tribe
- Ute Mountain Ute Tribe
- Ute Indian Tribe
- Navajo Nation
- Hopi Tribe.

The Hopi Tribe requested additional information on the Project by letter dated November 23, 2015. On January 25, 2016, OSMRE sent a letter *and a hard copy of the EA and unsigned FONSI* to each of the tribes explaining that the *comment period would run* through February 22, 2016. *The Hopi Tribe responded to the information provided on February 8and indicated that any concerns regarding the project had been adequately addressed. However, on February 9, 2015, OSMRE sent the Hopi Tribe a letter and a report entitled: Class III Cultural Resources Inventory of a Lease Modification Area (758 Acres in 2 Block) in Moffat County, Colorado for Trapper Mining Inc. The Hopi Tribe responded in a letter dated February 22, 2016, stating that they reviewed the report and recommending that if prehistoric Fremont cultural resources are identified that could be affected by future project activities, additional consultation be initiated for avoidance or treatment for those locations.*

The Southern Ute Indian Tribe responded by letter on March 4, 2016 indicating a potential concern with mining activities in the Project Area, however no specific information was given as to their concerns. Through a letter, OSMRE responded on April 13, 2016.

6.4 Cooperating Agencies

The following is a list of Cooperating Agencies for the preparation of this EA:

- BLM
- Colorado DNR, including the Executive Director's Office, CDRMS, CPW, and CSLB
- CDPHE, APCD
- Moffat County Commissioners
- Rio Blanco County

Table 6-1 lists the participants in the preparation of this EA from the Cooperating Agencies.

Table 6-1 Participants from Cooperating Agencies

Name	Agency	Title
Kathy McKinstry	BLM LSFO	Planning and Environmental Coordinator
Jennifer Maiolo	BLM LSFO	Mining Engineer
Desa Ausmus	BLM LSFO	Wildlife Biologist
Chad Meister	BLM Colorado State Office	Natural Resource Specialist (Air Quality)
Amy Laughlin	Colorado DNR	Policy Advisor
Dan Hernandez	CDRMS	Senior Environmental Protection Specialist
Phillip Courtney	CSLB	Solid Minerals Leasing Manager
Michael Warren	CPW	Energy Liaison, Northwest Region

Table 6-1 Participants from Cooperating Agencies

Name	Agency	Title
Ingrid Hewitson	CDPHE APCD	Air Quality Planner
Chuck Grobe	Moffat County	County Commissioner
Jeff Comstock	Moffat County	Director, Natural Resources Department
Mark Sprague	Rio Blanco County	Natural Resource Specialist

6.5 Preparers

Table 6-2 shows a list of those who participated in the preparation of this EA from OSMRE.

Table 6-2 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
Roberta Martinez-Hernandez	Civil Engineer
Gene Hay	Mining Engineer
Jeremy Iliff	Archeologist
Jacob Mullinix	Soils Scientist

Table 6-3 shows a list of the key preparers of this EA from the third party consultants, AECOM and Air Resource Specialists.

Table 6-3 Consultants

Name	Title	Resource/Role
Bill Killam, AECOM	Senior Project Manager	Senior NEPA Reviewer
Anne Baldrige, AECOM	Senior Project Manager	Project Manager
Eve Bingham, AECOM	Senior Project Manager	Assistant Project Manager
Bill Berg, AECOM	Senior Geologist	Geology, Paleontology, Solid Waste
Sue Coughenour, AECOM	Document Production Specialist	Technical Editor
Rob DeBaca, AECOM	Senior Biologist	Vegetation, Wildlife, Special Status Species
Chris Dunne, AECOM	Project Ecologist	Recreation, Visual Resources, Livestock Grazing, Alluvial Valley Floors, Prime Farmland
Steve Graber, AECOM	Human Resource Specialist	Socioeconomics, Environmental Justice
Meagan Jones, AECOM	Environmental Scientist	Soils, Wetlands, Noise
Matt Spansky, AECOM	Project Hydrogeologist	Water Resources
Gordy Tucker, AECOM	Cultural Resources Team Lead	Cultural Resources
Howard Gebhart, Air Resource Specialists	Senior Project Scientist	Air Quality and Climate Change

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None

3.2 Topography

None.

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Appendix A

Legal Notice and Outreach Letter

Public Notice
Trapper Mine Mining Plan Modification
Environmental Assessment

The U.S. Department of the Interior (DOI), Office of Surface Mining Reclamation and Enforcement (OSMRE), Western Region, will prepare an environmental assessment (EA) to analyze environmental impacts of a Federal mining plan approval for current and future mining within Federal Coal Leases Nos. C-079641 and C-07519 held by Trapper Mining Inc. as part of the Trapper Mine. The EA will cover the time period beginning July 1, 2015, and continuing through the planned life of mine for the portion of the two Federal coal lease areas lying within the approved Surface Mining Control and Reclamation Act of 1977 (SMCRA) Permit Area (the Project). As required by the National Environmental Policy Act of 1969 (NEPA), the EA will disclose the potential for direct, indirect, and cumulative impacts to the environment from the Project.

Preparation of the EA will be completed pursuant to the Court-approved Joint Proposed Remedy, as approved by the United States District Court for the District of Colorado on September 14, 2015, in the case entitled *WildEarth Guardians v. U.S. Office of Surface Mining et al.*, Case 1:13-cv-00518-RBJ (D. Colo. 2015). As part of the Court-approved remedy, OSMRE agreed to conduct a new NEPA analysis for Trapper's current and future mining activities within Federal Coal Leases Nos. C-079641 and C-07519.

The Trapper Mine is located approximately 6 miles south of the town of Craig in Moffat County, Colorado, east of Colorado Highway 13. The proposed Project is occurring on two federal coal leases administered by the Bureau of Land Management (BLM) and located within the eastern portion of the Trapper Mine's approved SMCRA Permit Area. Federal Coal Lease C-07519 was issued by the BLM in June 1958 and Federal Coal Lease C-079641 was issued by the BLM in October 1962. The leases within the SMCRA Permit Area cover a total of approximately 2,423 acres of Federal mineral estate. As of July 1, 2015, approximately 19 million tons of recoverable Federal coal remains within the Project Area. The Trapper Mine uses a combination of dragline, truck shovel, and highwall mining methods to remove the overburden and mine the coal.

The EA will update, clarify, and provide new and additional environmental information for the Project. As a result of the EA process, OSMRE will determine whether or not there are significant environmental impacts. An environmental impact statement will be prepared if the EA identifies significant impacts. If a finding of no significant impact is reached, and pursuant to 30 CRF 746.13, OSMRE will prepare and submit to the Assistant Secretary for Lands and Minerals Management (ASLM) a mining plan decision document recommending approval, disapproval, or conditional approval of the mining plan. The ASLM will approve, disapprove, or conditionally approve the mining plan approval document within the mining plan decision document, as required under the Mineral Leasing Act of 1920.

OSMRE will hold an open-house public outreach meeting that will include displays and handouts explaining the status of the Project. The public outreach meeting will also provide opportunities to ask questions of OSMRE and Trapper representatives about the Project and the NEPA process, and opportunities to provide written comments on the project. ***The meeting will be held on, October 29, 2015, from 4-8 pm at Moffat County Fairgrounds, Pavilion Building, 640 E. Victory Way, Craig, Colorado 81625.***

OSMRE is soliciting public comments on the Project. Your comments will help to determine the issues and alternatives that will be evaluated in the environmental analysis. You are invited to direct these comments by email: osm-nepa-co@osmre.gov, ensure the subject line reads: ATTN: OSMRE, Trapper

Mine MPDD EA. Comments may also be received by mail: OSMRE WR, C/O Nicole Caveny, C-079641 and C-07519 EA, 1999 Broadway, Suite 3320 Denver, CO 80202 and be postmarked no later than November 12, 2015, in order to be considered during the preparation of the EA. Comments received, including names and addresses of those who comment, will be considered part of the public record for this Project and will be available for public inspection. Additional information regarding the Project may be obtained from Nicole Caveny at (303) 293-5078. When available, the EA and other supporting documentation will be posted at and may be obtained from http://www.wrcc.osmre.gov/initiatives/trappermine.shtm.

United States Department of the Interior

OFFICE OF SURFACE MINING
RECLAMATION AND ENFORCEMENT

Western Region Office
1999 Broadway, Suite 3320
Denver, CO 80202-3050

October 13, 2015

Dear Interested Public Land User,

The U.S. Department of the Interior (DOI), Office of Surface Mining Reclamation and Enforcement (OSMRE), Western Region, will prepare an environmental assessment (EA) to analyze environmental impacts of a Federal mining plan approval for current and future mining within Federal Coal Leases Nos. C-079641 and C-07519 held by Trapper Mining Inc. as part of the Trapper Mine. The EA will cover the time period beginning July 1, 2015, and continuing through the planned life of mine for the portion of the two Federal coal lease areas lying within the approved Surface Mining Control and Reclamation Act of 1977 (SMCRA) Permit Area (the Project). As required by the National Environmental Policy Act of 1969 (NEPA), the EA will disclose the potential for direct, indirect, and cumulative impacts to the environment from the Project.

Preparation of the EA will be completed pursuant to the Court-approved Joint Proposed Remedy, as approved by the United States District Court for the District of Colorado on September 14, 2015, in the case entitled *WildEarth Guardians v. U.S. Office of Surface Mining et al.*, Case 1:13-cv-00518-RBJ (D. Colo. 2015). As part of the Court-approved remedy, OSMRE agreed to conduct a new NEPA analysis for Trapper's current and future mining activities within Federal Coal Leases Nos. C-079641 and C-07519.

The Trapper Mine is located approximately 6 miles south of the town of Craig in Moffat County, Colorado, east of Colorado Highway 13. The proposed Project is occurring on two federal coal leases administered by the Bureau of Land Management (BLM) and located within the eastern portion of the Trapper Mine's approved SMCRA Permit Area. Federal Coal Lease C-07519 was issued by the BLM in June 1958 and Federal Coal Lease C-079641 was issued by the BLM in October 1962. The leases within the SMCRA Permit Area cover a total of approximately 2,423 acres of Federal mineral estate. As of July 1, 2015, approximately 19 million tons of recoverable Federal coal remains within the Project Area. The Trapper Mine uses a combination of dragline, truck shovel, and highwall mining methods to remove the overburden and mine the coal.

The EA will update, clarify, and provide new and additional environmental information for the Project. As a result of the EA process, OSMRE will determine whether or not there are significant environmental impacts. An environmental impact statement will be prepared if the EA identifies significant impacts. If a finding of no significant impact is reached, and pursuant to 30 CFR 746.13, OSMRE will prepare and submit to the Assistant Secretary for Lands and Minerals Management (ASLM) a mining plan decision document recommending approval, disapproval, or conditional approval of the mining plan. The ASLM will approve, disapprove, or conditionally approve the mining plan approval document within the mining plan decision document, as required under the Mineral Leasing Act of 1920.

OSMRE will hold an open-house public outreach meeting that will include displays and handouts explaining the status of the Project. The public outreach meeting will also provide opportunities to ask questions of OSMRE and Trapper representatives about the Project and the NEPA process, and opportunities to provide written comments on the project. **The meeting will be held on October 29, 2015, from 4-8 pm at Moffat County Fairgrounds, Pavilion Building, 640 E. Victory Way, Craig, Colorado 81625.**

OSMRE is soliciting public comments on the Project. Your comments will help to determine the issues and alternatives that will be evaluated in the environmental analysis. You are invited to direct these comments by mail to:

OSMRE WR
C/O: Nicole Caveny
Trapper Mine EA
1999 Broadway, Suite 3320
Denver, CO 80202-3050

Comments may also be emailed to: osm-nepa-co@osmre.gov, ensure the subject line reads: ATTN: OSMRE, Trapper Mine MPDD EA. Comments sent by mail or email should be postmarked or received no later than November 12, 2015, in order to be considered during the preparation of the EA. Comments received, including names and addresses of those who comment, will be considered part of the public record for this Project and will be available for public inspection. Additional information regarding the Project may be obtained from Nicole Caveny at (303) 293-5078. When available, the EA and other supporting documentation will be posted at, and may be obtained from, http://www.wrcc.osmre.gov/initiatives/trappermine.shtm.

Sincerely,

M. Calle

Marcelo Calle, Manager
Field Operations Branch

Appendix B

Air Technical Support Document

TRAPPER MINE ENVIRONMENTAL ASSESMENT
TECHNICAL SUPPORT DOCUMENT

AIR AND CLIMATE RESOURCES

Prepared for

OFFICE OF SURFACE MINING RECLAMATION & ENFORCEMENT

Denver, Colorado

Prepared by

1901 Sharp Point Dr., Suite E
Fort Collins, CO 80525
970-484-7941
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D. Howard Gebhart

D. Howard Gebhart

Updated March 21, 2016

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1.0 INTRODUCTION & BACKGROUND

This Technical Support Document (TSD) describes the air and climate resource analyses conducted in support of the Trapper Mine Environmental Assessment (EA). The Air-Climate TSD reviews the technical air resources and climate analyses conducted on the proposed action and covers both direct and indirect air resources and climate resource impacts from continued operation of the Trapper Mine.

The TSD provides additional technical details about the emission calculations, dispersion modeling, and other aspects of the air and climate resource analysis. The air quality and climate resource discussion in the EA is covered at the appropriate level for the general public, while the TSD provides supplemental technical details of interest to the air quality/climate professional which may not be covered in the EA.

Direct impacts associated with the Trapper Mine include the following:

- Particulate matter (PM_{10} and $PM_{2.5}$) emissions associated with the Trapper Mine operations, including but not limited to emissions from drilling, blasting, coal excavation and removal, overburden excavation and removal, and emissions from coal/overburden hauling on unpaved roads within the mine.
- Emissions of nitrogen oxides (NO_X), sulfur dioxide (SO_2), carbon monoxide (CO), and volatile organic compounds (VOCs) associated with fuel combustion in mining equipment and haul trucks.
- Greenhouse gas (GHG) emissions, including but not limited to fugitive methane releases from the coal mining seams and GHGs associated with fuel combustion in mining equipment and haul trucks.
- Black carbon emissions associated with fuel combustion in mining equipment and haul trucks.

Ozone impacts are discussed in the Trapper Mine EA under the Cumulative Impacts section (EA Chapter 5) since the contribution of individual source emissions to regional ozone levels cannot be accurately quantified. However, emissions of ozone precursors (NO_X and VOCs) are quantified in this TSD.

Indirect impacts associated with coal combustion have been evaluated and include emissions at the Craig Station from combustion of coal to generate electricity. Based on the CDPHE-issued Title V operating permit (CDPHE, 2005), the Craig Station includes three coal-fired electric generating units (EGUs), with a combined net electric generating capacity of 1,264 megawatts (MW). Unit 1 was placed in service in 1980, Unit 2 in 1979, and Unit 3 in 1984. Coal from the Trapper Mine is used almost exclusively at Units 1 and 2 and coal from other sources is fired in Unit 3.

The Trapper Mine Air Quality & Climate TSD is organized as follows:

- Chapter 2: Emissions Inventory for Direct Air Quality Impacts from Mining Activities
- Chapter 3: Emissions Inventory for Indirect Air Quality Impacts Associated with Coal Combustion
- Chapter 4: Dispersion Modeling Analysis for Direct and Indirect Trapper Mine Emissions
- Chapter 5: Direct and Indirect Greenhouse Gas (GHG) Emissions and Associated Climate Impacts
- Chapter 6: Summary of Air Quality and Climate Impacts
- Chapter 7: References

2.0 EMISSIONS INVENTORY FOR DIRECT AIR QUALITY IMPACTS FROM MINING ACTIVITIES

All direct emission calculations were quantified based on the maximum allowable mining rate at the Trapper Mine, i.e., 2.6 million tons per year (mtpy). The maximum mining rate is based on the air quality permit issued by the Colorado Department of Public Health & Environment (CDPHE) - Permit 11MF253-1, Modification 2, Issued May 8, 2009 (CDPHE 2009). Operating data for each year of future mine life supplied by Trapper Mining, Inc. (TMI) was used with the maximum coal production rate to derive the emissions information.

For PM_{10} and $PM_{2.5}$, emissions were quantified for each year up to 2025 (when the coal reserves in the subject leases will be exhausted based on TMI's current mining plans). Based on the calculated $PM_{10}/PM_{2.5}$ emissions, a "worst-case" year was selected and all other pollutants emissions were then evaluated for the selected "worst-case" year. As documented below, the "worst-case" future emissions year was determined to be 2020.

2.1 Particulate Matter ($PM_{10}/PM_{2.5}$)

Particulate matter emissions (PM_{10} and $PM_{2.5}$) occur from mining activities as well as emissions associated with diesel fuel combustion in the mining equipment and trucks. Mining activities include drilling, blasting, coal and overburden removal and handling, and coal hauling by truck from the Trapper Mine to the adjacent Craig Station.

PM_{10} and $PM_{2.5}$ emission controls are imposed through the fugitive dust control plan contained in the Trapper Mine air emissions permit issued by the CDPHE. These emissions controls are summarized in **Table 2-1**.

Table 2-1
Fugitive Dust Emission Controls at Trapper Mine as Required by CDPHE Air Permit 11MF253-1, Modification 2, Issued May 8, 2009

Trapper Mine Fugitive Dust Control Measures
1. Topsoil and overburden stockpiles shall be compacted and revegetated within 1 year of completion of stockpile construction. 2. Emissions from material handling (i.e., removal, loading, and hauling), except for dragline operations, shall be controlled by watering two or more times per day except when ambient temperatures are below 32°F or precipitation is occurring. 3. Unpaved haul roads shall be treated with chemical stabilizers per suppliers' recommendations and watered as often as needed to control fugitive particulate emissions. Haul roads shall be graveled. 4. Reclamation works and sequential extraction of material shall be initiated to keep the total disturbed areas at any one time to a minimum. 5. Drilling of overburden for blasting shall employ water spray units or bag filters. 6. Sequential blasting shall be employed for particulate reduction associated with blasting activities. No blasting shall take place when wind speeds exceed 30 miles per hour, unless safety conditions warrant otherwise. 7. The utility waste placed at the mine shall be kept sufficiently moist until the waste is covered to control fugitive emissions.

Direct PM_{10} and $PM_{2.5}$ emissions associated with the mining activities include a number of individual sources of particulate emissions, including drilling, blasting, bulldozing of coal/overburden, truck loading for coal and overburden, dragline operation, overburden replacement, scraper activities, hauling of coal and overburden by truck, wind erosion of disturbed areas, road maintenance (graders), and light duty vehicle traffic. Emissions were calculated using appropriate emission factors and TMI's operating data on mine activity.

Table 2-2 documents the emission factors used for the PM_{10} and $PM_{2.5}$ emissions for each mining activity along with the technical source for each factor. The emission calculations used standard US Environmental Protection Agency (USEPA) factors for western surface coal mines from USEPA's Compilation of Air Pollutant Emission Factors, or AP-42 (USEPA Undated). The calculations used AP-42 Section 11.9 (Western Surface Coal Mines) or other AP-42 sections as appropriate for each individual emissions source. For PM_{10} and $PM_{2.5}$, given that the AP-42 factors already included any contribution associated with fuel combustion in mining equipment and trucks to the total particulate emissions, it was not necessary to separately calculate the PM_{10} and $PM_{2.5}$ emissions from fuel combustion in mining equipment and trucks.

Detailed emission calculations for each source category are available by CD upon request.

Table 2-2
Trapper Mine PM_{10} and $PM_{2.5}$ Emission Factors

Mining Operation	Technical Source for Factor	PM_{10} Factor	$PM_{2.5}$ Factor
Drilling: Coal	AP-42 Table 11.9-4[1]	0.08 lb/hole	0.08 lb/hole
Drilling: Overburden	AP-42 Table 11.9-4[1]	0.46 lb/hole	0.46 lb/hole
Blasting: Coal	AP-42 Table 11.9-1	77.5 lb/blast	4.5 lb/blast
Blasting: Overburden	AP-42 Table 11.9-1	83.8 lb/blast	4.8 lb/blast
Dragline	AP-42 Table 11.9-1	0.011 lb/yd^3	0.0011 lb/yd^3
Bulldozing: Coal	AP-42 Table 11.9-1	13.3 lb/hr	1.1 lb/hr
Bulldozing: Overburden	AP-42 Table 11.9-1	0.8 lb/hr	0.4 lb/hr
Bulldozing: Ash	AP-42 Table 11.9-1	98.9 lb/hr	4.6 lb/hr
Topsoil Removal: Scraper	AP-42 Tab le 11.9-4[1]	0.02 lb/ton	0.02 lb/ton
Topsoil: Scraper Travel Mode	AP-42 Tab le 11.9-4[1]	0.014 lb/ton	0.014 lb/ton
Truck Loading: Coal	AP-42 Table 11.9-1	6.5E-3 lb/ton	6.5E-4 lb/ton
Truck Loading: Overburden	AP-42 13.2.4 Eqn 1[2]	1.68E-4 lb/ton	2.54E-5 lb/ton
Grading: Coal/OB Roads	AP-42 Table 11.9-1	1.1 lb/VMT	0.11 lb/VMT
Truck Hauling: Coal	AP-42 13.2.2 Eqn 1a[3]	6.63 lb/VMT	0.663 lb/VMT
Truck Hauling: Overburden	AP-42 13.2.2 Eqn 1a[3]	4.23 lb/VMT	0.423 lb/VMT
Truck Hauling: Ash	AP-42 13.2.2 Eqn 1a[3]	3.45 lb/VMT	0.345 lb/VMT
Light Duty Vehicle Traffic	AP-42 13.2.2 Eqn 1a[3]	0.82 lb/VMT	0.082 lb/VMT
Wind Erosion	AP-42 Tab le 11.9-4[2]	0.73 lb/acre/day	0.11 lb/acre/day

[1] $PM_{10}/PM_{2.5}$ assumed to be the same

[2] The AP-42 Emission Factor represents TSP. Particle sizes from AP-42 Section 13.2.4 used to adjust for $PM_{10}/PM_{2.5}$

[3] AP-42 Section 13.2.2 Eqn 2 used to correct for the number of wet days (90) in AP-42 equation

Table 2-3 summarizes the PM_{10} and $PM_{2.5}$ emissions for each year through 2025 when the TMI coal reserves on the subject leases will be exhausted based on the current mining plans. The emission calculations in each year assume a constant coal production rate of 2.6 mtpy.

The emissions calculations for Table 2-3 used standard USEPA factors for western surface coal mines from USEPA's Compilation of Air Pollutant Emission Factors, or AP-42 (USEPA, Undated). These factors were combined with year-by-year projections of mine operations provided by TMI to calculate the PM_{10} and $PM_{2.5}$ emissions for each year.

Table 2-3
Projected Trapper Mine PM_{10} & $PM_{2.5}$ Emissions through 2025

Mining Year	PM_{10} Emissions (tpy)	$PM_{2.5}$ Emissions (tpy)
2016	533.88	79.75
2017	537.06	82.08
2018	526.23	80.25
2019	534.62	84.50
2020	603.51	93.25
2021	615.89	96.83
2022	569.46	88.21
2023	525.76	80.76
2024	450.35	69.22
2025	335.46	48.00

Table 2-3 includes indirect emissions from CCRs disposal. The total PM_{10} and $PM_{2.5}$ emissions including CCRs disposal were evaluated to select the worst-case year.

Based on **Table 2-3**, the peak PM_{10}/$PM_{2.5}$ emissions occur in Calendar Years 2020 and 2021. In the TMI mining plans, both 2020 and 2021 are years with higher than average overburden stripping ratios, so the overburden volumes to be handled and transported within the mine pit are greater along with the associated air emissions. As noted in **Table 2-3**, the magnitude of the emissions between 2020 and 2021 are virtually the same, so the selection of the worst-case year also considered the relative location of the PM_{10}/$PM_{2.5}$ emissions within the mine.

Beginning in 2019, TMI plans to open a new mining pit ("N Pit") and from 2019 forward, air emissions will occur in both "N Pit" and the current mining pit ("L Pit"). However, in 2020, there is a higher concentration of emissions in the current "L Pit". The "L Pit" also encroaches on the eastern SMCRA Permit Boundary in 2020, meaning that the separation distance between the emissions location and off-site ambient air is less. Given the higher density of emissions from "L Pit" and the proximity of "L Pit" to the ambient air boundary, 2020 was selected as the "worst-case year" for the air quality analysis as these conditions would be expected to produce higher air quality impacts in the air dispersion model. In 2021, the emissions would be less concentrated, with more of the emissions in "N Pit". Once the worst-case year was selected based on the emissions data for PM_{10} and $PM_{2.5}$, the same worst-case year (2020) was also used for all other pollutants.

It should be noted that only a fraction of the area encompassing the proposed "N Pit" actually lies within the boundaries for the coal leases that are the subject of the current Trapper Mine EA. Also, for the worst-case emissions years (2020 and 2021), the "N Pit" mining activity would occur outside of the lease boundary, but within the Trapper Mine SMCRA permit boundary. Nevertheless, because some of "N Pit" lies within the leases in question, all expected air emissions over the expected future life of mine, including both "N Pit" and "L Pit", were considered in the Trapper EA and air dispersion model.

A more detailed PM_{10}/$PM_{2.5}$ inventory for the worst-case year (2020) is summarized in **Table 2-4**. The AP-42 emission factors were combined with projections of mine operations provided by TMI to calculate the total PM_{10} and $PM_{2.5}$ emissions for the worst-case year (2020). Where specific $PM_{2.5}$ emission factors were unavailable, the calculations used a worst-case assumption that all PM_{10} emissions were in the $PM_{2.5}$ fraction.

Table 2-4
Worst-Case Year (2020) Trapper Mine
PM_{10} and $PM_{2.5}$ Direct Emissions

Mining Operation	PM_{10} (tpy)	$PM_{2.5}$ (tpy)
Drilling: Coal & Overburden	0.98	0.98
Blasting: Coal & Overburden	0.06	0.003
Truck Loading: Coal	8.48	0.88
Bulldozing: Coal	30.93	2.53
Bulldozing: Overburden	35.70	19.62
Overburden Replacement	78.58	11.79
Dragline	111.55	9.60
Topsoil Removal: Scraper	2.15	2.15
Topsoil: Scraper Travel Mode	27.93	2.79
Topsoil Unloading: Scraper	1.48	1.48
Grading: Coal/OB Haul Roads	6.03	0.60
Coal/Overburden Truck Hauling	87.95	8.79
Light Duty Vehicle Traffic	2.05	0.20
Wind Erosion	196.84	29.53
TOTAL	590.71	90.94

2.2 Combustion Emissions (NO_X, SO_2, CO, and VOCs)

Combustion emissions include consumption of diesel fuel in mining equipment and trucks along with emissions from blasting. Except for emissions from blasting, these emissions are not regulated by CDPHE Air Pollution Control Construction Permits and emissions from these sources are not counted against permit limits. Blasting emissions are limited in Permit 11MF253-1 by limiting the annual quantity of explosives used at Trapper Mine (13,500 tons per year). Whether or not such emissions are regulated under Permit 11MF253-1, all combustion emissions were quantified for the EA and such emissions were included in the air dispersion modeling to verify compliance with air quality standards.

Emissions for mining equipment/trucks were calculated with the MOVES2014 model (USEPA 2014) using the most relevant equipment listed under the “nonroad construction” category and TMI-provided data listing the annual operating time (hours) for each major piece of mining equipment and/or truck. Blasting emissions were calculated using the emissions factor from AP-42 Chapter 13, Table 13.3-1 with the anticipated use of explosives (ANFO) and the expected number of blasts during the worst-case year (2020).

The combustion emissions are documented in **Table 2-5**, reported in units of tons per year (tpy). Emissions are reported in Table 2-5 for NOx, SO_2, CO, and VOCs. PM_{10} and $PM_{2.5}$ emissions associated with blasting are already quantified in Table 2-4. Also, any PM_{10} and $PM_{2.5}$ emissions associated with fuel combustion in trucks and mining equipment are already included as part of the applicable fugitive dust calculations for truck traffic summarized in Table 2-4. Calculations for hazardous air pollutant (HAP) emissions associated with fuel combustion in the mining equipment and trucks are reported in **Table 2-6,** also in tpy. All fuel combustion and blasting calculations are documented on digital spreadsheets available by CD upon request.

Table 2-5
Direct Mining Emissions for Worst-Case Year (2020): Fuel Combustion and Blasting

	NO_X (tpy)	SO_2 (tpy)	CO (tpy)	VOCs (tpy)
Fuel Combustion: Mining Equipment & Trucks	987	52	378	72
Blasting	74	9	291	No Data
TOTAL	1,061	61	669	72

Table 2-6
Direct Mining Emissions for Worst-Case Year (2020)
Hazardous Air Pollutants – Fuel Combustion (tpy)

Benzene	Toluene	Xylene	1,3-Butadiene	Formaldehyde	Acetaldehyde	Acrolein	Napthalene
0.41	0.15	0.11	0.02	0.13	0.07	0.01	0.06

As noted above, PM_{10} and $PM_{2.5}$ emissions associated with blasting and fuel combustion are included within the emissions factors in **Table 2-2** and the total emissions shown in **Tables 2-3 and 2.4**. The fuel combustion contribution to PM_{10} and $PM_{2.5}$ emission totals is small compared to the fugitive dust totals for PM_{10} and $PM_{2.5}$ emissions.

2.3 Black Carbon Emissions

Black carbon is a subset of the PM_{10}/$PM_{2.5}$ emissions associated with diesel fuel combustion. Black carbon is effective at absorbing light and has a disproportionally larger impact on visibility degradation compared to other forms of particulate matter. Some researchers also link black carbon emissions to climate-related air quality impacts.

Black carbon has been calculated as a percentage of the $PM_{2.5}$ emissions associated with diesel fuel combustion based on Cai and Wang (2014). The calculated black carbon emissions based on diesel fuel consumption from the worst-case year (2020) is provided in **Table 2-7**.

Table 2-7
Direct Mining Related Emissions for Worst-Case Year (2020) – Black Carbon (tpy)

$PM_{2.5}$	Black Carbon Ratio	Black Carbon Emissions
64 tpy	0.813	52 tpy

3.0 EMISSIONS INVENTORY FOR INDIRECT IMPACTS ASSOCIATED WITH COAL COMBUSTION

Indirect impacts associated with coal combustion include emissions at the Craig Station from combustion of coal to generate electricity. Based on the CDPHE-issued Title V operating permit (CDPHE, 2005), the Craig Station includes three coal-fired EGUs, with a combined net electric generating capacity of 1,264 MW. Unit 1 was placed in service in 1980, Unit 2 in 1979, and Unit 3 in 1984. Coal from the Trapper Mine is used almost exclusively at Units 1 and 2 and coal from other sources is fired in Unit 3. The emission controls at the Craig Station are summarized in **Table 3-1**.

Table 3-1
Summary of Air Emission Controls – Craig Generating Station

	Unit 1	Unit 2	Unit 3
Capacity (Net)	428 MW	428 MW	408 MW
In-Service Date	1980	1979	1984
Particulate Matter	Fabric Filter Baghouse	Fabric Filter Baghouse	Fabric Filter Baghouse
SO_2	Wet Limestone Scrubber	Wet Limestone Scrubber	Spray Dryer Absorber (Dry Scrubber)
NO_X	Low NO_X Burners with Overfire Air	Low NO_X Burners with Overfire Air	Low NO_X Burners with Overfire Air
	Add SCR by 2021 to meet emission limits of the Colorado Regional Haze State Implementation Plan (SIP).	Add SCR by 2018 to meet emission limits of the Colorado Regional Haze SIP.	Add SNCR by 2018 to meet emission limits of the Colorado Regional Haze SIP.
Mercury	Ancillary control provided by existing systems for other pollutants	Ancillary control provided by existing systems for other pollutants	Activated Carbon Injection

In addition, Craig Station places some of its fly ash and bottom ash (e.g., coal combustion residuals or CCRs) at the Trapper Mine. Some of the CCRs are shipped off-site for beneficial uses and the remainder are placed in former mining pits at the Trapper Mine. The CCRs transport and placement emissions for the fraction handled at Trapper Mine are included in the indirect air quality impacts because the placement activities occur within the Trapper Mine SMCRA permit boundary but outside of the Project Area. These emissions would include fugitive dust emissions (PM_{10} and $PM_{2.5}$) associated with the CCRs hauling by truck to the placement site, and associated diesel fuel combustion emissions from the trucks, including GHG emissions.

The fugitive dust emissions associated with CCRs placed at Trapper Mine are regulated under the current air permit (Permit 11MF253-1).

3.1 Indirect Criteria Pollutant Emissions from Electricity Generation (SO_2, NO_X, CO, and VOCs)

Coal combustion for generation of electricity produces air emissions. The indirect emission calculations were not based on a specific worst-case year, but were instead estimated based on coal combustion at Craig Station Units 1 and 2 for the maximum coal production rate under Trapper's air permit, or 2.6 mtpy.

As described previously, coal from the Trapper Mine is used almost exclusively at Craig Units 1 and 2. Where supported by reliable technical information, emissions data unique to Units 1 and 2 were used to help estimate the Trapper Mine-related indirect emissions.

A summary of Craig Station indirect emissions is provided in **Table 3-2**. These calculations are based on the maximum Trapper coal production rates of 2.6 mtpy and do not represent any particular year of operation.

For the SO_2 and NO_X calculations, unit-specific emissions data for 2014 were obtained for the Craig Station from the USEPA Air Markets Program Data (AMPD). Based on these data, it is evident that the level of SO_2 emissions control at Units 1 and 2 is significantly better than Unit 3. The AMPD data show that more than 50 percent of the total SO_2 emissions at Craig Station during 2014 were from Unit 3. As described above, Units 1 and 2 control SO_2 through a wet scrubber while Unit 3 uses a spray dryer absorber. NO_X emissions control may be better at Units 1 and 2 (estimated 45 – 65% control efficiency) compared to Unit 3 (estimated 35 – 55% control efficiency), although the differences in NOx emissions are not as dramatic as the unit-to-unit variation in SO_2 emissions.

Table 3-2
Indirect Coal Combustion Emissions: Craig Generating Station (tpy)

	SO_2 Emissions			NO_X Emissions			CO	VOCs	PM_{10}	$PM_{2.5}$
	Unit 1	Unit 2	Unit 3	Unit 1	Unit 2	Unit 3				
Craig Emissions Total (2014)	799.02	963.36	2,000.90	3,768.07	4,603.28	5,367.91			110.0	68.5
Trapper Contribution (78.67%)	628.59	757.88	--	2,964.34	3,621.40	--			86.5	53.9
Trapper Contribution Adjusted to 2.6 mtpy	710.58	856.73	--	3,350.99	4,093.76	--	650.0	78.0	97.8	60.9

Note: PM_{10} and $PM_{2.5}$ emissions are the total for Units 1 and 2 as reported on the Tri-State Generation and Transmission APEN for the 2014 calendar year.

The USEPA AMPD database lists SO_2 and NO_X emissions, but not emissions for CO and VOCs. The SO_2 and NO_X estimate were based on the reported 2014 emissions at Craig Station Units 1 and 2, adjusted to a coal consumption level of 2.6 mtpy, as explained below. The AMPD data are documented in digital files available by CD upon request.

Trapper Mine contributes about 50 percent of the coal used at Craig Station. In 2014, the total coal consumption for Craig Station was estimated to be about 4.6 mtpy, which means that Trapper Mine contributed 2.3 mtpy. Based on 2014 load data reported to the AMPD database, Units 1 and 2 represented 63.56 percent of the total electric load generated at Craig Station. Assuming that the load and coal consumption are related, then, the overall coal consumption at Units 1 and 2 would have been 2.92 mtpy in 2014 (63.56 percent of 4.6 mtpy). Using this figure, the 2.3 mtpy contributed by Trapper Mine would have been 78.67 percent of the overall coal consumption at Units 1 and 2. This fraction was used to estimate the appropriate level of 2014 Craig Station Unit 1 and Unit 2 emissions assigned to coal sourced at TMI. The 2014 emissions assigned to coal sourced at TMI at a rate of 2.3 mtpy were then adjusted to the maximum allowable mining rate of 2.6 mtpy.

For CO and VOCs, Craig Station emissions were based on data listed in AP-42 Section 1.1.1 (Coal Combustion). The AP-42 factors (CO = 0.5 lb/ton, VOC = 0.06 lb/ton) were applied to the 2.6 mtpy mining rate to derive the indirect emissions information for these pollutants. For PM_{10} and $PM_{2.5}$, these emissions data were extracted from Air Pollution Emission Notices (APENs) for Craig Units 1 and 2 submitted by Tri-State Generation and Transmission to CDPHE. The APEN data report the total PM_{10} and $PM_{2.5}$ emissions for each unit during Calendar Year 2014. The reported APEN emissions were extrapolated to derive the Unit 1 and 2 PM_{10} and $PM_{2.5}$ emissions for that portion of emissions attributable to TMI coal using a consumption rate of 2.6 mtpy. The Craig Unit 1 and Unit 2 PM_{10} and $PM_{2.5}$ emissions were adjusted following the same procedure that was described above for SO_2 and NOx emissions.

Based on the above data, the Craig Station emissions associated with Trapper Mine coal at a 2.6 mtpy mining rate would be: SO_2 – 1,567 tpy, NO_X – 7,445 tpy, CO – 650 tpy, VOCs – 78 tpy, PM_{10} – 97.8 tpy, and $PM_{2.5}$ – 60.9 tpy.

Please note that the NO_X emissions estimates shown in Table 3-2 do not include the expected future benefits of improved emissions controls at Craig Station. Both Unit 1 and Unit 2 plan to install selective catalytic reduction (SCR) for NO_X emissions control to meet the emission limits contained in the Colorado Visibility and Regional Haze SIP (CDPHE 2014a). The SIP specifies the required NO_X emissions limits and the owner/operator (Tri-State Generation & Transmission) then selects the appropriate pollution control technology to achieve the required emission limits (See **Table 3-1**).

The SCR NO_x control is scheduled to be installed and operational by 2018 at Unit 2 and by 2021 at Unit 1. Based on the SIP, Unit 1 will have a maximum allowable NO_X limit of 0.07 lb/million British thermal unit (MMBtu) and Unit 2 will have a maximum allowable NO_X limit of 0.08 lb/MMBtu. CDPHE (2014a) lists the baseline NO_X emissions level for Units 1 and 2 at 0.35 lb/MMBtu, so the reduction in NO_X would be on the order of 80 percent at each unit, for a total reduction of about 8,000 tpy. The reductions attributable to Trapper Mine coal would be a fraction of the total Unit 1 and 2 reductions, or about 6,300 tpy, leaving post-control indirect NO_X emissions of 1,145 tpy.

3.2 Mercury Emissions from Electricity Generation

The CDPHE has provided mercury emissions data for Craig Station for the 2014 reporting year (Tri-State Generation and Transmission Association 2015). These Craig Station mercury emissions data are based on continuous emissions monitoring system equipment installed at each Craig Station unit.

The Craig Station is generally recognized to have one of the lower mercury emission rates for electric generating units in the United States. Based on 2009 mercury emissions data compiled by Environmental Integrity Project (2011), Craig Station was ranked second-lowest at the time among U.S. coal-fired power plants in terms of mercury emissions per unit of electrical generation output, expressed as lbs per GW-hr. The 2014 mercury emissions data for Craig Generating Station are summarized in **Table 3-3**.

Table 3-3
Actual 2014 Craig Generating Station
Mercury Emissions (lb/yr) as reported by Craig Station to CDPHE

Unit 1	4.41
Unit 2	4.85
Unit 3	33.69
Total	42.95

In the CDPHE mercury emissions reports, data for Units 1 and 2 are reported in terms of mass (lb/yr) and these data are reported directly in **Table 3-3**. The Unit 3 mercury data were calculated using data in the CDPHE mercury emission reports. The Unit 3 mercury emissions rate (0.009 lb/GW-hr) was converted to total mass (lb/yr) using the Unit 3 2014 production data listed in the AMPD database and described in the prior section. The total mercury emissions derived here (about 43 lb/yr) are consistent with the Craig Station mercury emissions listed in the 2014 USEPA Toxic Release Inventory.

The Craig Station emissions monitoring data show that mercury emissions are substantially less at Unit 1 and Unit 2 compared to Unit 3. This is most likely due to the differences in pollution control systems at the three Craig Station units. As described previously, Units 1 and 2 each use wet scrubbing systems for SO_2 emissions control, compared to a spray dryer absorber (dry scrubbing) at Unit 3. Wet scrubbing systems have been shown to be very effective at providing ancillary control benefits for mercury emissions. This is because the oxidized form of mercury (Hg^{2+}) is water soluble and can be easily removed by the wet scrubber technology. Even though Unit 3 does not reduce mercury to the same level of effectiveness as Units 1 and 2, the Unit 3 mercury emissions are still well below the maximum allowable limits established by Colorado state regulation.

As described in the indirect emission calculations for SO_2 and NO_X (See Section 3.1), Trapper Mine contributes about 50 percent of the total coal consumed at Craig Station. In 2014, the coal consumption for Craig Station was estimated to be about 4.6 mtpy, which means that Trapper Mine contributed 2.3 mtpy. However, Trapper Mine coal is almost exclusively used at Units 1 and 2. Based on the 2014 load data reported to the AMPD (described in TSD Section 3.1), Units 1 and 2 combined represented 63.56 percent of the total electric load generated at Craig Station. If the load and coal consumption are assumed to be related, then the coal consumption at Units 1 and 2 would have been 2.92 mtpy in 2014 (63.56 percent of 4.6 mtpy). Using this figure, the 2.3 mtpy contributed by Trapper Mine would have been 78.67 percent of the overall coal consumption at Units 1 and 2.

Applying the 78.67 percent factor to the reported 2014 mercury emissions, the Trapper contribution to the Craig mercury emissions at Units 1 and 2 can be calculated. Then, the last step for the mercury emissions analysis is to adjust the estimate to the maximum Trapper Mine coal production rate of 2.6 mtpy.

As summarized in **Table 3-4**, the above calculations derive 8.23 lb/yr as the indirect mercury emissions rate derived from combustion of 2.6 mtpy of Trapper Mine coal at Craig Station Units 1 and 2.

Table 3-4
Craig Generating Station Mercury Emissions from Trapper Mine Coal (lb/yr)

	Mercury Emissions for Trapper Mine 2014 Consumption Rates (2.3 mtpy)	Mercury Emissions at Maximum Trapper Coal Consumption Rates (2.6 mtpy)
Unit 1	3.47	3.92
Unit 2	3.82	4.31
TOTAL	7.29	8.23

The associated environmental impacts from these mercury emissions are described in the Special Status Species Section of the EA.

3.3 Coal Combustion Residuals Placement at Trapper Mine

The delivery and placement of coal combustion residuals or ash at Trapper Mine is characterized as an indirect emission because placement occurs in areas outside of the Project Area (defined as the area covered by the coal leases). TMI receives a fraction of the fly ash/bottom ash from Craig Station for placement, with the remainder shipped off-site for beneficial use. The emission calculations address the CCRs returned to Trapper Mine for placement, regardless of the origin of the coal. The annual CCRs volume returned to TMI for placement was estimated at 507,000 tpy and this figure was used to estimate the indirect emissions linked to CCRs placement at Trapper Mine.

PM_{10} and $PM_{2.5}$ emissions are principally fugitive dust from truck traffic carrying the CCRs from Craig Station to the placement site at Trapper Mine. Other emissions include bulldozing, wind erosion, and exhaust emissions associated with the diesel fuel combusted by the haul trucks. Again, any PM_{10} and $PM_{2.5}$ associated with the fuel combustion in the CCRs truck fleet is captured in the fugitive dust emissions factor and is not quantified separately. **Table 3-5** summarizes the indirect PM_{10} and $PM_{2.5}$ emissions associated with the coal combustion residuals placement.

Table 3-5
Indirect PM_{10} and $PM_{2.5}$ Emissions from
Coal Combustion Residual Placement at Trapper Mine

	PM_{10} (tpy)	$PM_{2.5}$ (tpy)
Ash/Sludge Hauling: Truck Traffic	7.85	1.38
Ash Bulldozing	1.16	0.35
Wind Erosion	3.80	0.57
TOTALS	12.81	2.30

The fuel combustion for haul trucks that transport the CCRs to the Trapper Mine placement site also releases pollutants such as NO_X, SO_2, CO, and VOCs. These emissions were calculated using the USEPA MOVES2014 model (USEPA 2014) and estimated operating time for the trucks. The relevant emissions are summarized in **Table 3-6**.

Table 3-6
Indirect Emissions for Worst-Case Year (2020) Fuel Combustion:
Coal Combustion Residuals Transfer by Truck to Trapper Mine

	NO_X (tpy)	SO_2 (tpy)	CO (tpy)	VOCs (tpy)
Fuel Combustion: Coal Combustion Residuals Haul Trucks	12.1	1.5	5.15	0.7

The calculations for the CCRs fugitive dust and diesel fuel combustion emissions are documented in electronic spreadsheets available by CD upon request.

4.0 DISPERSION MODELING ANALYSIS FOR DIRECT AND INDIRECT TRAPPER MINE EMISSIONS

An air dispersion modeling analysis was conducted to assess the air quality impacts associated with the Trapper Mine EA Proposed Action against the National Ambient Air Quality Standards (NAAQS). The modeling analysis was based on the emissions calculated for the Proposed Action for the future "worst-case year", which as described earlier, was determined to be 2020.

4.1 Modeling Overview

The air quality modeling analysis was conducted using the USEPA AERMOD dispersion model – Version 15181 (USEPA, 2004). AERMOD is the standard air dispersion model recommended by the US Environmental Protection Agency (USEPA) for use in regulatory actions such as permitting. The AERMOD modeling for the Trapper Mine EA generally followed the recommendations in USEPA's Guideline for Air Quality Models (USEPA, 2005a) and USEPA's current AERMOD Implementation Guidance (USEPA, 2015a). Recommended regulatory defaults were used for all AERMOD model inputs unless otherwise described in the discussion below.

One of the basic inputs to AERMOD is meteorological information (wind speed, wind direction, temperature, etc.). In the Trapper Mine EA modeling analysis, the AERMOD modeling was performed using two different meteorological data sets. One data set was the on-site monitoring data collected at Trapper Mine for the period March through September 2015. However, as the Trapper Mine on-site data do not span a full 12-month period, a second more complete dataset was also used. The CDPHE was solicited to recommend the alternate meteorological data, and CDPHE provided data collected at the Colowyo Mine Gossard monitoring site during 2012 (CDPHE, 2015a). The Gossard monitoring site is located at Latitude 40.313 N and Longitude 107.799 W at an elevation of 6,325 feet.

Wind roses showing the Trapper on-site monitoring data and the Gossard monitoring data are shown in **Figure 4-1** and **Figure 4-2**. Both wind roses show similar wind patterns, with the predominant winds from the south through southwest.

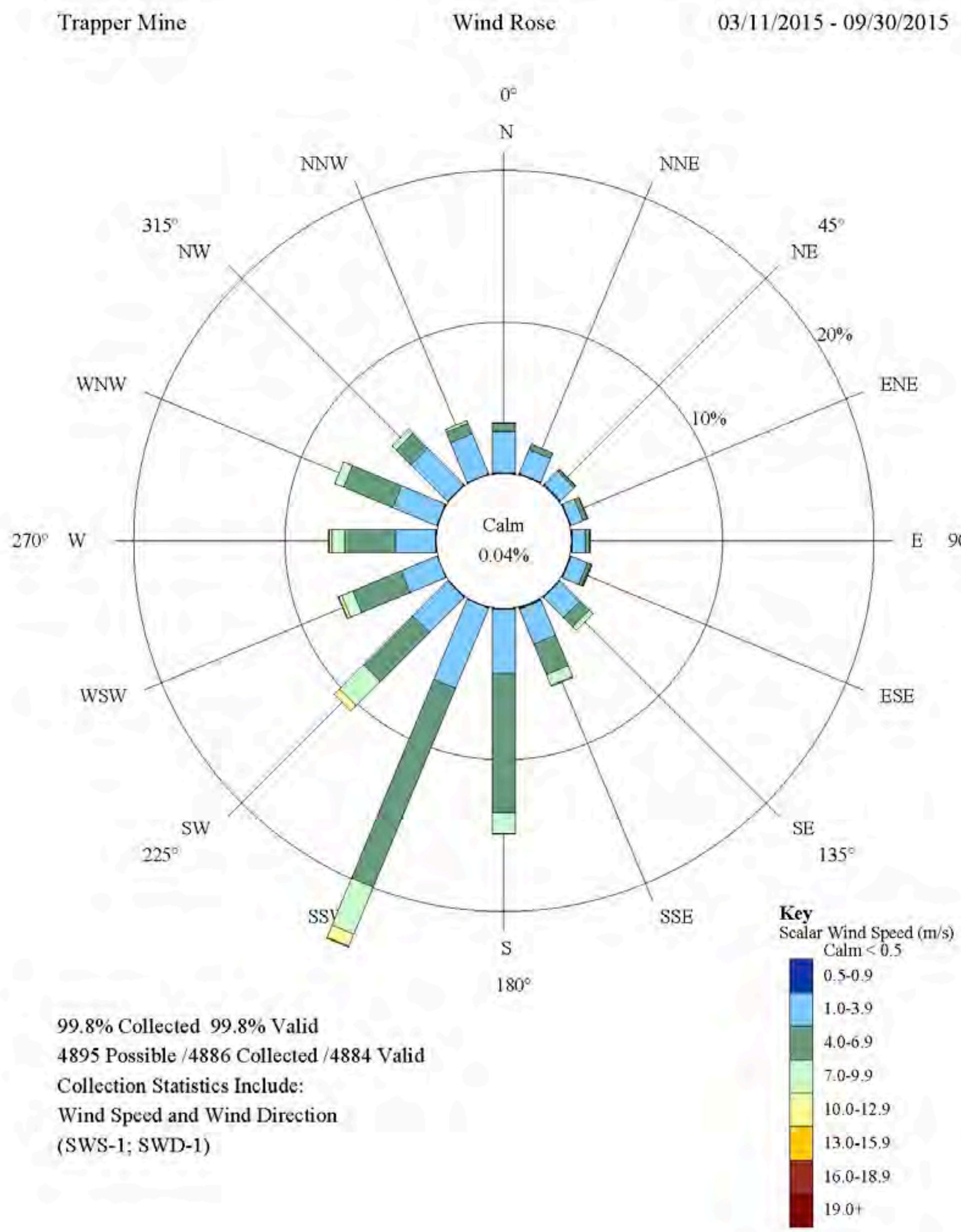

Figure 4-1: Trapper Mine On-Site Wind Rose

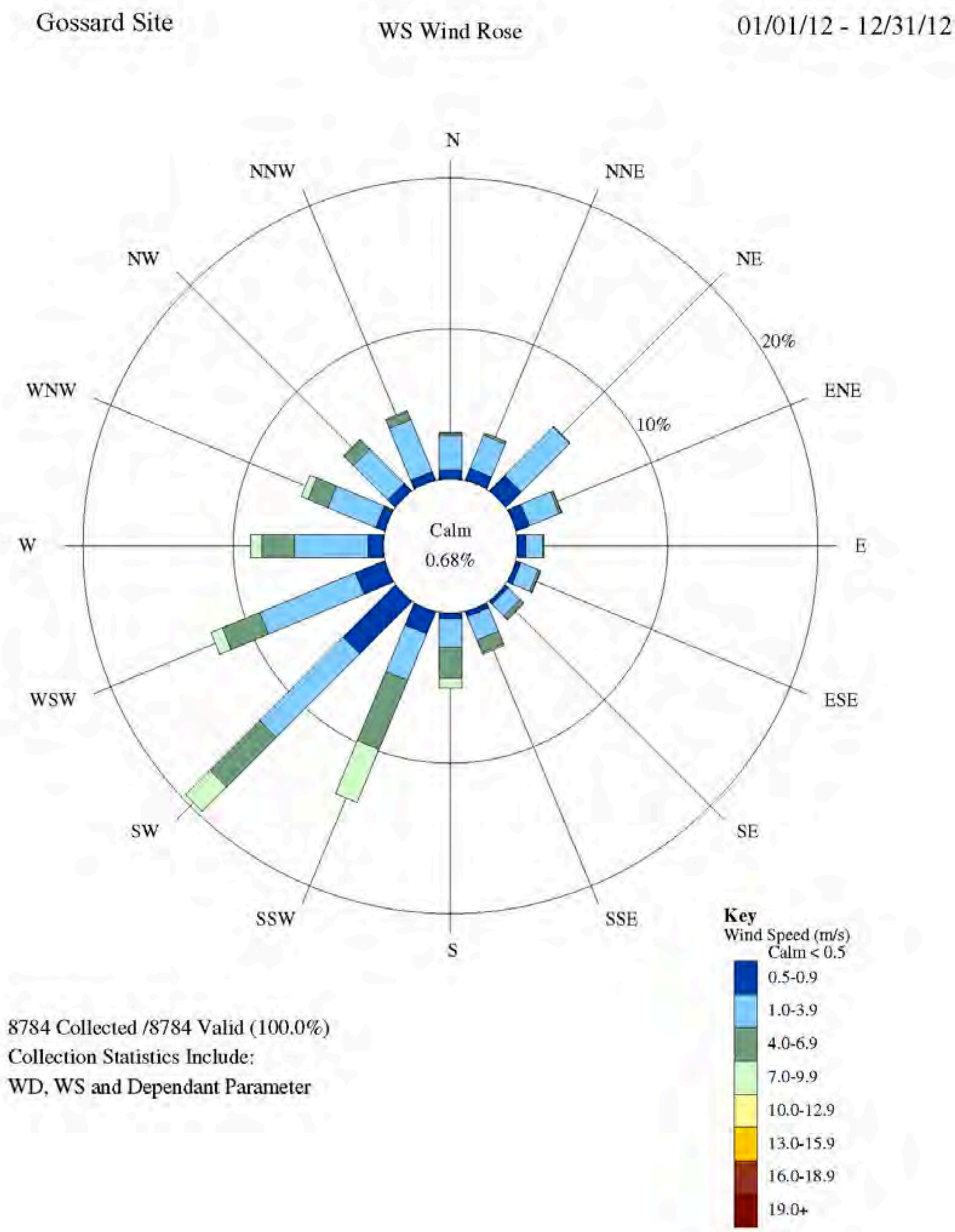

Figure 4-2: Gossard Wind Rose

Both the Trapper on-site data and Gossard data were processed using the USEPA AERMET program (Version 15181) following current regulatory recommendations and recommended regulatory data defaults. The Gossard data covers January 1 through December 31, 2012 and the Trapper on-site data covers the partial year period March 11 through September 30, 2015. Upper air data for these time periods from the closest National Weather Service (NWS) upper air monitoring station (Grand Junction, CO) were also used in AERMET. Supplemental meteorological data for AERMET were taken from the Craig-Moffat County Airport for these same time periods to substitute for any missing data from either monitoring site. Any wind velocity under 0.5 m/sec was considered to be “calm”.

AERMET requires land use characteristics to properly define surface characteristics such as albedo, Bowen ratio, and surface roughness length within the meteorological data file. The current AERSURFACE processor was used to derive these data parameters based on the four seasons and twelve 30 degree sectors across an area centered on a 1 km circle surrounding each meteorological monitoring site (Gossard and Trapper On-Site).

Once the modeling was conducted, it was observed that the Gossard meteorological data consistently returned higher AERMOD model predictions compared to the on-site Trapper data.

4.2 Technical Approach

4.2.1 Receptor Information

The AERMOD model calculations are performed at “receptors”, which are defined geographic locations where the public has access. Locations within the Trapper Mine permit boundary are not accessible to the public and as such, model receptors are excluded from these locations.

Because emissions at a surface mine are released at or near the ground, the expectation is that the maximum predicted model impacts would occur at or near the Trapper Mine permit boundary. Only if the emissions are elevated would the modeling predict maximum impacts downwind of the permit boundary. In fact, once the AERMOD modeling was completed, it was confirmed that the maximum impacts for all pollutants did in fact occur at or near the Trapper Mine permit boundary.

Given this expected behavior, the AERMOD receptors were placed at 100 meter intervals along the TMI permit boundary and out to a distance of approximately 500 meters downwind of the boundary. The selected receptor density was 100 meters, i.e., receptors were placed using a rectangular grid pattern with the separation between receptors of 100 meters. More receptors were placed along and near the north and east permit boundary as the emission sources at Trapper Mine tended to be clustered near those areas of the mine.

A map showing the AERMOD receptor locations around the Trapper Mine is provided in **Figure 4-3**. Please note that any property internal to Craig Station is treated as ambient air in the Trapper Mine modeling study, consistent with EPA/CDPHE guidelines given that Craig Station employees are treated as the "public" for the purposes of Trapper Mine. However, the general public does not have access to property within the Craig Station fenceline.

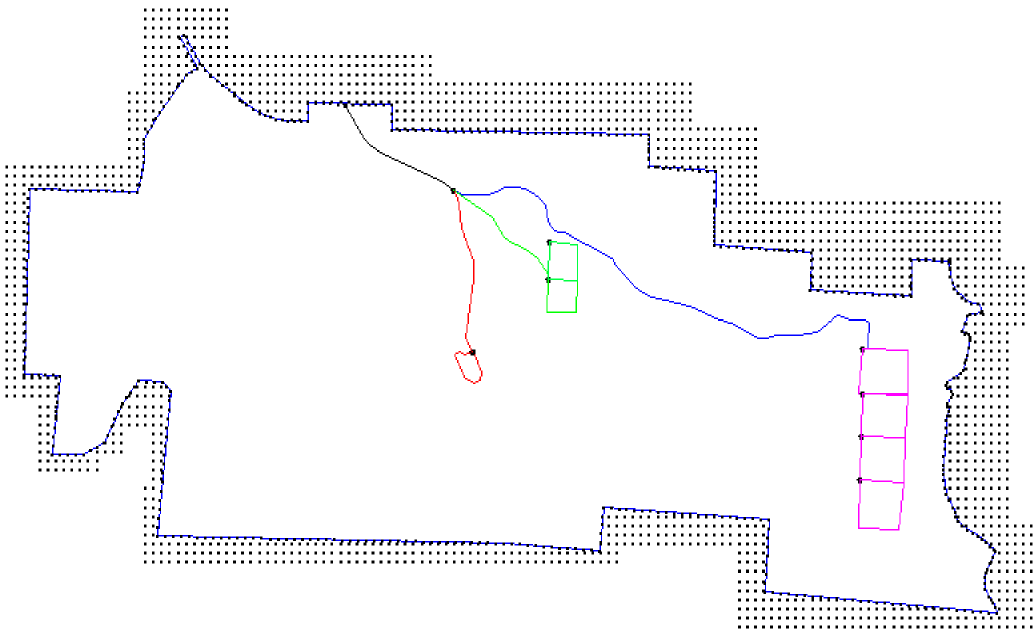

Figure 4-3: AERMOD Receptor Map – Trapper Mine EA Modeling

4.2.2 Background Concentrations

Background is how the model accounts for those emissions not explicitly included in the modeling inputs and is used to generate the "cumulative impact" from all emission sources. For background, recommendations were provided by CDPHE (2015b) for each of the pollutants and averaging times of concern. The recommended CDPHE background values were based on nearby ambient air monitoring data collected in northwest Colorado. **Table 4-1** summarizes the background concentration values recommended by CDPHE and also includes the source/year for the nearby monitoring data used to assign the background value. In some cases, the background values were provided in units of parts per million (ppm) or parts per billion (ppb), so the table also displays the background concentration after being converted to the appropriate modeling units (micrograms per cubic meter or μg/m^3).

Table 4-1
Recommended Background Concentration Values from CDPHE

Pollutant	Averaging Time	CDPHE-provided Background	Background Concentration (micrograms per cu meter)	Monitoring Site & Data Year
CO	1-hour	1 ppm	1,145	Williams Willow Creek, 2012
	8-hour	1 ppm	1,145	
SO_2	1-hour	1 ppb	2.62	Williams Willow Creek, 2012
NO_2	1-hour	7 ppb	13.16	Williams Willow Creek, 2012
	Annual	1 ppb	1.88	
PM_{10}	24-hour	23 µg/m^3	23	ColoWyo West, 1997-98
$PM_{2.5}$	24-hour	14 µg/m^3	14	Williams Willow Creek, 2012
	Annual	3 µg/m^3	3	

The background concentrations listed above for each pollutant and averaging time were added to the AERMOD concentration results for determination of the cumulative impacts and for comparison to the NAAQS.

4.2.3 Emissions Information

This section summarizes how the Trapper Mine emissions information was input to the modeling. The emissions data for the 2020 worst-case modeling year are summarized in Chapters 2 and 3 of the TSD. The modeling analysis included the direct emissions associated with mining activities and the indirect emissions associated with CCR transfer and placement to the extent that the modeled indirect emissions occur within the Trapper Mine permit boundary. Emissions associated with the Craig Generating Station were included in the modeling analysis through the background concentrations.

In the AERMOD modeling, emissions were assigned as either occurring in the mining pit or along the coal/ash haul roads. In cases where travel occurs internal to the mining pit (such as overburden hauling), these emissions were assigned to the pit. Road emissions included the following category of emissions: coal haul trucks, ash haul trucks, light-duty vehicles, and road graders. All other emissions were assigned to the mining pit or ash placement area as appropriate. The emissions layout for the 2020 worst-case year modeling is shown in **Figure 4-4**.

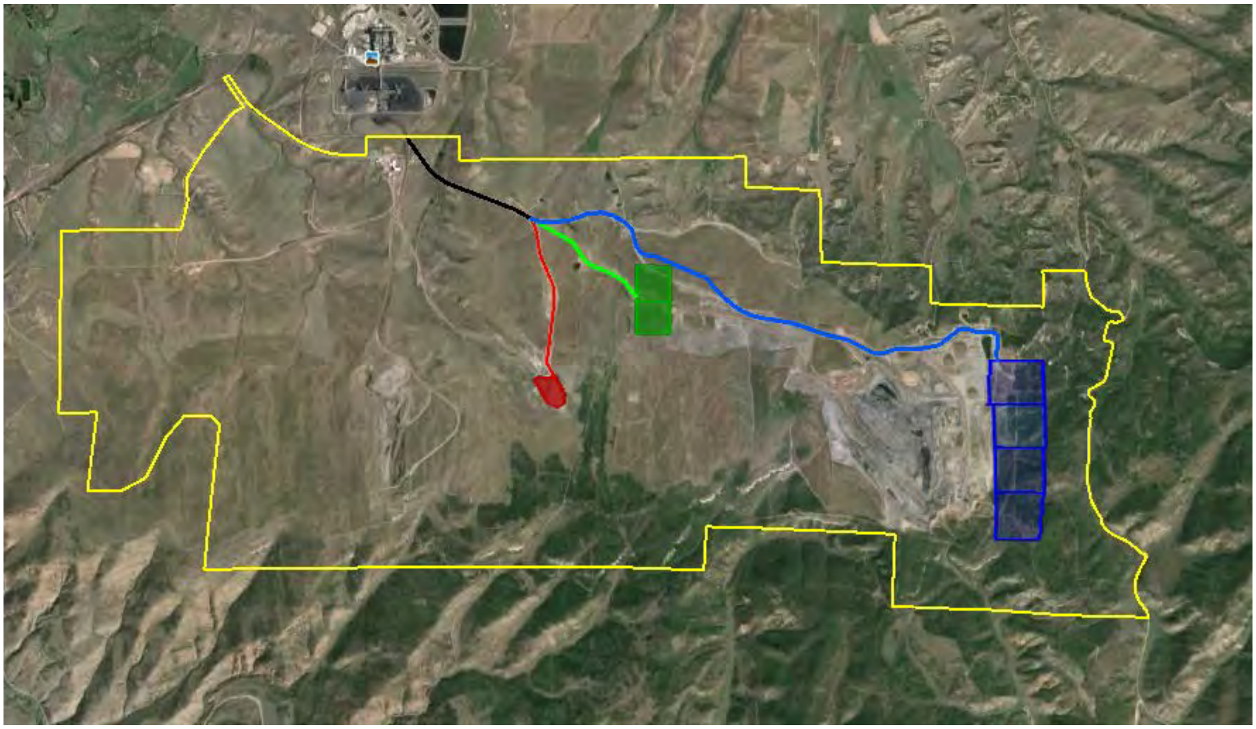

Figure 4-4: Geographic Allocation of Emissions during Worst-Case Year (2020)

The road locations were modeled based on the existing road locations as determined using digital images of the Trapper Mine, i.e., Google Earth. Please note that the coal haul road between Trapper Mine and Craig Station is a private road with no access by the general public. For the worst-case year (2020), the proposed N pit will bisect the haul road leading from L Pit back to the Craig Station, so the L Pit coal haul road will be relocated to the north in order to bypass N Pit. TMI defined the expected future haul road location through this region for input to the model.

Each road segment was assigned the appropriate level of emissions based on the expected traffic volume and type of truck traffic along that particular road segment (coal truck vs. ash truck). Each segment was assigned a color for tracking the associated emissions (black, red, green, or blue….See **Figure 4-4**). The allocation of the haul road emissions along each segment and the related volume source release parameters are described in **Table 4-2**.

Table 4-2

Volume Source Emissions and Data Parameters for Trapper Mine Haul Road Emissions

Source Description	# of segments	Release Height (above ground)	Initial Sigma Y	Initial Sigma Z	PM10 Emissions	PM2.5 Emissions
		m	m	m	tpy/segment	tpy/segment
L Pit Haul Road (Blue)	301	5.848	19.53	5.44	0.197	0.049
N Pit Haul Road (Green)	76	5.848	19.53	5.44	0.024	0.004
Ash Haul Road (Red)	91	5.848	19.53	5.44	0.060	0.010
Combined Haul Road (Black)	85	5.848	19.53	5.44	0.280	0.064

The haul road sources were modeled using the “volume source” option in AERMOD and current recommendations for modeling emissions from haul roads (USEPA, 2011). The horizontal dimension for the volume source (initial sigma-y) was based on the road width plus a small buffer to account for the lateral air displacement generated by the passing truck. The vertical dimension for the volume source (initial sigma-z) was assigned based on 1.7 times the truck height, with the release height at the mid-point of the volume. The 90-ton coal haul truck dimensions were used for these calculations as the coal haul trucks comprise most of the road traffic emissions.

For the mining pits and ash placement areas, the “area poly source” option in AERMOD was employed. The “pit source” option within AERMOD was considered for the Trapper Mine modeling analysis, but not selected. At TMI, the mining pit is not the classic “hole-in-the ground” simulated by AERMOD’s pit source option to calculate the retention of particulate emissions within the pit. At TMI, the mining pit instead carves into the side of the hill, and the pit is relatively open to the north, which is also the direction of the prevailing winds. As the mining pit generally lacks a well-defined wall on the downwind side, the pit retention calculations in AERMOD’s pit source option were not believed to be technically appropriate. Instead, the “area poly source” option was selected and pit retention of PM emissions was not modeled.

As mentioned previously, the mining operations in the worst-case year (2020) cover two separate mining pits. L Pit is the current mining pit at Trapper, but by 2020 has progressed from its current location to the east (See Figure 4-4). However, by 2020, L Pit is nearing the end of its reserves, so by 2019, TMI is starting to mine its coal reserves in N Pit. The initial mining in the N Pit is outside of the Project Area. Emissions were assigned between the two pits based on the activity levels for each pit as estimated by TMI for the worst-case year. These data are provided in various electronic spreadsheets available by CD upon request.

Within AERMOD, L Pit (blue…See **Figure 4-4**) was characterized as four area-poly sources and N Pit (green...See **Figure 4-4**) was characterized as two area-poly sources. Within each pit, each area-poly source was approximately of equal dimensions (area). However, since the overburden stripping ratios increase as one moves further south in both pits, a higher fraction of the pit emissions were assigned to the southernmost area-poly sources in each pit.

The area-poly source locations were assigned based on the expected disturbance areas for Year 2020 as defined by Trapper's mining plans, plus the projected disturbance areas for the year prior and also the preceding year, i.e., Years 2019-2021. The three year period accounts for land disturbance generated during the 2020 worst-case year from pre-stripping and from backfilling/reclamation.

It is also necessary to properly simulate the vertical distribution of emissions within the mining pit. The vertical distribution of emissions can be large given the vertical separation between the pit floor and the top of the pit and not properly simulating the vertical distribution of pit emissions could lead to serious errors in the AERMOD results. The "area poly source" option includes an optional vertical dimension value (initial sigma-z), which in essence turns the two-dimensional area-poly source into a three-dimensional pseudo-volume source. The vertical separation distance between the pit floor and the top of the pit was used to assign the vertical dimension value in AERMOD. This value was larger for those area sources at the south end of the pit where the pit walls are higher. The base elevation for all pit sources within a given pit (L Pit and N Pit) was assigned a single value, which assumes that the pit floor remained at a constant elevation for all pit area-poly sources. The source release height also considers the vertical distribution of the in-pit emissions, given that all pit sources were assigned the same base elevation. The release height was set at 25% of the vertical separation between the pit floor and the top of the pit, which skewed the majority of the emissions toward the bottom of the pit and is a conservative assumption in terms of the AERMOD modeling. The selected modeling approach recognizes that the location of individual emission sources within the pit are likely to vary over the year being simulated, such that a precise placement of each individual emission source within the pit area (e.g., haul road, dragline, etc.) is not practical. Any such placement of emission sources for the purpose of modeling would only be valid for a fixed point in time and would not represent the worst-case year as a whole.

Lastly, the $PM_{10}/PM_{2.5}$ emissions inventory for the pit sources showed that wind erosion was a significant contributor to the total emissions. Wind erosion emissions do not occur continuously, but instead only occur during period of high wind velocities. This effect was simulated in the AERMOD model by restricting the wind erosion emissions to those hours of where the wind speed exceeded the defined threshold velocity - approximately 12 miles per hour.

Table 4-3 shows the emissions distributions and area-poly source parameters for the pit emission sources.

Table 4-3
Area-Poly Source Emissions and Data Parameters for Trapper Mining Pits

Source ID	Base Elevation	Release Height	# Vertices	Initial Vertical Dimension	PM10 Emissions	PM2.5 Emissions	Area
	m	m		m	tpy/ft^2	tpy/ft^2	ft^2
LPIT1	2112.68	15	4	32.25	9.45E-06	2.94E-06	3,064,191
LPIT2	2112.68	27.5	4	59.13	2.11E-05	6.56E-06	2,743,601
LPIT3	2112.68	40	4	86	3.12E-05	9.71E-06	2,781,169
LPIT4	2112.68	40	4	86	4.15E-05	1.29E-05	2,787,479
NPIT1	2001.89	12.5	4	26.875	7.72E-06	1.39E-06	1,515,810
NPIT2	2001.89	10	4	21.5	2.02E-05	3.63E-06	1,351,211
ASH	2144.74	10	8	9.3	2.97E-05	1.44E-06	765,753
LPITWIND1	2112.68	15	4	32.25	1.85E-05	2.81E-06	3,064,191
LPITWIND2	2112.68	27.5	4	59.13	1.85E-05	2.81E-06	2,743,601
LPITWIND3	2112.68	40	4	86	1.85E-05	2.81E-06	2,781,169
LPITWIND4	2112.68	40	4	86	1.85E-05	2.81E-06	2,787,479
NPITWIND1	2001.89	12.5	4	26.875	3.36E-05	5.10E-06	1,515,810
NPITWIND2	2001.89	10	4	21.5	3.36E-05	5.10E-06	1,351,211
ASHWIND	2144.74	10	8	9.3	2.43E-06	3.68E-07	765,753

4.2.4 Particle Deposition

For the $PM_{10}/PM_{2.5}$ modeling, the particle deposition options in AERMOD were employed. With particle deposition, some of the plume mass is lost during transport downwind due to the fact that particles can fall from the plume and adhere to the ground and/or vegetation. Larger sized particles are deposited at a faster rate than smaller particles.

For the Trapper Mine modeling, the PM_{10} emissions were classified as either “coarse” or “fine” based on the particle size and the emissions inventory. The coarse fraction represents those particles larger than $PM_{2.5}$, but smaller than PM_{10}. The coarse particles were assigned a mean diameter of 6.25 microns, which is the middle of the size range (2.5 to 10 microns). The fine fraction represents those particles smaller than $PM_{2.5}$, and were assigned a mean diameter of 1.25 microns, again based on the midpoint of the size range (0 to 2.5 microns). The emissions inventory was used to assign the mass fraction to each category (coarse vs. fine). The assigned mass fraction varied depending on whether the emissions being modeled were from the road volume sources or the pit area-poly sources. The particle size data input to AERMOD are shown in **Table 4-4**.

Table 4-4
AERMOD Particle Size Data for PM_{10} Deposition Modeling

Pollutant	Group Name	Diameter [microns]	Mass Fraction for listed size category	Density [g/cm^3]
PM_{10}	Roads	1.25	0.2	2.2
		6.25	0.8	2.2
	N –PIT	1.25	0.25	2.2
		6.25	0.75	2.2
	L-PIT	1.25	0.21	2.2
		6.25	0.79	2.2
	ASH	1.25	0.128	2.2
		6.25	0.872	2.2
	WIND	6.25	0.872	2.2
		1.25	0.132	2.2
$PM_{2.5}$	ALL	1.25	1	2.2

As noted in Table 4-4, $PM_{2.5}$ emissions were also modeled using deposition. However, for the $PM_{2.5}$ modeling, the only classification was the “fine” category and 100% of the $PM_{2.5}$ emissions were assigned to this size category.

4.2.5 Ozone Limiting Method

For the NO_2 modeling only, AERMOD was employed using the “ozone limiting method” option. When this option is applied, the chemical conversion of NO_X emissions to the regulated form, nitrogen dioxide (NO_2), is assumed to be limited by the available ozone (O_3) in the atmosphere. The atmospheric conversion to NO_2 is assumed to occur by the following reaction:

$$NO + O_3 \rightarrow NO_2 + O_2$$

The inputs to the ozone limiting method are the fraction of NO_X emissions released as NO_2 and the background ozone concentrations. The NO_2 fraction of emissions from diesel-fired equipment and trucks was derived using data generated by Caterpillar (2011), where it was stated that the NO_2 emissions fraction for Caterpillar’s diesel-fired equipment was in the range of 5-15%. The mid-range of 10% was used for the Trapper Mine NO_X emissions modeling analysis.

For the background ozone levels, monitored ozone data from the CDPHE Lay Peak ozone monitoring site located near Maybell (west of Craig) was used to develop a conservative seasonal/diurnal ozone concentration profile. For each month of data (January through December), a diurnal (24-hour) ozone concentration profile was developed using the peak monitored monthly ozone concentration for that hour (See **Table 4-5**).

This approach for identifying the background ozone concentrations retains some conservatism in the OLM analysis because the peak ozone concentration in any month would overestimate the background level during most hours, and the resulting NO_2 model prediction would be higher, i.e., conservative.

Table 4-5
Seasonal/Diurnal Ozone Profile for OLM
Ozone Concentrations in parts per billion (ppb)

Hour	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	40	43	49	59	65	57	49	55	42	44	44	42
1	39	42	50	57	60	60	48	52	41	43	44	41
2	39	43	50	55	57	59	46	48	37	41	43	41
3	38	46	49	55	54	58	42	47	39	39	41	42
4	38	48	49	55	56	58	39	47	38	41	40	40
5	39	47	48	52	54	51	41	48	38	41	39	40
6	40	46	48	56	50	53	44	47	41	41	38	41
7	40	45	48	63	57	57	44	48	34	40	38	40
8	41	45	50	64	62	59	52	51	46	42	41	40
9	41	46	56	68	63	62	58	61	54	43	45	41
10	41	47	57	73	65	63	61	61	54	47	44	42
11	41	48	69	72	67	72	67	66	57	51	47	43
12	42	49	58	73	67	66	68	69	58	50	49	45
13	45	51	59	72	68	64	68	72	58	53	50	44
14	45	52	58	70	70	64	66	72	59	53	50	44
15	46	51	60	70	68	65	65	74	60	53	50	46
16	44	50	58	70	67	69	68	75	61	53	49	46
17	45	49	58	73	67	70	64	75	63	53	47	45
18	44	49	57	70	70	68	62	72	61	50	45	44
19	43	47	56	67	68	66	57	68	60	47	45	44
20	44	48	54	68	66	64	60	63	57	46	44	45
21	44	48	54	59	66	60	58	61	52	46	44	43
22	42	46	51	58	72	57	60	59	52	45	45	42
23	41	46	50	55	71	57	52	60	46	43	42	41

4.3 AERMOD Modeling Results

4.3.1 NAAQS Compliance Demonstration

This section summarizes the AERMOD modeling results for Trapper Mine emissions and compares the predicted concentrations to the applicable NAAQS. Where the NAAQS is expressed in units of parts per billion or parts per million, the NAAQS concentration value has been converted to micrograms per cubic meter to allow for direct comparison against the AERMOD modeling results. The AERMOD modeling addressed the following regulated pollutants: CO, SO_2, NO_2, PM_{10}, and $PM_{2.5}$.

The AERMOD modeling results are summarized in **Table 4-6** for the on-site Trapper meteorological data and in **Table 4-7** for the Gossard meteorological data. The modeling results are presented using the appropriate form of the NAAQS. As seen by the AERMOD results in these tables, the Gossard data provided the worst-case modeling result for all pollutants and averaging times.

As demonstrated by **Tables 4-6 and 4-7**, the predicted AERMOD concentration for each pollutant and averaging time, plus an appropriate background level to account for impact from emission sources not explicitly included in the modeling, demonstrates compliance with all applicable NAAQS.

Table 4-6
AERMOD Modeling Results – Trapper Mine: Trapper On-Site Meteorological Data
All concentrations in micrograms per cubic meter

Pollutant	Averaging Time	Form[1] - AERMOD Modeled Concentration	Background Concentration	Cumulative Impact (AERMOD plus Bkgnd)	NAAQS[2]
CO	1-hour	2nd - 2154.02	1,145	3,299.02	10,000
	8-hour	2nd - 526.6	1,145	1,671.60	40,000
SO_2	1-hour	4th - 30.4	2.62	33.02	195.6
	3-hour	1st- 14.22	2.62	16.84	700
NO_2	1-hour	8th - 135.23	13.16	148.39	188
	Annual	NA[3]	1.88	NA	100
PM_{10}	24-hour	2nd – 25.55	23	48.55	150
$PM_{2.5}$	24-hour	8th - 3.21	14	17.21	35
	Annual	NA[3]	3	NA	12

[1]The AERMOD concentration shown is the concentration expressed in the form of the NAAQS. For example, since the SO_2 NAAQS is based on the 99th percentile daily maximum concentration, the 4th highest concentration value from AERMOD is reported (i.e., over 365 days, the highest 3 days are excluded to reach the 99th percentile concentration). Other pollutants are addressed similarly based on the form of the NAAQS.

[2] NAAQS concentrations expressed as the equivalent concentration in micrograms per cubic meter. The 3-hr SO_2 standard represents the State of Colorado SO_2 standard and not the NAAQS.

[3] No annual average computed for Trapper Mine on-site data as the meteorological data span less than a full year.

Table 4-7
AERMOD Modeling Results – Trapper Mine: Gossard Meteorological Data
All concentrations in micrograms per cubic meter

Pollutant	Averaging Time	Form[1] - AERMOD Modeled Concentration	Background Concentration	Cumulative Impact (AERMOD plus Bkgnd)	NAAQS[2]
CO	1-hour	2nd - 3791.54	1,145	4,936.54	10,000
	8-hour	2nd - 907.4	1,145	2,052.40	40,000
SO_2	1-hour	4th - 49.41	2.62	52.03	195.6
	3-hour	2nd – 26.32	2.62	28.94	700
NO_2	1-hour	8th - 159.27	13.16	172.43	188
	Annual	1st - 24.67	1.88	26.55	100
PM_{10}	24-hour	2nd – 67.16	23	90.16	150
$PM_{2.5}$	24-hour	8th - 12.78	14	26.78	35
	Annual	1st - 3.96	3	6.96	12

[1]The AERMOD concentration shown is the concentration expressed in the form of the NAAQS. For example, since the SO_2 NAAQS is based on the 99th percentile daily maximum concentration, the 4th highest concentration value from AERMOD is reported (i.e., over 365 days, the highest 3 days are excluded to reach the 99th percentile concentration). Other pollutants are addressed similarly based on the form of the NAAQS.

[2] NAAQS concentrations expressed as the equivalent concentration in micrograms per cubic meter. The 3-hr SO_2 standard represents the State of Colorado SO_2 standard and not the NAAQS.

4.3.2 Maximum Impact Locations

The location of the maximum modeled concentration described in **Tables 4-6** and **4-7** varies between pollutants and averaging periods and depends largely on the emission distribution and the nature of the meteorology data. The dominant wind direction (south through southwest) caused all maximum modeled concentrations to be along either the north or east Trapper Mine permit boundary.

For PM_{10} and $PM_{2.5}$, the emissions were dominated by mining activities in and near the mining pits. As such, the maximum modeled PM_{10} 24-hour concentration occurred along the Trapper Mine permit boundary to the northeast of N-Pit. This impact was believed to be dominated by mining-related emissions associated with the N-Pit and also from emissions associated with the L-pit coal hauling where the haul road bypasses N-Pit on the north side. Even though N-Pit had fewer emissions compared to L-Pit, the shorter transport distance from N-Pit to the boundary plus the contribution from the coal hauling emissions helped increase the PM_{10} impacts in this area.

The maximum modeled $PM_{2.5}$ concentrations both occurred along the eastern Trapper Mine permit boundary to the northeast of L-Pit. The worst-case $PM_{2.5}$ impact locations were caused by the relatively high concentration of emissions within L-Pit and the direction of the prevailing winds.

The maximum modeled 1-hour average NO_2 concentration occurred along the northeastern section of the Trapper Mine permit boundary to the north of the L-Pit. These impacts were influenced by the high concentration of NO_X emissions from the truck and mining equipment in L-Pit.

For pollutants such as carbon monoxide (CO), annual mean nitrogen dioxide (NO_2), and sulfur dioxide (SO_2), combustion emissions from haul road trucks is the dominant source of emissions. For these pollutants, the maximum modeled impacts occurred near where the coal haul road leading to the Craig Station passes through the permit boundary of the Trapper Mine. As mentioned before, the coal haul road is a private road with no public access. The maximum modeled impacts occur near this particular location because the transport distance between the emission source and potential receptors is minimized where the haul road exits the Trapper Mine. The CO 1-hr and 8-hr, NO_2 annual, and SO_2 1-hr maximum modeled impacts were all located near where the coal haul road passes through the Trapper Mine permit boundary.

5.0 DIRECT AND INDIRECT GREENHOUSE GAS (GHG) EMISSIONS AND ASSOCIATED CLIMATE IMPACTS

GHG emissions associated with the Trapper Mine include carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). The direct Trapper Mine GHG emissions are associated with the fuel combustion in mining equipment and trucks, and blasting. In addition, fugitive methane emissions are released at surface mines from the coal seams. Indirect GHG emissions occur from the combustion of Trapper Mine coal at the Craig Station plus fuel combustion associated with truck and equipment associated with CCR placement within the Trapper Mine.

GHG emissions are reported on the basis of carbon dioxide equivalents (CO_2e). This accounts for the differences in the global warming potential (GWP) of the individual constituents.

5.1 Direct Greenhouse Gas Emissions

Direct GHG emissions from fuel combustion in mining equipment and trucks were calculated using the equipment operating time for the worst-case year (2020) and applicable emission factors from the USEPA MOVES2014 model (USEPA 2014). Similar to the other pollutant estimates, data from MOVES2014 was applied using the most applicable equipment type under the “nonroad construction” category. For blasting, emissions data from AP-42 Table 13-3.1 were applied using the estimated explosives (ANFO) use in blasting for the worst case year (2020).

Emissions estimates for methane releases at surface coal mines were taken from an USEPA’s Surface Mines Emissions Assessment (USEPA 2005b), which reports methane releases in cubic feet per ton of coal removed.

Table 5-1 lists the estimated direct GHG emissions and the GWP for the individual GHG gasses. GHG emissions are shown in Metric Tons (MT) for consistency with international standards (1 MT = 1,000 kg = 1.1 tons US). For the N_2O estimates, if specific N_2O emissions data were not available for a given source category, all NO_X emissions were assumed to be in the form of N_2O in order to provide for a worst-case assessment. All GHG calculations are documented in the electronic spreadsheets available by CD upon request.

Table 5-1
Direct Mining Emissions for Worst-Case Year (2020) GHG Emissions
(tons and MT per year)

	CO_2	CH_4	N_2O	CO_2e
Global Warming Potential	1	36[1]	298	--
Fuel Combustion (tons)	86,711	--	987[2]	380,973
Blasting (tons)	291	3	74[2]	22,364
Coal Seams (tons)	--	3,524	--	126,878
TOTAL (tons)	87,002	3,527	1,061	530,215
TOTAL (Metric Tons)	79,093	3,206	965	482,014

1: EPA lists the GWP for methane in the range of 28-36. The upper bound (36) was used in order to provide for a worst-case estimate for the CO_2e emissions.

2: All NO_X emissions assumed to be in the form of N_2O for the GHG calculation

5.2 Indirect Greenhouse Gas Emissions

Indirect GHG emissions are associated with combustion of coal provided to Craig Station by the Trapper Mine and secondarily from diesel fuel combustion associated with the haul trucks which carry the coal to Craig Station and the coal combustion residuals materials back to Trapper Mine for final placement.

At the Craig Station, CO_2 emissions associated with coal combustion are listed in the AMPD database, so the CO_2 emissions estimates were handled in a manner similar to the SO_2 and NO_X emissions described in Section 3.1 of the TSD. The total 2014 Craig Station CO_2 emissions were obtained from the AMPD and the portion derived from Trapper Mine coal was calculated. This value was then adjusted to a coal production level of 2.6 mtpy.

Because the AMPD reports only CO_2 emissions, the total GHG emissions as CO_2e needed to be determined by including emissions of other GHG pollutants, specifically CH_4 and N_2O. Using the AP-42 emission factors (Section 1.1, Coal Combustion) and the global warming potential of each pollutant, a CO_2e factor was determined and compared to the CO_2-only emissions factor from AP-42. This ratio was then used to adjust the CO_2-only emissions reported in the AMPD for Craig Station. Because CO_2 dominates the GHG emissions for coal combustion compared to CH_4 and N_2O, the calculated adjustment factor was very small (0.5 percent). These calculations are shown in **Table 5-2**.

Table 5-2
Adjustment of CO_2-Only Coal Combustion Emissions to CO_2e

	CO_2	CH_4	N_2O	Total
AP-42 Factors (lb/ton)	4810	0.04	0.08	
Global Warming Potential	1	36	298	
AP-42 Factors as CO_2e (lb/ton)	4810	1.44	23.84	4835

For the coal combustion residuals placement, GHG emissions associated with the diesel fuel combustion in the trucks hauling ash to the coal combustion residuals placement site were calculated using the USEPA MOVES2014 emissions model (USEPA 2014). MOVES2014 only lists data on CO_2 emissions; so other GHG emissions were not calculated for the coal combustion residuals placement. However, like coal combustion, GHGs from diesel fuel combustion are dominated by the CO_2 emissions and omitting the other GHG pollutants from the calculation does not introduce a significant error in the overall estimate. Also, the coal combustion residuals placement is a very small fraction of the overall indirect GHG emissions.

The indirect GHG emissions calculated for Trapper Mine are shown in **Table 5-3**. The coal combustion emissions dominate and the GHG emissions contribution associated with the CCR placement is very small in comparison to the coal combustion GHG emissions. The indirect GHG emissions are shown in MT for consistency with international standards (1 MT = 1,000 kg = 1.1 tons US). Also, in order to provide some perspective on the estimated indirect Trapper Mine GHG emissions, the calculated GHG emissions are compared against national (2007) and statewide (2010) totals. The indirect Trapper Mine GHG emissions are about 4.5% of the statewide GHG emissions total (2010) and are less than 0.1% of the national GHG emissions total (2007).

Table 5-3
Indirect Trapper Mine GHG Emissions reported as CO_2e
Trapper Mine Coal Combustion and Coal Combustion Residual Placement

	GHG Emissions as CO_2e (MT per yr)	Indirect Project Emissions as compared to State/National Totals
Coal Combustion at 2.6 mtpy	5,341,966	
CCR transportation	985	
Total Indirect GHG Emissions	5,342,951	
Colorado GHG Emissions (2010)	129.95 mtpy	4.1%
Nationwide GHG Emissions (2007)	7,150.1 mtpy	0.07%

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 has predicted that Colorado will experience the following general trends related to climate change (USEPA 2015b).

- The region will experience warmer temperatures with less snowfall.
- Temperature are expected to increase more inwinter 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, recreationalists, and others. In late summer, rivers, lakes, and reservoirs will be drier.
- More frequent, more severe, and possibly longer-lasting droughts.
- Crop and livestock production patterns could shift northward; less soil moisture due to increased evaporation may increase irrigation needs.
- Drier conditions will reduce the range and health of ponderosa and lodgepole pine forests; and increase the susceptibility to fire.
- Grasslands and rangeland could expand into previously forested areas
- Ecosystems will be stressed and wildlife as mountain lion, black bear, long-nose sucker, marten, and bald eagle could be further stressed.

Another approach to address climate change impacts is to calculate the “social cost of carbon” (SCC). The SCC protocol was developed for use in cost-benefit analyses for proposed regulations that could impact cumulative global GHG emissions (USEPA 2013). The SCC estimates economic damages associated with increases in carbon emissions and includes but is not limited to changes in net agricultural productivity, human health, and property damages associated with increased flood risks.

The SCC is typically expressed as the cost in dollars per metric ton of emissions and there is a wide range of costs, with the greatest influence on costs caused by the discount rate. The discount rate is a measure to estimate the present value for costs/damages that may occur far out into the future. For 2020 emissions, the range in SCC presented by the USEPA is \$13/MT to \$137/MT, represented as 2011 dollars (USEPA 2013).

For the Trapper EA, OSMRE has elected not to specifically quantify the social cost of carbon. First, there is no certainty that GHG emissions at Craig Station would actually be reduced if the subject Trapper Mine coal was not mined given that Craig Station has alternative sources for coal and that Trapper Mine also has non-federal coal reserves that could be mined (see additional discussion of this topic under the No Action Alternative in the EA).

Also, in order to provide any meaningful insight, the projected SCC costs 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 cost to the project and also given the uncertainties that indirect GHG emissions would actually be reduced under any reasonable project alternatives, OSMRE has elected not to quantify the social cost of carbon for this EA and has instead quantified direct and indirect GHG emissions and evaluated these emissions in the context of state and national GHG emission inventories (see **Table 5-3**).

6.0 SUMMARY OF AIR QUALITY & CLIMATE IMPACTS

Direct air quality impacts from mining activities include emissions associated with recovery of the coal resource, including coal/overburden handling and transfer along with emissions from combustion of diesel fuel in trucks and mining equipment. Although air emissions are released into the environment from mining activities, air quality dispersion modeling has demonstrated that health-based air quality standards will not be exceeded in the vicinity of Trapper Mine. As such, the direct air quality impacts are negligible. Direct air quality impacts are short-term and will occur for the life of mining activities.

Indirect air quality impacts occur from combustion of coal mined by TMI at Craig Station Units 1 and 2. The coal combustion releases air emissions, most notably SO_2 and NO_X. Craig Station employs pollution abatement equipment to reduce these emissions and has plans to further reduce NO_X emissions at Units 1 and 2 in the 2018-2021 timeframe. The indirect air quality emissions are short-term and occur for the life of mining activities and are also negligible.

The indirect air quality impacts associated with mercury emissions released during coal combustion are discussed in the Special Status Species Section of the Trapper Mine EA.

Emissions of greenhouse gasses (GHGs) occur from both direct and indirect sources. Direct GHG emissions include fugitive releases of methane from the coal seams and GHG emissions from combustion of diesel fuel in the truck fleet and other mining equipment. Indirect GHG emissions, primarily CO_2, occur from coal combustion at Craig Station Units 1 and 2. Any climate impacts that may occur are difficult to assign to an individual emission source of GHGs such as Trapper Mine and/or Craig Station. Climate impacts are potentially long-term, but any contribution to climate change associated with direct/indirect emissions from Trapper Mine is likely to be negligible and would cease after the life of the mine.

7.0 REFERENCES

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Appendix C

Biological Opinion

United States Department of the Interior

FISH AND WILDLIFE SERVICE

COLORADO FIELD OFFICE/LAKEWOOD
PO BOX 25486, DENVER FEDERAL CENTER
DENVER, COLORADO 80225-0486

IN REPLY REFER TO:
ES/GJ-6-CO-16-F-005
TAILS 06E24100-2016-F-0050

March 22, 2016

Memorandum

To: Supervisor, Program Support Division, Field Operations Branch, Office of Surface Mining Reclamation and Enforcement, Denver, Colorado

From: Acting Colorado Field Supervisor, U.S. Fish and Wildlife Service, Ecological Services Field Office, Lakewood, Colorado

Subject: Reinitiation of Consultation for the Trapper Mining Inc. Trapper Mine, Mining Plan Modification of Federal Coal Leases C-07519 and C-079641, Moffat County, Colorado

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 received December 9, 2015, included a biological assessment (BA) entitled *Reinitiation of Consultation for the Trapper Mining Inc. Trapper Mine, Mining Plan Modification* (OSMRE 2015a). OSMRE analyzed the effects from the subject project to a number of listed species identified in the BA; the final determinations of OSMRE 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	proposed critical habitat	not likely to destroy or adversely modify
Greenback cutthroat trout (*Oncorhynchus clarki stomias*)	threatened	no effect
Dudley Bluffs Twinpod (*Physaria obcordata*)	threatened	no effect
Ute ladies'-tresses (*Spiranthes diluvialis*)	threatened	no effect

Three other listed species, Black-footed ferret (*Mustela nigripes*), Canada lynx (*lynx canadensis*), and Mexican spotted owl (*Strix occidentalis lucida*), were analyzed in past consultations between OSMRE and the Service on Trapper Mine activities (see 1.2 Consultation History in BA). OSMRE had determined that there would be no effect to those three species. OSMRE found past analyses to be adequate and did not reanalyze effects to those species in the current BA.

Below, 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 determination for the western yellow-billed cuckoo (cuckoo) and its proposed critical habitat.

For the Dudley Bluffs Twinpod, Ute ladies'-tresses, black-footed ferret, Mexican spotted owl, and Canada lynx, 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 past and current analyses for these species.

Concurrence for western yellow-billed cuckoo and its proposed critical habitat

No cuckoos have been found at the Trapper Mine or the Craig Generating Station (Craig Station), both of which lack cuckoo habitat. Cuckoo habitat is present approximately 1.5 miles to the northwest of the Craig Station along the Yampa River. 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 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).

As described in the BA (Appendix B), in order to further our collective knowledge regarding the use of the Yampa proposed critical habitat unit by yellow-billed cuckoos, Trapper Mining Inc. (Trapper) plans to commit $5,000 for a yellow-billed cuckoo survey during the breeding season within the recently proposed critical habitat unit along the Yampa River. Trapper would either conduct the survey itself or hire a contractor to perform the survey (in either case the official survey protocol would be followed by a qualified permit holder). The results of the survey will be provided to the Service.

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 coal mining of Federal coal leases C-07519 and C-079641 at the Trapper Mine and subsequent combustion of the coal at the Craig Generating Station

TAILS No. 06E24100-2016-F-0050

Colorado pikeminnow (*Ptychocheilus lucius*)

FISH AND WILDLIFE SERVICE
Mountain Prairie Region
Grand Junction, Colorado

Acting Colorado Field Supervisor, Ecological Services ____________________

Date 3/22/16

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 (mine plan approval) 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 ESA are defined as "...those that are caused by the proposed action and are later in time, but still are <u>reasonably certain to occur</u>." (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 and Trapper mined coal would be taken to be combusted. OSMRE also does not have discretion or authority regarding the manner in which the coal will be combusted. In the past, coal mined at the Colowyo and Trapper mines has been burned 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

On February 28, 2013, OSMRE submitted a consultation request and BA for a 5-year permit renewal for Trapper Mine (SMCRA Permit C-1981-010) Permit Renewal Application Number 6 (RN-06). The BA determined that the endangered fish in the Upper Colorado River Basin would be adversely affected by water depletions (amount updated), it contained "no effect" determinations for the Canada lynx, Mexican spotted owl, and Ute ladies'-tresses orchid, a determination of "may affect, not likely to adversely affect the continued existence of" the North American wolverine (*Gulo gulo luscus*) and greater sage-grouse (*Centrocercus urophasianus*), and made a determination that mining activities would "not affect the continued existence of" the black-footed ferret and western yellow-billed cuckoo. In response, the Service issued a Biological Opinion on June 21, 2013 (TAILS 06E24100-2013-F-0098), that addressed a revised assessment of 160.1 acre-feet/year (AF/yr) of water depletions from the Yampa River. No new water depletions have been identified as part of the current consultation and are not addressed further in this BO.

On June 15, 2009, OSMRE submitted a consultation request and BA documenting a 94.8 AF/yr net water depletion for a mining plan modification for Permit C-1981-010 at the Trapper Mine, which would result from an additional 312 acres of mining disturbance. The BA also contained "no effect" determinations for the black-footed ferret, Canada lynx, Mexican spotted owl, and Ute ladies'-tresses orchid. The Service issued a Biological Opinion on September 17, 2009, (TAILS 65413-2009-F-0179), that addressed the 94.8 AF/yr of water depletions from the Yampa River for the expansion of mining into the additional 312 acres within Trapper Mine's 10,382.3 acre permit area.

1.0 PROPOSED ACTION (as described in the BA)

The Trapper surface coal mine is located in Moffat County, Colorado, approximately 6 miles south of the Town of Craig, Colorado on State of Colorado, and private lands. The Trapper mine approved Colorado Division of Reclamation and Mining Safety (CDRMS) permit area encompasses approximately 11,157 acres, of which approximately 2,423 acres are part of the two federal coal leases under analysis in this BO (Federal coal leases C-079641 and C-07519). The other acres within the permit area have already been mined, contain non-Federal coal, or are not currently under consideration for mining; thus, those acres are not part of the proposed action and will not be considered further in this BO.

The Yampa River flows generally east to west approximately 6 miles north of the Project Area, and the Williams Fork River skirts the south side of the permit area and flows into the Yampa River approximately one mile west of the permit area. Within the permit area, on north facing slopes, portions of the Buzzard, Coyote, No Name, Johnson, Pyeatt and Flume gulches flow generally south to north primarily in response to snowmelt or heavy rains. These gulches eventually discharge flows into the Yampa River. Drainages within the southern portion of the permit area include portions of Ute, Castor, Deer, Elk, and Horse gulches that flow generally southward into the Williams Fork River.

1.1 Action Area

The description of action area is informed by the following definitions.

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 Trapper Mine, 2) the topographic airshed (airshed) (BA Fig. 6), and 3) critical habitats designated for all four endangered fish species found along the Yampa and White Rivers down to where each meets the Green River, which are within, adjacent to, and downriver from the airshed. The airshed encompasses the Trapper Mine and Craig Generating Station; it generally covers the area from Steamboat Springs west nearly to Dinosaur National Monument, and from the Flat Top Mountains north to the Elkhead Mountains (BA Fig. 6). The airshed includes portions of Moffat, Rio Blanco, Garfield, and Routt 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

Trapper production from the two lease areas is expected to be approximately 19.1 million tons from July 1, 2015, through the life of mine, currently anticipated to extend to 2024. The average production rate is approximately 2.3 million tons per year from eight coal seams of the Williams

Fork Formation with a maximum production rate of 2.6 million tons per year. Trapper currently produces coal and will continue to produce coal in the future from the L Pit located on Federal Coal Lease C-079641. Future mining also will occur in the N Pit located partially within Federal Coal Lease C-07519. Coal is mined using dragline, truck and shovel and highwall augering methods. The coal is transported by haul truck to the Craig Generating Station located to the north of the mine. Trapper currently has no provisions to ship coal to other locations (OSMRE 2015a).

1.3 Coal Combustion

The destination of the coal, once mined, is not under the jurisdiction of OSMRE. However, all of the coal produced at the Trapper Mine is sent to the Craig Generating Station in Craig, Colorado. Trapper coal supplies as much as 54 percent of the annual fuel for 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.

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 (OSMRE 2015b):

- 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 2018. 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.

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 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. Trapper plans to commit $45,000 for Colorado River endangered fish research and $10,000 for Colorado River endangered fish on-the-ground recovery efforts. These proposed conservation measures would become mandatory commitments with the approval of the BA and issuance of the BO. Trapper commits to fund these projects within 45 days of issuance of the Trapper Mine BO. Further details are as follows:

I. Commitment for Research Purposes for the Colorado River Fish

a. Water Quality Testing. Trapper will be able to provide funding in the amount of $23,280 for quarterly water quality testing in two locations along both the White River and the Yampa River, beginning in June 2016 and ending in March of 2019. This amount is designed to allow sampling for 12 quarters of data from each of the four designated sites, or a total of 48 individual water quality samples. The water from these sites will be tested for both total mercury (Hg) and methylmercury (MeHg).

b. Fish Tissue Mercury Sampling. Trapper will provide $21,720 for a mercury deposition study that will be conducted by the United States Geological Survey (USGS) (in cooperation with the BLM's Little Snake Field Office) for the investigation of MeHg uptake in fish tissues to be conducted in coordination with Colorado Parks and Wildlife. This study is to help the Service (and other interested parties) find out what the current mercury and selenium concentrations are in fish in the Yampa and White Rivers. Most likely a surrogate fish species (probably smallmouth bass) will need to be sampled due to the difficulty of obtaining enough endangered fish for sampling.

The information obtained through these study efforts will advance the scientific understanding of the potential effects of coal combustion to the four endangered fish and will facilitate future conservation efforts for these species

II. Commitment for Colorado River Fish Recovery Efforts

Trapper will provide $10,000 for recovery actions that are managed by the Upper Colorado River Endangered Fish Recovery Program (Recovery Program). Trapper will provide the funding to the National Fish and Wildlife Foundation to distribute to the Recovery Program.

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 ≥ 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 2015a).

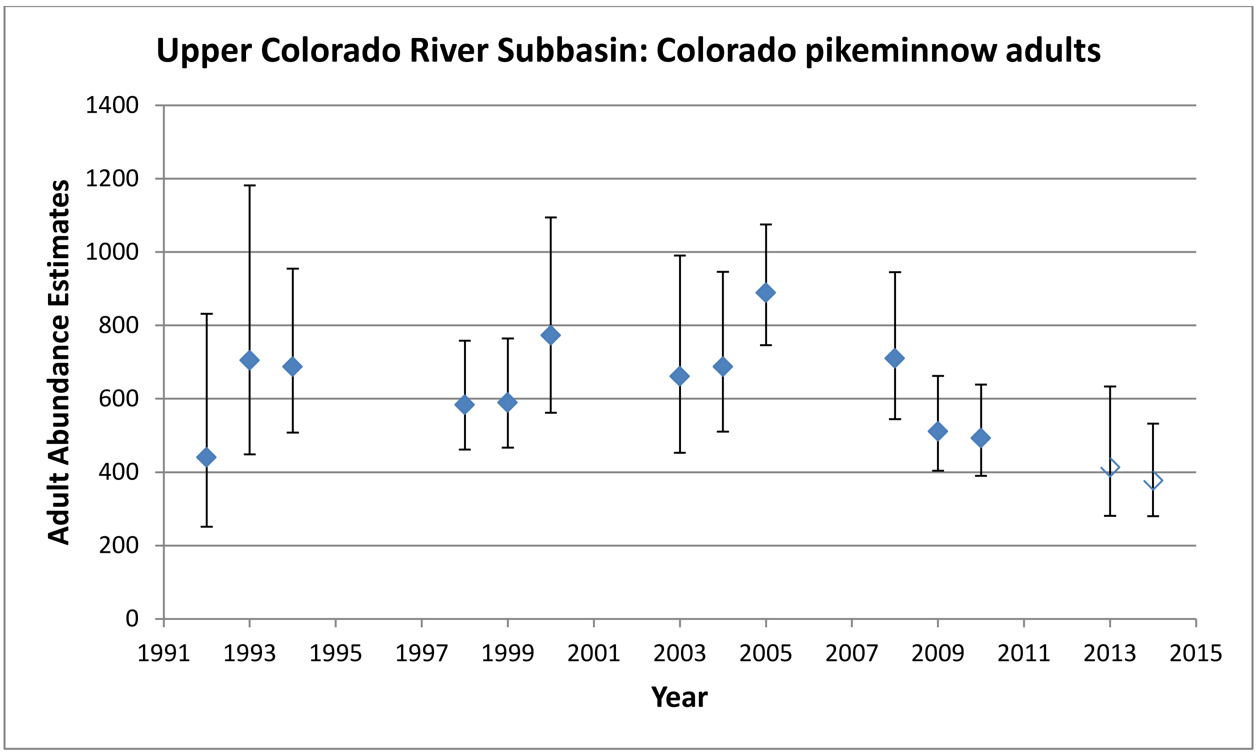

Figure 1. Adult Colorado pikeminnow population abundance estimates for the Colorado River (Osmundson and Burnham 1998; Osmundson and White 2009; 2014). Error bars represent the 95 percent confidence intervals. The 2013 and 2014 data are preliminary and represented by hollow data points.

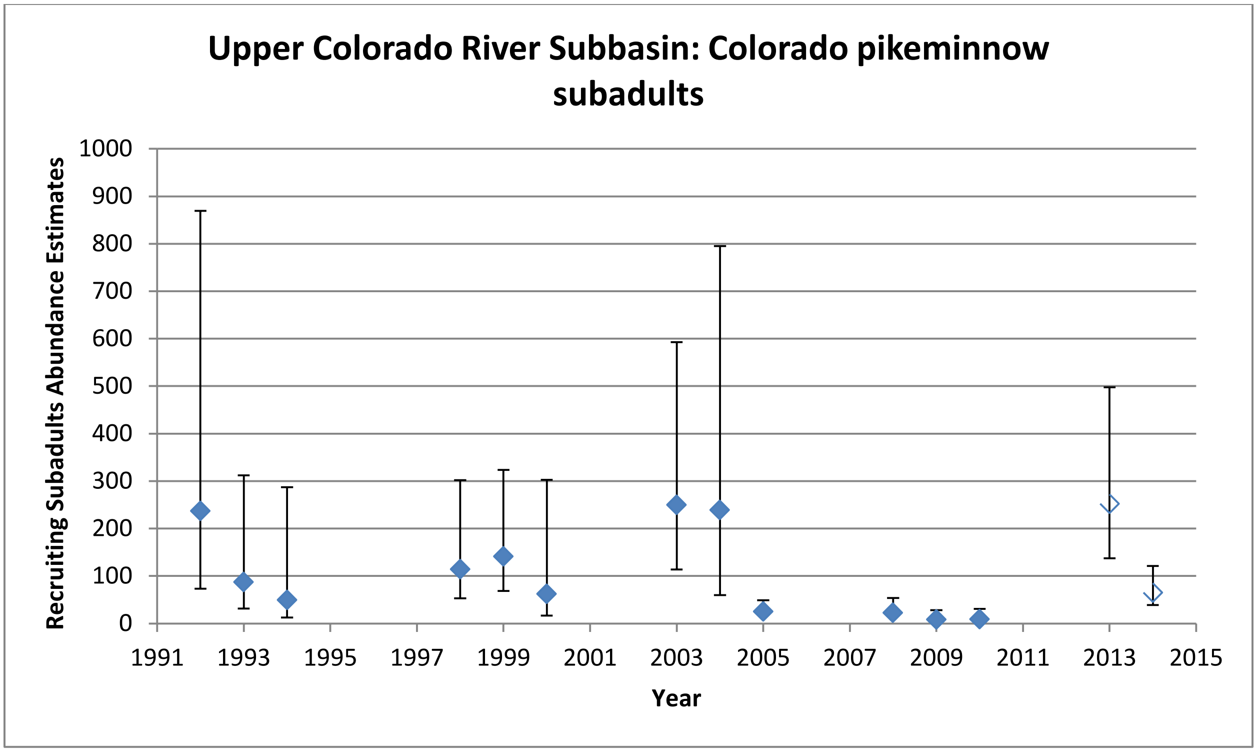

Figure 2. Colorado pikeminnow recruitment abundance estimates (calculated using the same mark recapture methodology as for the adults) for the Colorado River (Osmundson and White 2009, 2014; Service 2015a). Recruits are age-6 (400-449mm TL). Error bars represent the 95 percent confidence intervals. The 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 2014b).

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.

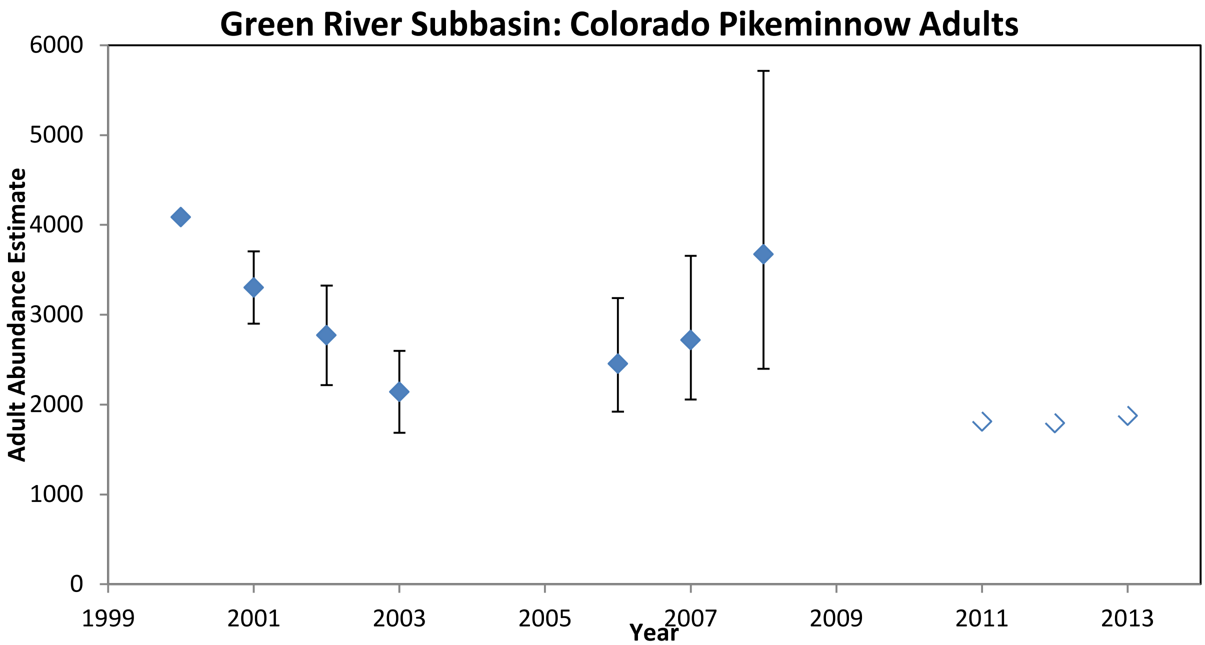

Figure 3. Adult Colorado pikeminnow population abundance estimates for the Green River (2000-2008 estimates from Bestgen et al. 2010; preliminary estimates for 2011-2013 from Bestgen et al. 2013). Error bars represent the 95 percent confidence intervals. In 2000, the lower Green River was not sampled. 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 2015a). 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).

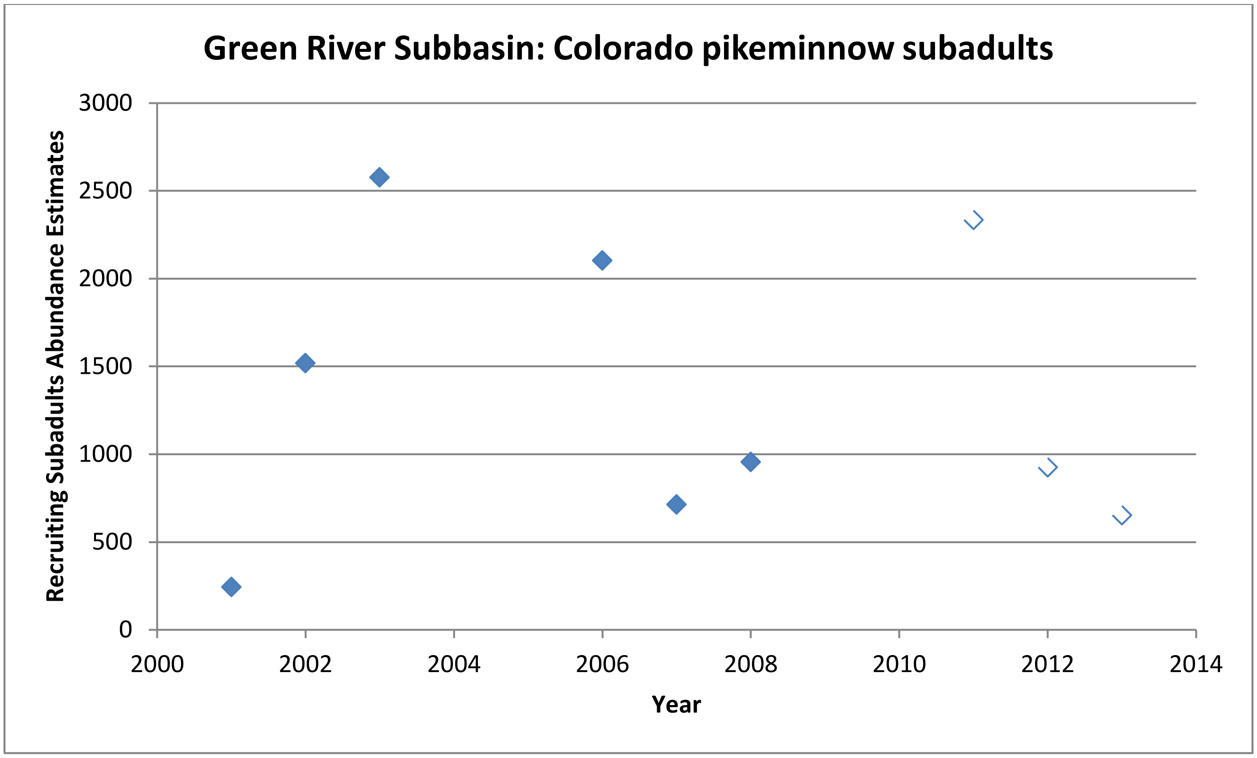

Figure 4. Estimated numbers of Colorado pikeminnow recruits (400–449 mm TL) in the Green River subbasin (Yampa, White, Middle Green, Desolation-Gray Canyons, and Lower Green) for 2001–2013. Data from Bestgen et al. (2010). Estimates of recruitment for the most recent 2011-2013 sampling period are preliminary.

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.

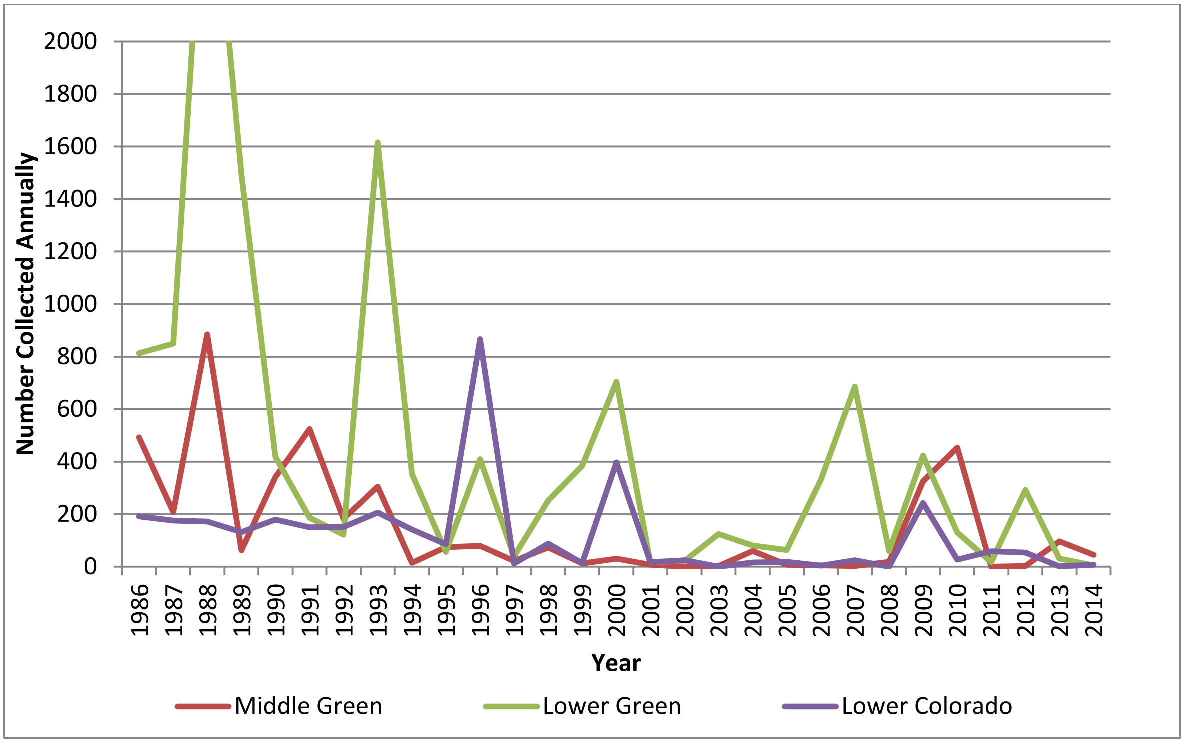

Figure 5. Numbers of age-0 Colorado pikeminnow collected each year from three different habitat reaches of river. A total of 2,892 Age-0 were collected in the lower Green River in 1988; the significance of strong Age-0 cohorts collected in the late 1980's was discussed in Bestgen et al. 2010. Data from 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 2015b). 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 2015b). 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 2014b). 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).

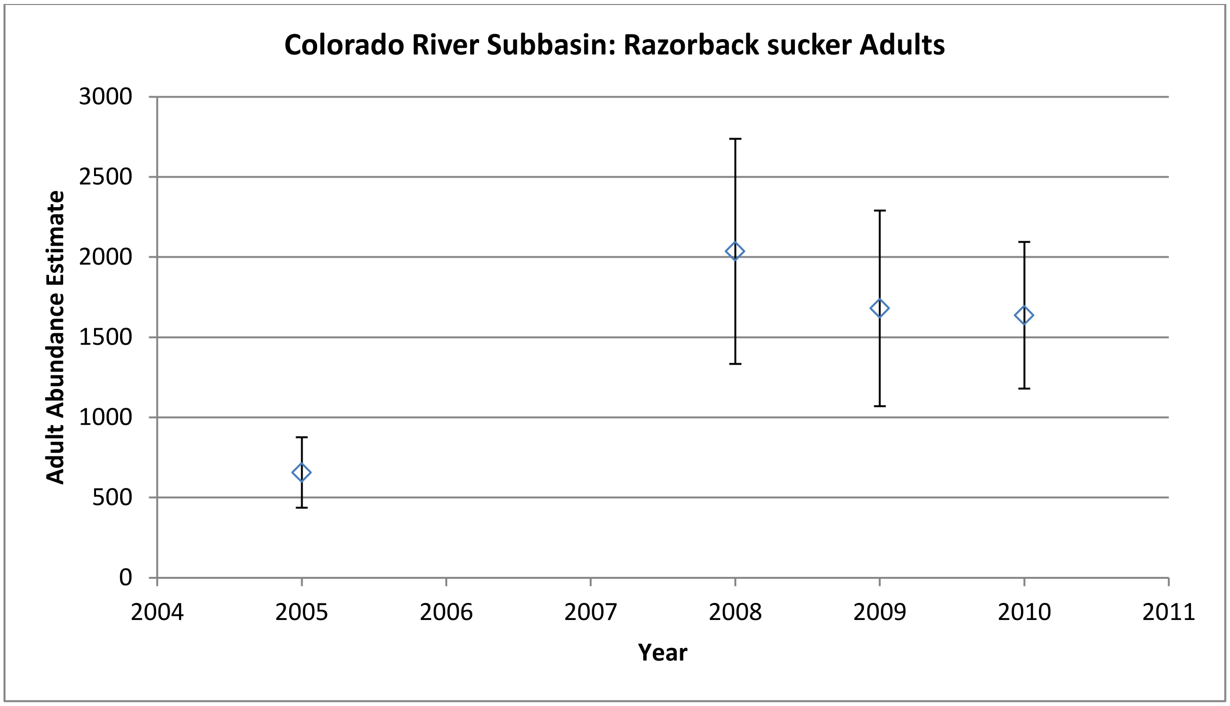

Figure 6. Preliminary population estimates of the adult razorback sucker in the Colorado River (Palisade, CO to the confluence of the Green River). Error bars represent the 95 percent confidence intervals (Service 2015a).

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 2015a).

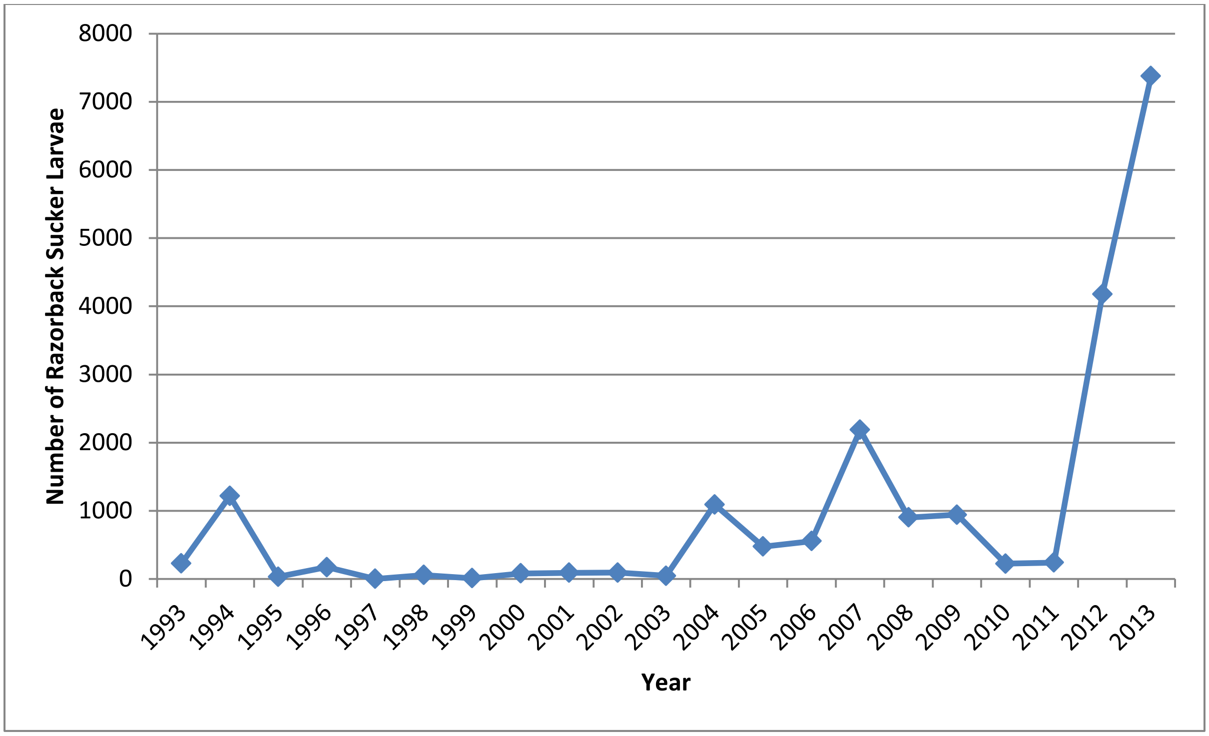

Figure 7. Numbers of razorback sucker larvae collected in light traps in the middle Green River since 1993.

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 2015a). 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^{o}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.

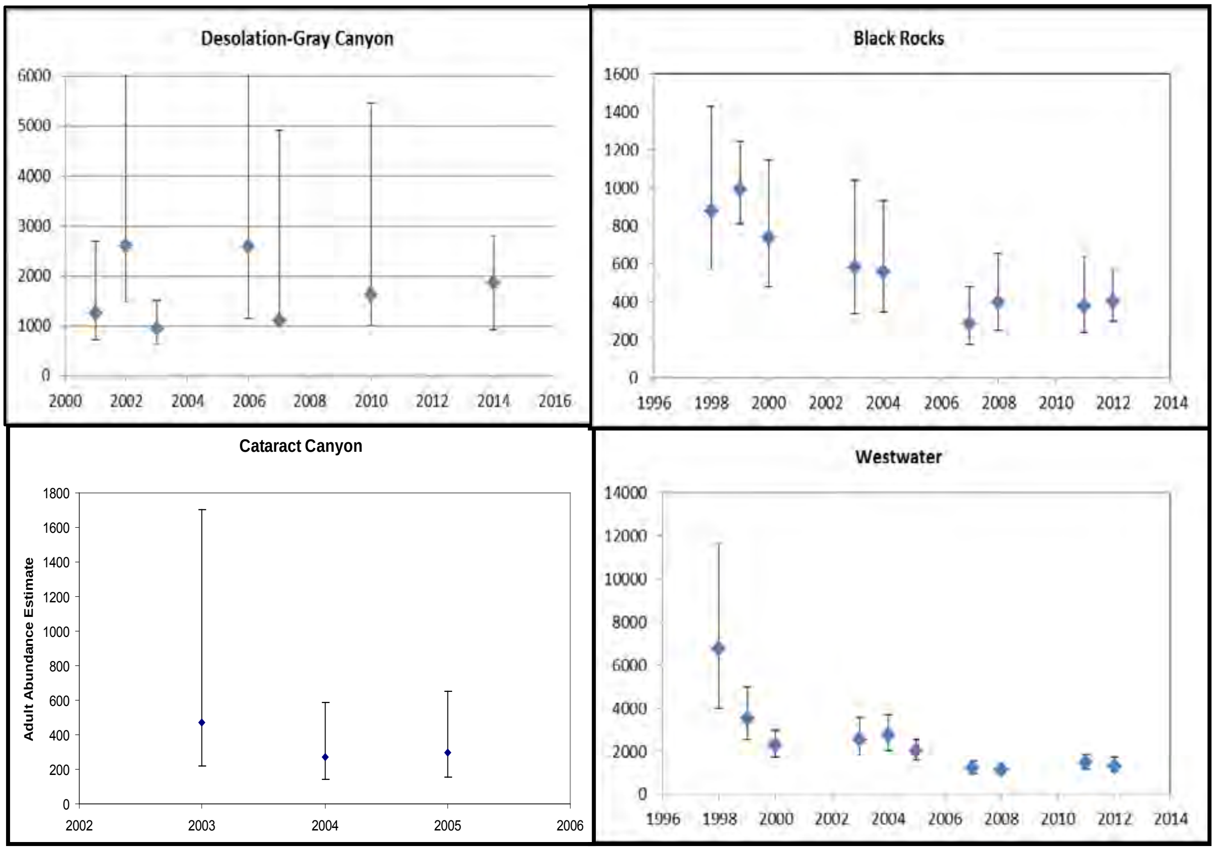

Figure 8. Adult humpback chub population estimates with confidence intervals for four populations in the upper Colorado River Basin (note that the scale differs among the graphs for the different populations). Clockwise from upper left: Desolation-Gray Canyons (from Badame 2011, 2012; Service 2015a); 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.

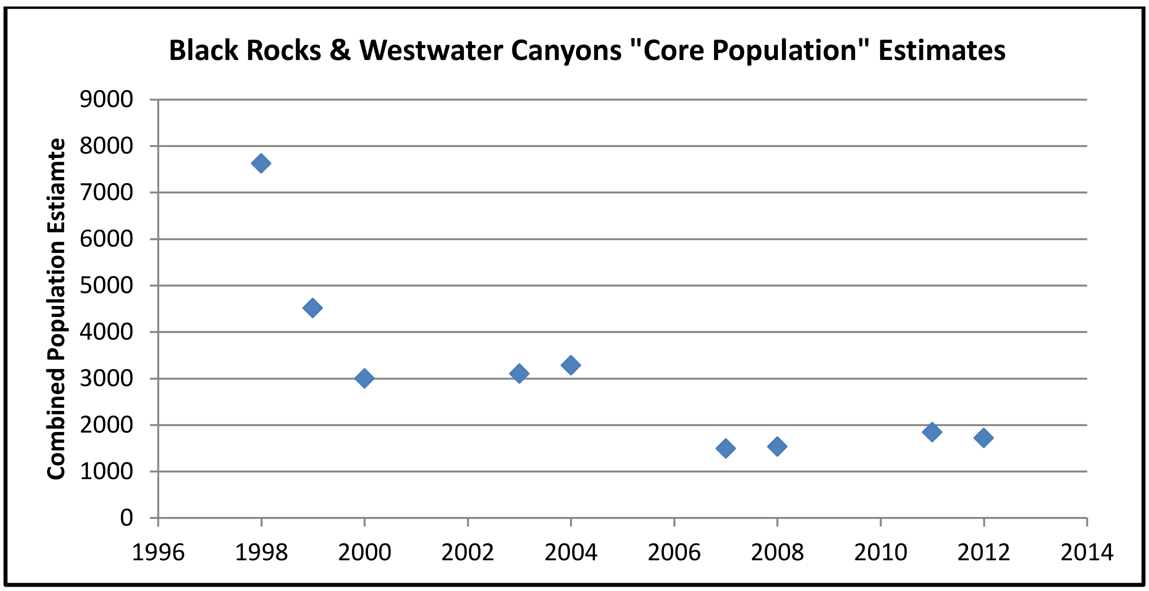

Figure 9. Combined population estimates for humpback chub in Black Rocks and Westwater Canyon based on a robust open model created by Dr.'s Bestgen and White, Colorado State University. The 2002 Recovery Goal downlist criteria for these combined ("core population") estimates is 2,100 adults.

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 April23, 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).

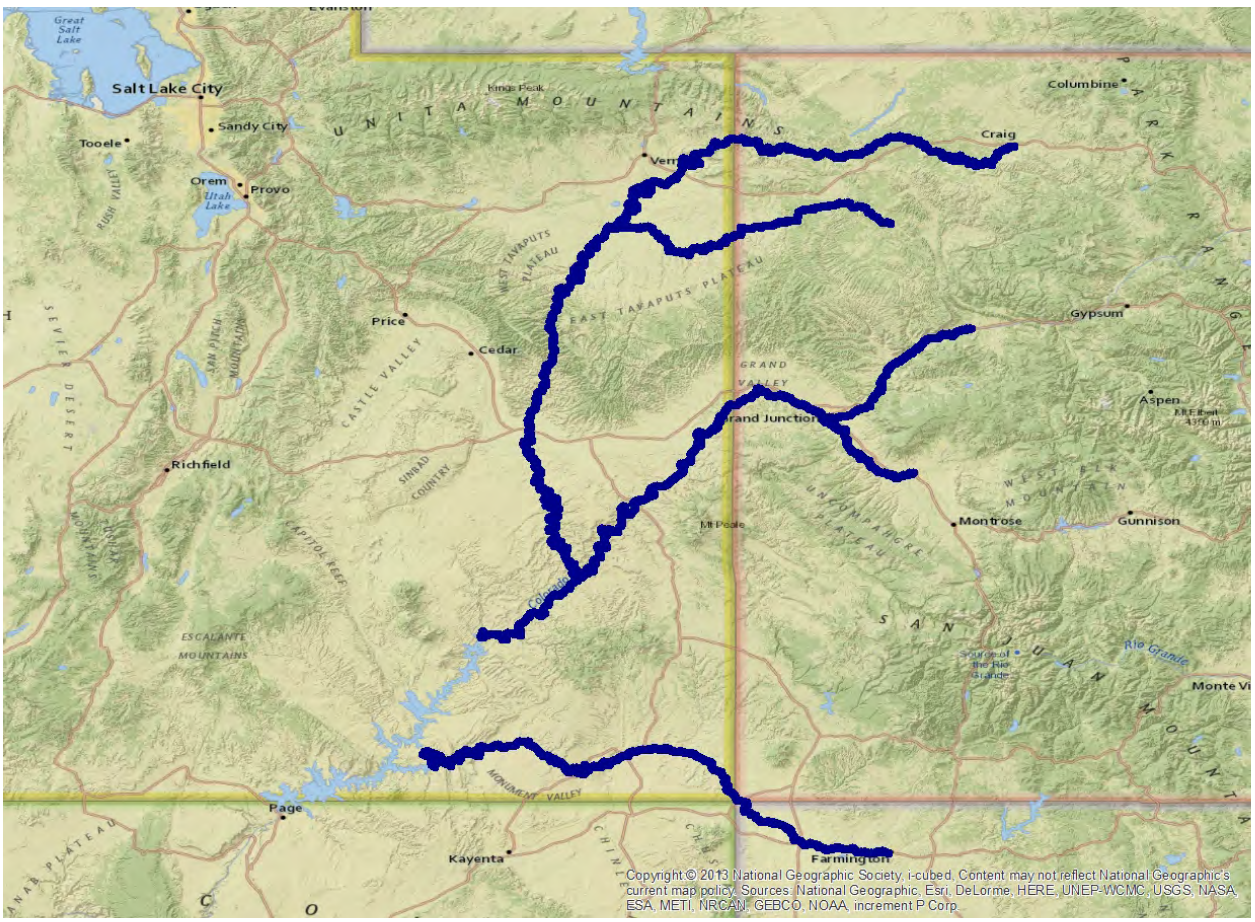

Figure 6. Designated critical habitat for the Colorado pikeminnow.

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 primary constituent elements (PCEs) of the habitat, which are identical for all four endangered fish species. PCEs are physical or biological features essential to the conservation of a species for which its designated or proposed critical habitat is based on, such as: 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 PCEs of critical habitat are the same for each of the four endangered fish within the Colorado River system. The PCEs 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 2015b). 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 1 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 PCEs 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.

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 2015a). 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).

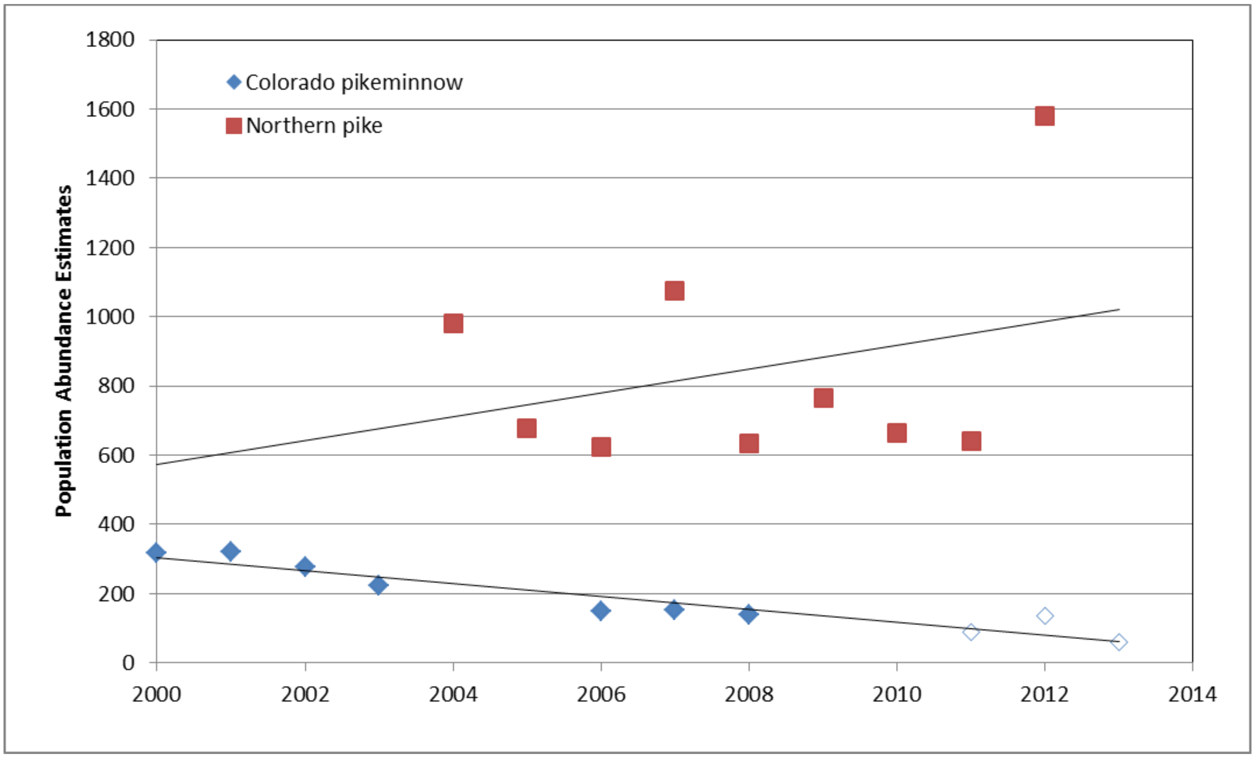

Figure 7. Comparison of Colorado pikeminnow population estimates (CPM) (2000 – 2008 data from Bestgen et al. 2010) and northern pike (Battige 2012) in the middle Yampa River. The 2011-2013 data points for Colorado pikeminnow are preliminary. Northern pike population estimates were not conducted in 2013.

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 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 Foidel Creek 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 Federal Trapper Mine coal at the Craig 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.

- 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 difficult to precisely describe the effects to individuals of the four endangered fish species. To satisfy Congress's direction in 7(a)(2) regarding ensuring 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 a conservation action--an analysis of mercury concentrations in fish tissue in the Yampa and White Rivers--as described above. The results of this effort will help 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 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 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. Independent from the project under consideration in this consultation, an effort to conduct such a mercury deposition modeling effort in the Yampa River Basin has begun recently, conducted by the Electric Power Research Institute (EPRI) and funded by the Colowyo Coal Company, L.P. and their parent organization, Tri-State Generation and Transmission Association, Inc. 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 Trapper coal 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, Trapper Mine sends all of its produced coal to the Craig Generating Station; their coal supplies as much as 54 percent of the annual fuel for the Craig Generating Station. In 2014 (the last year data are available), the Craig Generating Station emitted 19.2 kg of mercury. In that year, the total coal consumption rate for Craig Generation Station was about 4.6 million tons (mtpy) of coal, which means that Trapper Mine contributed at a rate of 2.3 mtpy. The Craig Generating Station has three power generating units, and Trapper Mine coal is almost exclusively used at Units #1 and #2. Based on 2014 load data reported to the EPA Clean Air Markets database, Units #1 and #2 represented 63.56 percent of the total electric load generated at Craig Generation Station. If the load and coal consumption are assumed to be directly related, then the coal consumption at Units #1 and #2 would have been 2.92 mtpy in 2014 (63.56 percent of 4.6 mtpy). Using this figure, the 2.3 mtpy contributed by Trapper Mine would have been 78.76 percent of the overall coal consumption at Units #1 and #2.

Emissions monitoring data obtained from CDPHE for 2014 show that mercury emissions are substantially less at Unit #1 (2.0 kg) and Unit #2 (2.20 kg) compared to Unit #3 (15.28 kg). This is most likely due to the differences in pollution control systems at the three Craig generating units. Units #1 and #2 each use wet scrubbing systems for sulfur dioxide (SO2) emissions control, compared to a spray dryer absorber (dry scrubbing) at Unit #3. Wet scrubbing systems have been shown to be extremely effective at providing ancillary control benefits for mercury emissions. This is because the oxidized form of mercury (Hg2+) is water soluble and can be readily removed by the wet scrubber technology.

Applying the 78.76 percent factor to the reported 2014 mercury emissions listed above, the Trapper contribution to the Craig mercury emissions would be 1.57 kg at Unit #1 and 1.73 kg at Unit #2. Adjusting the mercury emissions estimate to the maximum production rate of 2.6 mtpy under the proposed action would result in mercury emissions of 3.73 kg per year that is attributable to combustion of Trapper Mine coal at the Craig Generating Station.

The proposed action assumes a constant rate of mining at Trapper Mine and a stable rate of combustion at the Craig Generating Station each year from July 1, 2015, through the life of the mine in 2024. This would result in a total of 35.06 kg of mercury emitted from the Craig

Generating Station as a result of the combustion of Trapper Mine coal over the next 9.4 years (3.73 kg x 9.4 = 35.06 kg).

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 and 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 much 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, 0.187 kg of mercury would be deposited in the local action area each year from the combustion of the proposed Trapper Mine coal at the Craig Generating Station (3.73 kg x 0.05). Over the proposed life of the project (9.4 years), this would equate to 1.76 kg of locally-deposited mercury (0.187 kg x 9.4).

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 map 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 Colorado River Fish Action Area is within these two watersheds and is 10,514 km2 (BA, Figure 6). Therefore, assuming an even distribution of mercury deposition, there would be a total of 102.59 kg of mercury deposited annually over the entire Action Area. 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 local mercury deposition is 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 (102.59 kg x 0.05).

The proportion of local mercury attributable to the Craig Generating 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 consumes coal at a rate of 4.8 mtpy, and the Hayden Generating Station uses coal at a rate of 1.75 mtpy (i.e., the Craig Generating Station consumes 73.3 percent of total coal consumed at both generating stations). Using these numbers, the Craig Generating Station would contribute 3.75 kg of local mercury (0.733 x 5.13 kg); and the Hayden Generating Station would contribute 1.37 kg of local mercury (0.267 x 5.13 kg). Applying percentages to the sourced coal that is consumed in the three units at the Craig Generating Station estimates Trapper's contribution to locally deposited mercury. Trapper sourced coal that is combusted in Unit #1 and Unit #2 contributes 19.16 percent of the mercury emitted from the Craig Generating Station, and other coal that is consumed in Unit #1, Unit #2, and Unit #3 contributes 80.84 percent of the mercury emissions. Relating these percentages to the local mercury deposition from the Craig Generating Station indicates that Trapper Mine coal results in 0.72 kg of locally deposited mercury (3.75 kg x 0.1916); and other coal results in 3.04 kg of locally deposited mercury. 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 endangered fish critical habitats).

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 Trapper Mine coal that is combusted at the Craig Generating Station provides a total mercury deposition of 1.8 kg (0.72 kg x 2.5) in the Action Area from the proposed action.

We see that estimating the amount of mercury locally deposited from the combustion of the proposed Trapper coal using emissions data from the Craig Generating station (and assumptions regarding local deposition), results in a smaller estimate of locally deposited mercury (0.187 kg/yr) than that obtained from the estimate using the mercury deposition data at the MDN site (and associated conservative assumptions regarding mercury sources) (1.8 kg/yr). In terms of volume, this translates to between 0.47 and 4.4 ounces of mercury per year, 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.

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.

4.2 Effects to Endangered Fish

4.2.1 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:

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 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 sub-lethal 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 Trapper 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.

4.2.2 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.

4.3 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 PCEs 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.

4.3.1 Colorado pikeminnow

Mercury from the combustion of Trapper 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 (PCE #1). It is difficult to quantify the level of impact from the proposed actions to critical habitat given the lack of information on where 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 potentially smaller than mercury, impacts to critical habitat from selenium added to the system through coal combustion, 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 PCE #1 in 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 (PCE#2) and the biological environment (PCE#3) are currently experiencing the most severe impacts, which are unrelated to the project and unaffected by the project (e.g., dams and diversions impacting PCE#2, nonnative species impacting PCE#3).

4.3.2 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, although 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 source of the Craig Generating Station. Razorback sucker critical habitat is located downstream from, but not within, the mercury deposition airshed analyzed for this consultation. Mercury and selenium contributions from the project to the action area diminish with distance from this point source. This increases our confidence that the project would not diminish water quality to a point where critical habitat can no longer provide the PCEs essential for the conservation of the species.

4.3.3 Humpback chub and bonytail

Critical habitat for the humpback chub and bonytail along the Yampa River is identical and no critical habitat has been designated for either of these species along the White River. 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. 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 source of 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. This increases our confidence that the project would not diminish water quality to a point where these critical habitats can no longer provide the PCEs essential for the conservation of these two species.

4.4 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 Station. According to a recent OSMRE biological assessment (OSMRE 2015), in 2013, the last year data is available, the Craig and Hayden Generating Stations emitted 19.2 and 7.5 kg of mercury, respectively for a total of total of 26.7 kg. The Craig Station emits more than twice the amount of mercury than the Hayden Generating Station, and is 21 miles closer to habitats occupied by endangered fish in the Yampa River; both generating stations are within the airshed analyzed for effects in this consultation, and therefore are 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.

4.5 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.

4.6 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. 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 at the Trapper 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 is that the current levels of mercury in endangered fish tissue within the action area is similar to what has been measured in the past, as discussed in the Baseline and Effects of the Action sections above. The Trapper-funded conservation measures, as described above, are expected to shed new light on mercury concentrations in the Yampa and White Rivers and in fish tissue in the action area. If the results of these or similar studies indicate that water or 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 will 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 reinitiation is necessary.

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Appendix D

American Indian Consultation

United States Department of the Interior

OFFICE OF SURFACE MINING
RECLAMATION AND ENFORCEMENT

Western Region Office
1999 Broadway, Suite 3320
Denver, CO 80202-3050

November 5, 2015

Chairman Herman G. Honanie
P.O. Box 123
Kykotsmovi, AZ 86039

Dear Chairman Honanie,

The U.S. Department of the Interior (DOI), Office of Surface Mining Reclamation and Enforcement (OSMRE), Western Region, will prepare an environmental assessment (EA) to analyze environmental impacts of a Federal mining plan approval for current and future mining within Federal Coal Leases Nos. C-079641 and C-07519 held by Trapper Mining Inc. as part of the Trapper Mine. The EA will cover the time period beginning July 1, 2015, and continuing through the planned life of mine for the portion of the two Federal coal lease areas lying within the approved Surface Mining Control and Reclamation Act of 1977 (SMCRA) Permit Area (the Project). As required by the National Environmental Policy Act of 1969 (NEPA), the EA will disclose the potential for direct, indirect, and cumulative impacts to the environment from the Project. In accordance with the 2011 Department of Interior Policy on Consultation with Indian Tribes and 36 CFR Part 800.2(c)(2)(ii), the regulations implementing Section 106 of the National Historic Preservation Act of 1966 (as amended), OSMRE requests continued consultation with your tribe for the stages of the proposal development and implementation of the final federal action.

Preparation of the EA will be completed pursuant to the Court-approved Joint Proposed Remedy, as approved by the United States District Court for the District of Colorado on September 14, 2015, in the case entitled *WildEarth Guardians v. U.S. Office of Surface Mining et al.*, Case 1:13-cv-00518-RBJ (D. Colo. 2015). As part of the Court-approved remedy, OSMRE agreed to conduct a new NEPA analysis for Trapper's current and future mining activities within Federal Coal Leases Nos. C-079641 and C-07519.

The Trapper Mine is located approximately 6 miles south of the town of Craig in Moffat County, Colorado, east of Colorado Highway 13. The proposed Project is occurring on two federal coal leases administered by the Bureau of Land Management (BLM) and located within the eastern portion of the Trapper Mine's approved SMCRA Permit Area. Federal Coal Lease C-07519 was issued by the BLM in June 1958 and Federal Coal Lease C-079641 was issued by the BLM in October 1962. The leases

within the SMCRA Permit Area cover a total of approximately 2,423 acres of Federal mineral estate. As of July 1, 2015, approximately 19 million tons of recoverable Federal coal remains within the Project area. The Trapper Mine uses a combination of dragline, truck shovel, and highwall mining methods to remove the overburden and mine the coal.

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If you are interested, we would be willing to meet with you at your convenience to discuss the proposed mining plan modification and its impact on cultural resources. If you wish to provide comments please send those to:

OSMRE WR
C/O: Nicole Caveny
Trapper Mine EA
1999 Broadway, Suite 3320

You also have the option to submit comments and/or questions to: OSM-NEPA-CO@OSMRE.gov, please ensure the subject line reads: ATTN: OSMRE, Trapper Mine MPDD EA. Additional information regarding the Project may be obtained from Nicole Caveny, telephone number (303) 293-5078. We would appreciate receiving those comments with the next 60 days. For your convenience, information about the South Taylor Project can be accessed on the OSMRE Western Region website at: http://www.wrcc.osmre.gov/initiatives/trappermine.shtm.

Thank you for taking the time to consider this project. If this letter has not been sent to the correct representative, please help us update our records. OSMRE will be in contact with your office in the coming weeks to inquire if you have had time to consider this project further. In the meantime, if you have any questions, please contact me directly at (303) 293-5035.

Sincerely,

Marcelo Calle, Manager
Field Operations Branch

Copy:
Alfred Lomahquahu, Jr., Vice Chairman
Vernita Selestewa, Tribal Secretary

Attachments

United States Department of the Interior

OFFICE OF SURFACE MINING
RECLAMATION AND ENFORCEMENT

Western Region Office
1999 Broadway, Suite 3320
Denver, CO 80202-3050

October 27, 2015

President Russell Begaye
P.O. Box 7440
Window Rock, AZ 86515

Dear President Begaye,

The U.S. Department of the Interior (DOI), Office of Surface Mining Reclamation and Enforcement (OSMRE), Western Region, will prepare an environmental assessment (EA) to analyze environmental impacts of a Federal mining plan approval for current and future mining within Federal Coal Leases Nos. C-079641 and C-07519 held by Trapper Mining Inc. as part of the Trapper Mine. The EA will cover the time period beginning July 1, 2015, and continuing through the planned life of mine for the portion of the two Federal coal lease areas lying within the approved Surface Mining Control and Reclamation Act of 1977 (SMCRA) Permit Area (the Project). As required by the National Environmental Policy Act of 1969 (NEPA), the EA will disclose the potential for direct, indirect, and cumulative impacts to the environment from the Project. In accordance with the 2011 Department of Interior Policy on Consultation with Indian Tribes and 36 CFR Part 800.2(c)(2)(ii), the regulations implementing Section 106 of the National Historic Preservation Act of 1966 (as amended), OSMRE requests continued consultation with your tribe for the stages of the proposal development and implementation of the final federal action.

Preparation of the EA will be completed pursuant to the Court-approved Joint Proposed Remedy, as approved by the United States District Court for the District of Colorado on September 14, 2015, in the case entitled *WildEarth Guardians v. U.S. Office of Surface Mining et al.*, Case 1:13-cv-00518-RBJ (D. Colo. 2015). As part of the Court-approved remedy, OSMRE agreed to conduct a new NEPA analysis for Trapper's current and future mining activities within Federal Coal Leases Nos. C-079641 and C-07519.

The Trapper Mine is located approximately 6 miles south of the town of Craig in Moffat County, Colorado, east of Colorado Highway 13. The proposed Project is occurring on two federal coal leases administered by the Bureau of Land Management (BLM) and located within the eastern portion of the Trapper Mine's approved SMCRA Permit Area. Federal Coal Lease C-07519 was issued by the BLM in June 1958 and Federal Coal Lease C-079641 was issued by the BLM in October 1962. The leases

within the SMCRA Permit Area cover a total of approximately 2,423 acres of Federal mineral estate. As of July 1, 2015, approximately 19 million tons of recoverable Federal coal remains within the Project area. The Trapper Mine uses a combination of dragline, truck shovel, and highwall mining methods to remove the overburden and mine the coal.

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If you are interested, we would be willing to meet with you at your convenience to discuss the proposed mining plan modification and its impact on cultural resources. If you wish to provide comments please send those to:

OSMRE WR
C/O: Nicole Caveny
Trapper Mine EA
1999 Broadway, Suite 3320

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Thank you for taking the time to consider this project. If this letter has not been sent to the correct representative, please help us update our records. OSMRE will be in contact with your office in the coming weeks to inquire if you have had time to consider this project further. In the meantime, if you have any questions, please contact me directly at (303) 293-5035.

Sincerely,

M. C. Calle

Marcelo Calle, Manager
Field Operations Branch

Copy:
Jonathan Nez, Vice President
Dr. Alan S. Downer, THPO

Attachments

United States Department of the Interior

OFFICE OF SURFACE MINING
RECLAMATION AND ENFORCEMENT

Western Region Office
1999 Broadway, Suite 3320
Denver, CO 80202-3050

October 27, 2015

Chairman Darwin St. Clair
P.O. Box 538
Fort Washakie, WY 82514

Dear Chairman St. Clair,

The U.S. Department of the Interior (DOI), Office of Surface Mining Reclamation and Enforcement (OSMRE), Western Region, will prepare an environmental assessment (EA) to analyze environmental impacts of a Federal mining plan approval for current and future mining within Federal Coal Leases Nos. C-079641 and C-07519 held by Trapper Mining Inc. as part of the Trapper Mine. The EA will cover the time period beginning July 1, 2015, and continuing through the planned life of mine for the portion of the two Federal coal lease areas lying within the approved Surface Mining Control and Reclamation Act of 1977 (SMCRA) Permit Area (the Project). As required by the National Environmental Policy Act of 1969 (NEPA), the EA will disclose the potential for direct, indirect, and cumulative impacts to the environment from the Project. In accordance with the 2011 Department of Interior Policy on Consultation with Indian Tribes and 36 CFR Part 800.2(c)(2)(ii), the regulations implementing Section 106 of the National Historic Preservation Act of 1966 (as amended), OSMRE requests continued consultation with your tribe for the stages of the proposal development and implementation of the final federal action.

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Sincerely,

Marcelo Calle, Manager
Field Operations Branch

Copy:
Clint Wagon, Co-Chairman
Willie Ferris, Historic Preservation

Attachments

United States Department of the Interior

OFFICE OF SURFACE MINING
RECLAMATION AND ENFORCEMENT

Western Region Office
1999 Broadway, Suite 3320
Denver, CO 80202-3050

October 27, 2015

Chairman Clement Frost
P.O. Box 737
356 Ouray Drive
Ignacio, CO 81137

Dear Chairman Frost,

The U.S. Department of the Interior (DOI), Office of Surface Mining Reclamation and Enforcement (OSMRE), Western Region, will prepare an environmental assessment (EA) to analyze environmental impacts of a Federal mining plan approval for current and future mining within Federal Coal Leases Nos. C-079641 and C-07519 held by Trapper Mining Inc. as part of the Trapper Mine. The EA will cover the time period beginning July 1, 2015, and continuing through the planned life of mine for the portion of the two Federal coal lease areas lying within the approved Surface Mining Control and Reclamation Act of 1977 (SMCRA) Permit Area (the Project). As required by the National Environmental Policy Act of 1969 (NEPA), the EA will disclose the potential for direct, indirect, and cumulative impacts to the environment from the Project. In accordance with the 2011 Department of Interior Policy on Consultation with Indian Tribes and 36 CFR Part 800.2(c)(2)(ii), the regulations implementing Section 106 of the National Historic Preservation Act of 1966 (as amended), OSMRE requests continued consultation with your tribe for the stages of the proposal development and implementation of the final federal action.

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Sincerely,

M. C. Calle

Marcelo Calle, Manager
Field Operations Branch

Copy:
Elise Redd, Culture Department Director
Alden Naranjo, NAGPRA Coordinator

Attachments

United States Department of the Interior

OFFICE OF SURFACE MINING
RECLAMATION AND ENFORCEMENT

Western Region Office
1999 Broadway, Suite 3320
Denver, CO 80202-3050

October 27, 2015

Chairperson Gordon Howell
P.O. Box 190
Ft. Duchesne, UT 84026

Dear Chairperson Howell,

The U.S. Department of the Interior (DOI), Office of Surface Mining Reclamation and Enforcement (OSMRE), Western Region, will prepare an environmental assessment (EA) to analyze environmental impacts of a Federal mining plan approval for current and future mining within Federal Coal Leases Nos. C-079641 and C-07519 held by Trapper Mining Inc. as part of the Trapper Mine. The EA will cover the time period beginning July 1, 2015, and continuing through the planned life of mine for the portion of the two Federal coal lease areas lying within the approved Surface Mining Control and Reclamation Act of 1977 (SMCRA) Permit Area (the Project). As required by the National Environmental Policy Act of 1969 (NEPA), the EA will disclose the potential for direct, indirect, and cumulative impacts to the environment from the Project. In accordance with the 2011 Department of Interior Policy on Consultation with Indian Tribes and 36 CFR Part 800.2(c)(2)(ii), the regulations implementing Section 106 of the National Historic Preservation Act of 1966 (as amended), OSMRE requests continued consultation with your tribe for the stages of the proposal development and implementation of the final federal action.

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within the SMCRA Permit Area cover a total of approximately 2,423 acres of Federal mineral estate. As of July 1, 2015, approximately 19 million tons of recoverable Federal coal remains within the Project area. The Trapper Mine uses a combination of dragline, truck shovel, and highwall mining methods to remove the overburden and mine the coal.

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A site that may be of interest is the Recurve Rockshelter (site number 5MF948). The site was first recorded in 1980 and was plotted in a side canyon of an intermittent tributary of the Williams Fork. The location of the 5MF948 can be found on Map M45 in the Trapper Mining Inc. (Trapper) Permit. In 2013, Trapper hired archaeological consulting firm Grand River Institute (GRI) to complete three block surveys to allow for planned expansion of the mine to the east. GRI found that 5MF948 was incorrectly documented. The site is actually located within the permit area approximately 700 feet of mining projected to occur in 2016 based on map M10a of the permit. Site 5MF948 appears to consist of a number of petroglyphs on an outcrop of the Twentymile Sandstone. The outcrop has a south southeast aspect and is located on the opposite side of the mountain from where the Trapper mine is located. Unfortunately, a number of the petroglyphs have been shot with a firearm and have been damaged. The Colorado Division of Reclamation and Mining Safety (DRMS) have not found evidence that the damage has occurred from mining operation. However, DRMS has required that Trapper complete a study to evaluate if 5MF948 is far enough away from blasting at the mine, and given the expected sizes of the blasts, whether or not site will be affected.

If you are interested, we would be willing to meet with you at your convenience to discuss the proposed mining plan modification and its impact on cultural resources. If you wish to provide comments please send those to:

OSMRE WR
C/O: Nicole Caveny
Trapper Mine EA
1999 Broadway, Suite 3320

You also have the option to submit comments and/or questions to: OSM-NEPA-CO@OSMRE.gov, please ensure the subject line reads: ATTN: OSMRE, Trapper Mine MPDD EA. Additional information regarding the Project may be obtained from Nicole Caveny, telephone number (303) 293-5078. We would appreciate receiving those comments with the next 60 days. For your convenience, information about the South Taylor Project can be accessed on the OSMRE Western Region website at: http://www.wrcc.osmre.gov/initiatives/trappermine.shtm.

Thank you for taking the time to consider this project. If this letter has not been sent to the correct representative, please help us update our records. OSMRE will be in contact with your office in the coming weeks to inquire if you have had time to consider this project further. In the meantime, if you have any questions, please contact me directly at (303) 293-5035.

Sincerely,

M. C. Calle

Marcelo Calle, Manager
Field Operations Branch

Copy:
Ronald Wopsock, Vice Chairperson
Betsy Chapoose, NAGPRA Representative

Attachments

United States Department of the Interior

OFFICE OF SURFACE MINING
RECLAMATION AND ENFORCEMENT

Western Region Office
1999 Broadway, Suite 3320
Denver, CO 80202-3050

October 27, 2015

Chairman Manuel Heart
124 W. Mike Wash Road Tribal Complex
P.O. Drawer JJ
Towaoc, CO 81334

Dear Chairman Heart,

The U.S. Department of the Interior (DOI), Office of Surface Mining Reclamation and Enforcement (OSMRE), Western Region, will prepare an environmental assessment (EA) to analyze environmental impacts of a Federal mining plan approval for current and future mining within Federal Coal Leases Nos. C-079641 and C-07519 held by Trapper Mining Inc. as part of the Trapper Mine. The EA will cover the time period beginning July 1, 2015, and continuing through the planned life of mine for the portion of the two Federal coal lease areas lying within the approved Surface Mining Control and Reclamation Act of 1977 (SMCRA) Permit Area (the Project). As required by the National Environmental Policy Act of 1969 (NEPA), the EA will disclose the potential for direct, indirect, and cumulative impacts to the environment from the Project. In accordance with the 2011 Department of Interior Policy on Consultation with Indian Tribes and 36 CFR Part 800.2(c)(2)(ii), the regulations implementing Section 106 of the National Historic Preservation Act of 1966 (as amended), OSMRE requests continued consultation with your tribe for the stages of the proposal development and implementation of the final federal action.

Preparation of the EA will be completed pursuant to the Court-approved Joint Proposed Remedy, as approved by the United States District Court for the District of Colorado on September 14, 2015, in the case entitled *WildEarth Guardians v. U.S. Office of Surface Mining et al.*, Case 1:13-cv-00518-RBJ (D. Colo. 2015). As part of the Court-approved remedy, OSMRE agreed to conduct a new NEPA analysis for Trapper's current and future mining activities within Federal Coal Leases Nos. C-079641 and C-07519.

The Trapper Mine is located approximately 6 miles south of the town of Craig in Moffat County, Colorado, east of Colorado Highway 13. The proposed Project is occurring on two federal coal leases administered by the Bureau of Land Management (BLM) and located within the eastern portion of the Trapper Mine's approved SMCRA Permit Area. Federal Coal Lease C-07519 was issued by the BLM

in June 1958 and Federal Coal Lease C-079641 was issued by the BLM in October 1962. The leases within the SMCRA Permit Area cover a total of approximately 2,423 acres of Federal mineral estate. As of July 1, 2015, approximately 19 million tons of recoverable Federal coal remains within the Project area. The Trapper Mine uses a combination of dragline, truck shovel, and highwall mining methods to remove the overburden and mine the coal.

The EA will update, clarify, and provide new and additional environmental information for the Project. As a result of the EA process, OSMRE will determine whether or not there are significant environmental impacts. An environmental impact statement will be prepared if the EA identifies significant impacts. If a finding of no significant impact is reached, and pursuant to 30 CFR 746.13, OSMRE will prepare and submit to the Assistant Secretary for Lands and Minerals Management (ASLM) a mining plan decision document recommending approval, disapproval, or conditional approval of the mining plan. The ASLM will approve, disapprove, or conditionally approve the mining plan approval document within the mining plan decision document, as required under the Mineral Leasing Act of 1920.

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at: http://www.wrcc.osmre.gov/initiatives/trappermine.shtm.

Thank you for taking the time to consider this project. If this letter has not been sent to the correct representative, please help us update our records. OSMRE will be in contact with your office in the coming weeks to inquire if you have had time to consider this project further. In the meantime, if you have any questions, please contact me directly at (303) 293-5035.

Sincerely,

Marcelo Calle, Manager
Field Operations Branch

Copy:
Juanita Plentyholes, Vice-Chairwoman
Terry Knight, THPO

Attachments


Archeological Site 5MF948; Petroglyph


Archeological Site 5MF948; Petroglyph


Archeological Site 5MF948; Petroglyph


Archeological Site 5MF948; Petroglyph

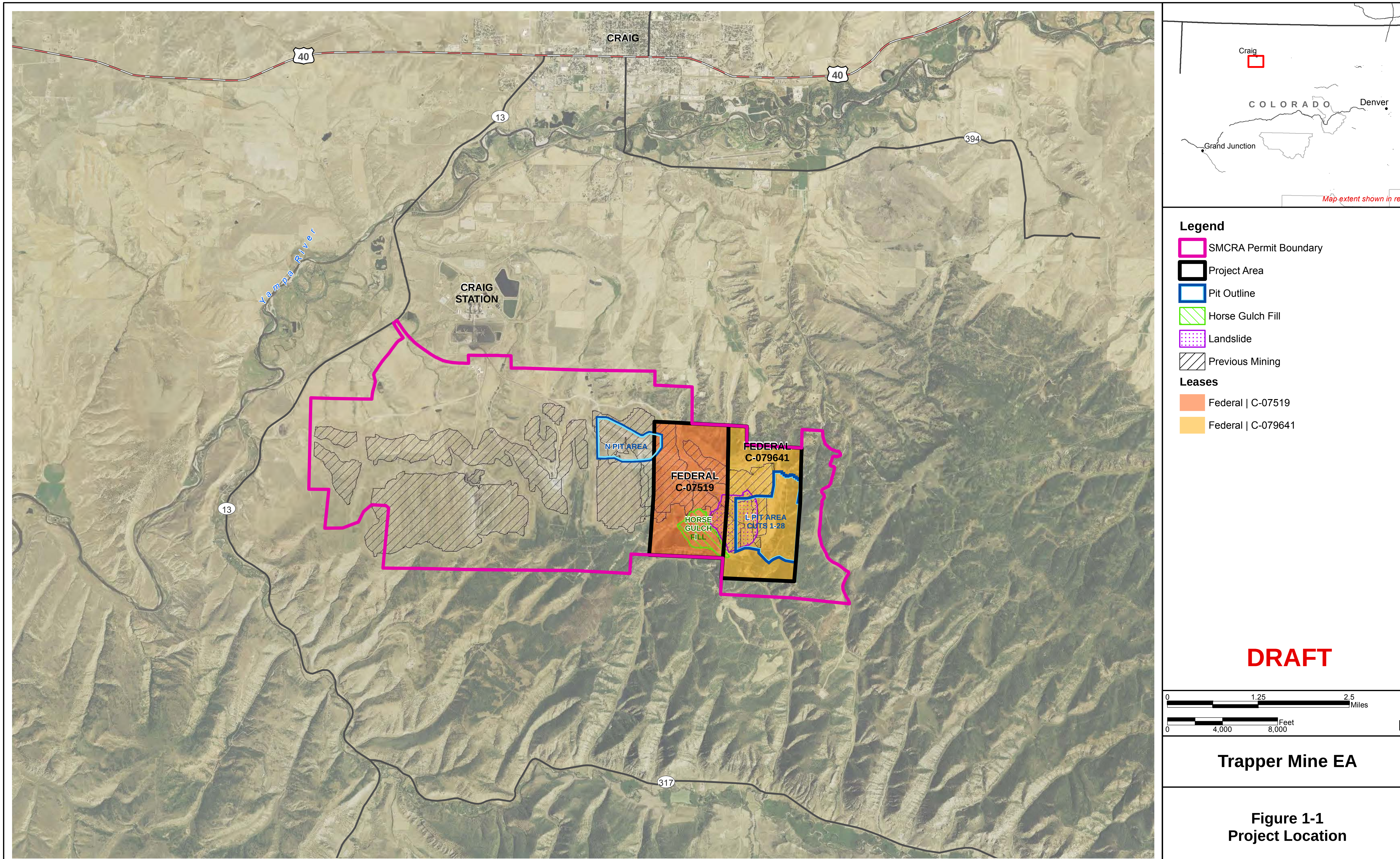

Archeological Site 5MF948; Petroglyph


Archeological Site 5MF948; Petroglyph


Archeological Site 5MF948; Petroglyph


Archeological Site 5MF948; Petroglyph


Archeological Site 5MF948; Petroglyph



Trapper Mine EA

Figure 1-1
Project Location

Appendix E

Public Comments and Responses

OSMRE - Trapper Mine
Federal Coal Leases C-07519 and C-079641 Mining Plan Modification
Public Comments on the Draft EA and OSMRE Response

Contents

List of Tables

1.0 Introduction

The Trapper Mine Federal Coal Leases C-07519 and C-079641 Mining Plan Modification Environmental Assessment (Trapper Mine EA) and Unsigned Finding of No Significant Impact (FONSI) were released for public comment on January 25, 2016. The public comment period ran through February 19, 2016. Notice that the documents were planned for release, along with the release date, was published in the *Craig Daily Press* on January 21, 2016 and in the *Meeker Herald Times* on January 20, 2016. Once the documents were released, legal notice of availability was published in the *Craig Daily Press* on January 28, 2016 and in the *Meeker Herald Times* on January 27, 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 202 Notice of Availability letters were sent directly to those who requested notification of the release of the Trapper Mine EA during the public scoping period. Fifty-eight electronic DVD copies of the EA and unsigned FONSI were sent to adjacent landowners, nearby community leaders and other interested individuals. During the comment period a number of DVDs were returned for incorrect postage. As a result, OSMRE re-mailed all 58 DVDs and extended the comment period for the addressees through March 4, 2016.

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 comments received during the public comment period on the Trapper Mine EA and unsigned FONSI. Each comment letter or email received was read by OSMRE 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 Trapper 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 Trapper Mine EA or the unsigned FONSI as being inadequate or inaccurate; develop reasonable alternatives not considered by the agency, 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 Trapper 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 document is to provide responses to substantive comments received on the Trapper Mine EA and the unsigned FONSI.

3.0 Comment Overview

Comments were accepted from the release of the Trapper Mine EA on January 25, 2016 through March 4, 2016. A total of 1,148 comment letters and emails were received. If substantive comments were identified within a letter, the resource area or concern was noted and summarized in the response to comments presented below in five summary comments and responses. Several comment letters contained corrections to the Trapper Mine EA that required specific responses and changes to the documents. Those comments with specific changes are shown on **Table E-1** located following the summary comments and responses.

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

<u>OSMRE should adopt the No Action Alternative. If approval is necessary, then OSMRE must prepare an environmental impact statement for the proposed mining plan.</u>

OSMRE has completed the Trapper Mine EA to determine if there would be significant effects as a result of approving the mining plan modification or if an Environmental Impact Statement (EIS) is required. OSMRE has properly and fully analyzed the direct, indirect and cumulative impacts in this EA in accordance with CEQ regulations. In NEPA documents, significance is determined by context and intensity as defined by CEQ regulations at 40 CFR 1508.27. 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 unsigned FONSI, we have determined that there are no significant impacts for the preferred alternative (Alternative A). Thus, an EIS is not warranted.

Under the Mineral Leasing Act of 1920 the Secretary, as delegated to the Assistant Secretary 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 Trapper Mine EA Chapter 1, 1.2.3 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 consideration of seven factors listed in 30 CFR 746.13, one of which is "information prepared in compliance with NEPA, which includes the Trapper Mine EA." OSMRE has not as yet submitted a recommendation to the ASLM on the decision.

3.1.2 Summary Comment 2

<u>The Trapper Mine EA Fails to Analyze and Assess the Impacts of All Similar and Cumulative Actions including the Colowyo Mine and other mining operations in the western U.S.</u>

We disagree with the comment and believe that the Trapper Mine EA adequately considers direct and indirect effects of the Colowyo Mine and other mines in the region as appropriate.

The cumulative impacts are discussed in Chapter 5.0 of the Trapper Mine EA. The Colowyo Mine is specifically discussed under Past and Present Actions in **Section 5.2** with the Collom Expansion discussed under Reasonably Foreseeable Future Actions in **Section 5.3**. As shown in **Table 5-1** in **Section 5.1**, the cumulative area, as defined for direct impacts for most of the resources, does not encompass the Colowyo Mine due to geographic distance and lack of connection. The cumulative impacts to air quality and climate change, special status species, socioeconomics, access and transportation do extend to include the Colowyo Mine and are discussed in the Trapper Mine EA at **Sections 5.4.2, 5.4.9, 5.4.11,** and **5.4.14**, respectively. As discussed for air resources, the emissions associated with existing mining activities in the region are ongoing and ongoing air quality and climate impacts are reflected in the baseline data described in the Affected Environment, **Section 3.3**. In addition, although the cumulative impact assessment area for water resources does not extend downstream to the Colowyo Mine or upstream to other mines in the region, the Trapper Mine EA does include a discussion of the findings of the Colorado Division of Reclamation, Mining and Safety's Cumulative Hydrologic Impact Assessment with regard to water resources in Section **5.4.4.**

In addition to the Colowyo Mine, two other active coal mining operations are discussed, as well as several coal mining operations in temporary cessation and permanent cessation. Other mining activities within Moffat, Routt and the eastern third of Rio Blanco County also were discussed. These activities meet the definition of similar actions because they are common in timing while more distant in geography. Mining activities outside of the defined area were not considered common in either timing or geography and were not included as similar actions in the Trapper Mine EA.

The Trapper Mine EA also analyzes the indirect impacts of combustion of both the Colowyo Mine and Trapper Mine coal at the Craig Station and indirect impacts from placement of coal combustion residuals (CCRs) at the Trapper Mine. Because the CCRs are not distinguishable as coming from coal burned from the Trapper Mine or coal burned from the Colowyo Mine, there is no distinction of the coal source for the CCRs.

The commenter indicated that because the Trapper Mine EA provides information on indirect impacts from combustion of Trapper mined coal and relates that information to statewide and national GHG emissions, the Trapper Mine EA must evaluate all similar coal mining projects on a national level. Information on how the annual emissions attributable to the Trapper Mine contribute to statewide and national GHG emissions was provided for context. The Trapper Mine EA discusses that there are no reliable scientific methods to quantify how the contribution of the GHG emissions attributable to Trapper individually affects global climate changes, so presenting the Trapper-attributable emissions in context of state and national emissions allows the public to better understand the context.

Further the commenter indicates that other pending Interior Department coal decisions throughout the western US must be addressed by OSMRE in the Trapper Mine EA as similar or cumulative coal leasing and mining decisions when considering impacts to GHG and climate in the Trapper Mine EA. The analysis of all potential coal decisions in the western US as cumulative actions is outside of the scope of analysis as defined in the Purpose and Need in Section 1.3 of the EA. Although these activities are not within the scope of this Trapper Mine EA, to the extent that the commenter seeks a programmatic analysis of federal coal leasing managed by the Department of Interior's Bureau of Land Management, we encourage the commenter to actively participate in the process surrounding the Department of Interior's development of a programmatic Environmental Impact Statement on the federal coal leasing program. For more information about this initiative, please see http://www.blm.gov/wo/st/en/prog/energy/coal_and_non-energy/details_on_coal_peis.html.

The scope of cumulative actions analyzed in the Trapper Mine EA analysis is appropriate and meets the Purpose and Need for the Trapper Mine EA and as such is appropriate for making a FONSI determination.

3.1.3 Summary Comment 3

The Trapper Mine EA Fails to Analyze and Assess Impacts to Endangered Fish

We disagree with the comment that the statement that the EA fails to analyze and assess impacts to endangered fish. **Section 4.10** includes an impact analysis to the federally endangered Colorado pikeminnow, humpback chub, bonytail chub, and razorback sucker and the critical habitats of each of these species. These are specified by name where impacts would differ, but are collectively analyzed and referred to as Colorado River Fish where impacts would be similar. Impacts have been provided in separate subsections describing direct and indirect impacts (**Sections 4.10.1** and **4.10.2**, respectively).

In order to provide further clarification, additional information has been brought forward from the Biological Assessment that has been submitted to the U.S. Fish and Wildlife Service as part of the Section 7 consultation in accordance with the Endangered Species Act. The Biological Assessment was included as Appendix B to the public review Trapper Mine EA. The Trapper Mine EA analysis specifies that the magnitude or level of indirect impacts cannot be determined due to the many uncertainties regarding the actual exposure and uptake of mercury and selenium that these endangered fish species and critical habitat are experiencing from Trapper Mine coal.

The commenter expressed particular concern over the impacts of mercury and selenium discharge from water outflows, as well as deposition of mercury and selenium from the combustion of coal at Craig Station. Water outflows and the relationship of selenium and mercury discharge are described in **Section 4.5.1.1** of the Trapper Mine EA. Given the water quality monitoring results observed to date and sediment controls in place, there is negligible direct exposure to selenium from Trapper Mine. TMI's CDPS permit does not include an effluent limit for mercury (TMI 2012). However, in 2014, TMI began sampling for mercury at several of the mine CDPS outfall locations. Although the results have consistently indicated mercury is below the detection limit, the analyses to date has not achieved a detection limit below the 0.01 microgram per liter mercury standard for the Yampa River. Thus, it is not possible to determine the degree to which (if any) the mine has in the past or would in the future contribute mercury to the Yampa River and the associated effects to the Colorado River fish species. As part of conservation/mitigation measures required in the USFWS Biological Opinion, TMI will commit to providing funding for 12 quarters of mercury and methyl mercury sampling from 4 designated locations, 2 in the White River and 2 in the Yampa River. TMI will also provide funding for a mercury deposition study to be conducted by the US Geological Survey investigating the methyl mercury uptake in fish tissue. Both of these conservation/mitigation measures are discussed in the Biological Opinion in **Appendix C.**

The analysis in **Section 4.10.2** comprehensively examines the amount of mercury attributable to Trapper Mine coal that is consumed at the Craig Generating Station. Our analysis process and results regarding indirect mercury emissions attributable to Trapper Mine coal for analysis area described in the Trapper Mine EA is consistent with the modeled results have been provided as Exhibit 1 from the commenter. Our calculated value of 0.1726 g/km^2/yr falls slightly above the median of the upper category (0.033284 - 0.264639 g/km^2/yr) shown on Exhibit 1 provided by the commenter. However, the Exhibit 1 information did not describe how the mercury categories were classified (i.e. quantiles, manual intervals, defined intervals, equal intervals, natural breaks, etc.), which is crucial to unbiasedly depicting the Exhibit 1 analysis results. Furthermore, the Trapper Mine EA study area is based on an airshed boundary that differs from the area mapped on Exhibit 1 provided by the commenter so direct correlation of the two analyses is not possible. However, as pointed out above, the Trapper Mine EA calculations of mercury emissions attributable to combustion of coal from Trapper Mine are within the upper range of the data the commenter provided.

The Trapper Mine EA analysis has taken a hard look at the published literature relevant to the region to identify the possible impacts related to mercury on the Colorado River Fish species. Results from studies by Hamilton et al. (2005) have been added to the selenium analysis for razorback sucker in **Section 4.10.2**. The values from Beckvar et al. (2005) that are summarized in the commenter referenced section of Exhibit 3 were present already in **Section 4.10.2**. The hypothesized population level impacts described by the U.S. Fish and Wildlife Service to Colorado pikeminnow have been added to the analysis.

The commenter indicated that OSMRE must consult with the U.S. Fish and Wildlife Service over potential project impacts to threatened and endangered species in accordance with Section 7 of the Endangered Species Act. We agree and OSMRE has completed Section 7 consultation with USFWS to address impacts to federally listed species associated with the proposed action and this is discussed in **Section 4.10** of the EA. A Biological Opinion has been issued by the U.S. Fish and Wildlife Service on impacts to the western yellow-billed cuckoo, Colorado pikeminnow, humpback chub, bonytail chub, razorback sucker, and associated proposed or designated critical habitat. The Biological Opinion is included in the final EA as **Appendix C**. The Biological Opinion found that the Project is not likely to jeopardize the four endangered fish, nor is it likely to destroy or adversely modify their critical habitats. The Biological Opinion also found that the project is not likely to adversely affect the western yellow-billed cuckoo and not likely to destroy to adversely modify proposed critical habitat. Mitigation and conservation measures are included in the Biological Opinion in **Appendix C** and discussed in **Section 4.10.**

3.1.4 Summary Comment 4

The Trapper Mine EA Fails to Analyze and Assess Impacts to Air Quality

The commenter indicates that the Trapper Mine EA fails to contain any analysis or assessment of impacts to air quality and instead defers to the permitting of the State of Colorado to assert that air quality impacts will not be significant. The commenter goes on to discuss that the State of Colorado does not adequately regulate nitrogen dioxide from blasting emissions or the recently adopted NAAQS for ozone, and, therefore, the impacts are not adequately addressed.

We disagree with the commenter's assertions: the Trapper Mine EA includes a robust air quality analysis in Chapter 4 Environmental Consequences, **Section 4.3,** Air and Climate Resources, and does not defer to CDPHE permitting. This analysis includes an assessment of NAAQS compliance for blasting emissions that includes PM_{10}, $PM_{2.5}$, NO_x, SO_2, CO, and VOCs as shown in **Chapter 4.0** for the worse case year on **Tables 4-4** and **4-5**, respectively.

In addition, ozone emissions and compliance with the recently reduced ozone standard of 70 parts per billion is discussed in **Chapter 5.0** of the EA. The ozone emissions are discussed in terms of cumulative ozone emissions and the current monitoring data for the airshed boundary which indicates that the area within the airshed boundary is in compliance (**Table 5-5**). Because the mining at Trapper Mine and coal combustion at Craig Station are not expected to change as a result of the proposed mining plan modification, the regional analysis based on existing monitoring is appropriate.

The Trapper Mine EA also includes a discussion of the Colorado Air Resource Management Modeling Study (CARMMS) commissioned by BLM to track air quality across the different Colorado field offices, with a focus on addressing how potential future oil and gas development might affect air quality and is particularly useful in discussing projections of future O_3 levels as described in **Section 5.4.2.2** of the EA. CARMMS simulates the air quality effects of oil and gas development out to the year 2021, and simulates different levels of projected development. The "high" development scenario is based on reasonably foreseeable development scenarios developed by each local BLM field office.

The CARMMS modeling output for the 4th highest daily maximum concentration was reviewed for the "high" development scenario. The area of Moffat County surrounding Craig showed projected O_3 levels from the CARMMS modeling generally in the 67 to 70 ppb range, which is within the updated NAAQS. Immediately near Craig and the Craig Station, the projected O_3 levels from the CARMMS modeling would be in the 65 to 70 ppb range. In close proximity to the Craig Station, the NO_X emissions from the power plant likely deplete the O_3 levels, and this effect appears in the CARMMS modeling.

In western sections of Moffat County and Rio Blanco County near Rangely, the projected O_3 levels would be 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 Trapper Mine airshed boundary defined for the cumulative impact area. 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.

3.1.5 Summary Comment 5

The Trapper Mine EA Fails to Analyze and Assess Climate Change Impacts

The potential impacts on climate change and GHG are discussed in **Section 4.3** and **Section 5.4.2** of the EA. The EA analysis follows the Draft CEQ Guidance regarding GHG and Climate Change in NEPA analyses (CEQ 2014).

The commenter indicates that OSMRE inappropriately rejected analyzing and assessing the social cost of carbon emissions that would result from the proposed mining plan modification.

As stated in the Trapper Mine EA OSMRE has elected not to specifically quantify the SCC for several reasons.

1. There is no certainty that GHG emissions at Craig Station would actually be reduced if Trapper Mine coal from the Project Area was not mined given that Craig Station has alternative sources for coal, and the Trapper Mine also has non-federal coal reserves that could be mined (see **Section 2.5**).
2. 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.

The Trapper Mine EA further states that 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 (**Table 4-14**).

Despite not using the SCC protocol, OSMRE did not ignore the effects or costs of carbon emissions. The Trapper Mine EA did evaluate the climate change impacts of the proposed action and alternatives using quantitative measures rather than dollars. The Trapper Mine EA quantified the estimated greenhouse gas emissions that would result from both direct and indirect actions associated with the alternatives. The direct and indirect effects from mining operations and coal combustion on GHGs and Climate Change are discussed in **Section 4.3** of the EA and cumulative effects are discussed **Section 5.4.2.** Both analyses included a quantification of projected GHG emissions as CO_2 equivalents. In addition to the quantitative measures, the Trapper Mine EA also qualitatively described the potential GHG/climate change impacts associated with emissions increases and complexities of these linkages in order to inform OSMRE's decision making.

Table E-1 Comments Resulting in Changes to the EA

Comment	Response	Changes to EA
Table 4-1; page 4-3 Air and Climate Resources. The indirect impacts of the combustion of GHG should be classified as "negligible" rather than "minor," based on the precedent from other recent EA's. In the recently approved South Taylor EA, an emission rate of 13,000,000 metric tons per year was classified as a "negligible impact" and not a "minor impact." The Trapper EA estimated that even in the worst case, the emissions would only amount to 5,342,951 per year. As this number is 2-1/2 times less than that in the South Taylor EA, this should be reclassified as a negligible impact for purposes of this EA.	OSMRE is in agreement that the impacts related to direct and indirect impacts of the combustion of GHG gases are negligible. There is a high level of uncertainty associated with quantifying climate change impacts and further uncertainty associated with linking those impacts to an individual emission source. GHG emissions attributable to the Trapper Mine will not result in detectable effects and would fit within the definition of negligible impacts as provided in Section 4.1.	**Table 4-1, page 4-2.** - Change made under Air and Climate Resources, Direct GHG emissions reduced impact from minor to negligible. **Table 4-1, Page 4-3** - Under Air and Climate resources, Indirect GHG emissions reduced the impact from minor to negligible.
Table 4-1; page 4-4 Water Resources. The phrase "and acid mine drainage" should be deleted. There is no potential for acid forming run-off at Trapper Mine because of the carbonate within the waste rock.	OSMRE agrees with the comment. As discussed in Section 4.5.1.1, the acid generating potential at TMI is relatively low at less than 0.5 percent and the mine spoil material typically contains enough available carbonate for dissolution to effectively buffer acidic water generated by Pyritic oxidation. As a result, water quality impacts from acid mine drainage and release of trace metals are not expected to occur. The text has been changed to reflect this information.	**Table 4-1, Page 4-4** - Under Water Resources, Direct Surface Water Impacts, eliminated the reference to negligible impacts from acid mine drainage. Section 4.5.1.1, Page 4-29, Next to Last Paragraph - Reworded the last sentence to read "As such, surface water quality impacts from acid mine drainage and trace metals are not expected to occur."
Table 4-1, page 4-5 Fisheries and Wildlife. After "Minor impacts to Columbian sharp-tailed grouse due to loss of production area within the Project Area," the commenter recommends adding "in the short run. In the long run, reclamation is expected to improve habitat over the original baseline." The commenter notes that there would be no long-term impact to Columbian sharp-tailed grouse habitat. As mining disturbance is reclaimed, the reclaimed areas will create CSTG habitat superior to the pre-disturbance habitat for breeding, nesting and brood rearing. According to Figure 3-13, Columbian Sharp-Tailed Grouse Range, some winter habitat may be lost but great gains in their production area would be seen with Alternative A. This revision is consistent with the findings in the text: "Reclaimed areas at Trapper Mine have shown an increased presence of Columbian sharp-tailed grouse. TMI has worked cooperatively with	OSMRE agrees with the comment. Changes have been made to the discussion in Table 4-1 and in the discussion of Columbian sharp-tailed grouse Page 4-45. These changes clarify that impacts to the Columbian sharp-tailed grouse are minor in the short-term and following reclamation habitat for the Columbian sharp-tailed grouse will be improved over pre-mining conditions.	**Table 4-1, Page 4-6, Special Status Species, Direct Impacts** - Changed the minor impact to indicate it would be short-term. Added the following sentence to the discussion; "In the long-term reclamation will improve Columbian sharp-tailed grouse habitat over the pre-mining conditions." Section 4.10.1.1, Page 4-45, Columbian Sharp-Tailed Grouse heading - Reworded the last sentence to indicate the minor impacts would be short-term. Added a sentence at the end reading "Following reclamation habitat will be improved over the pre-mining conditions."

Table E-1 Comments Resulting in Changes to the EA

Comment	Response	Changes to EA
CPW to develop reclaimed areas to promote Columbian sharp-tailed grouse habitat and evaluate the presence of the species." EA at 3.10.2.7.		
Page 4-29; final paragraph. There are seven permitted outfalls downstream, including Oak (017) and West Flume (019).	Although Oak (017) and West Flume (019) are downstream of the Project Area, they are not directly downstream of the L and N Pits and would not receive significant runoff from the active mining areas. The discussion in the text has been revised to provide this clarification.	**Section 4.5.1.1, Page 4-29 Last Paragraph** - Reworded fifth sentence to read "Permitted outfalls directly downstream of the proposed Project Area mine pits include CDPS site 016 on Sage Gulch….."
Page 4-35. The EA states that "The area of the I Pit in the western SMCRA permit boundary has not been previously mined, so there is no post-mining data available for comparison to help predict future impacts." However, nearly all of the area above both Coyote Gulch and No Name Gulch ponds has been mined out for a number of years, so these ponds offer the best post-mining data available for comparison as they show history for all phases of mining and reclamation up to and including Phase III bond release.	OSMRE has reviewed the information presented in the comment and agrees that the No Name and Coyote Gulch ponds lie downstream of the proposed I Pit area. Water quality has been evaluated for these ponds and indicates that impacts from mining to water quality would be negligible in the short and long term.	**Section 4.5.2.1, Page 4-35** - The sentence in the middle of the third paragraph has been revised to read as follows, "The area of the I Pit in the western SMCRA permit boundary has not been previously mined, but areas of No Name Gulch and Coyote Gulch upstream of the I Pit have been mined and post-mining drainage flows into the No Name and Coyote Gulch ponds. Hydrologic data collected from the No Name Gulch pond and the Coyote Gulch pond as well as near the L and N Pits suggest that implementation of TMI's CDPS Permit and drainage control measures would help limit surface water quality and quantity impacts to negligible levels in the short term and long term."
Page 4-37, last paragraph of 4.6.1.1. The following two sentences could potentially be confusing when read together: "This can make poor soils more productive and stable in areas that were unproductive before mining. However, mixing the horizons can make productive areas less productive leading to difficulty with revegetation of some species." The commenter recommends replacing these statements with: "The net environmental effects of mixing horizons can be difficult to predict because it can make poor soils more productive and stable in areas that were unproductive before mining but also may have the effect of making previously productive areas less productive, leading to difficulty with revegetation of some species."	OSMRE agrees with the comment and has revised the wording of Chapter 4 to reflect this change.	**Section 4.6.1.1, last paragraph of section** - The third sentence has been revised to read "The net environmental effects of mixing horizons can be difficult to predict because it can make poor soils more productive and stable in areas that were unproductive before mining, but also may have the effect of making previously productive areas less productive, leading to difficulty with revegetation of some species."

Table E-1 Comments Resulting in Changes to the EA

Comment	Response	Changes to EA
The commenter also recommends replacing the word "Scraping," both here and in the following paragraph, with the more accurate term "salvaging."		
Page 4-40, First paragraph of 4.9.1.1. Delete the sentence "Development of big sagebrush may take an additional 10 to 20 years." There is simply not sufficient information to confidently estimate when the big sagebrush community will return or even that it necessarily will return. There are just too many variables.	OSMRE agrees with the comment. However, instead of eliminating the sentence entirely, OSMRE has replaced the sentence with additional clarification on the inability to quantify the timing for full development of a big sagebrush community.	**Section 4.9.1.1, Page 4-40, end of first paragraph** - The last sentence has been replaced with the following, "The time required for development of a mature big sagebrush community is difficult to predict given the many factors which could affect the development of this community."
Page 4-59, First paragraph under 4.16.2.1. Delete "Facility structures would be demolished in-place and covered with a minimum of 6 feet (2 meters) of suitable material. The area will be regraded to achieve the approved post-mining topography followed by topsoil and seeding as described in the reclamation plan. All demolition materials (e.g. culverts, fencing) related to sedimentation ponds will be placed within the ponds and covered with a minimum of 6 feet (2 meters) of suitable material or transported to the pit area during the reclamation process." This is not contained within the Trapper approved permit. Trapper disposes of any solid waste in compliance with its solid waste permit.	OSMRE agrees and the discussion has been deleted. Text has been inserted indicating that solid waste is disposed in accordance with the approved solid waste permit.	**Page 4-49, Section 4.16.2.1** - The suggested language has been deleted. The following discussion has been added, "The removal of materials and products would considerably reduce the risks associated with spills and contamination of soil and groundwater. Solid waste would be disposed in accordance with the TMI approved solid waste permit. Inert materials that can be disposed in mine pits would be placed into pits during backfilling. When active reclamation is complete, the potential impacts of waste generation and disposal would be negligible."
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.	Section 4.10 includes an impact analysis to the federally endangered Colorado pikeminnow, humpback chub, bonytail chub, and razorback sucker and the critical habitats of each of these species. These are specified by name where impacts would differ, but are collectively analyzed and referred to as Colorado River Fish where impacts would be similar. Impacts have been provided in separate subsections describing direct and indirect impacts. OSMRE does not agree that the EA failed to analyze and assess impacts to endangered fish and their critical habitat in the Yampa River drainage and downstream. The analysis is discussed in **Section 4.10.2.** Specific information in **Section 4.10.2** was taken from the	**Section 4.10.2** - Added information after the first paragraph to further describe the impacts to the endangered fish. Information was taken from the Biological Assessment.

Table E-1 Comments Resulting in Changes to the EA

Comment	Response	Changes to EA
	Biological Assessment developed as part of the consultation with the U.S. Fish and Wildlife Service in accordance with Section 7 of the Endangered Species Act, included as Appendix B to the EA. Additional information that defines the types of impacts to the endangered fish and their critical habitat has been brought forward from the Biological Assessment for inclusion in **Section 4.10.2**. Note that the analysis in the EA specifies that the magnitude or level of indirect impacts cannot be determined due to the many uncertainties regarding the actual exposure and uptake of mercury and selenium that these endangered fish species and critical habitat are experiencing from Trapper Mine Coal (see **Section 4.10.2**).	
….These findings are buttressed by reports indicating 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. With regards to the Colorado pikeminnow, the U.S. Fish and Wildlife Service recently reported: "Management strategies for controlling anthropogenic mercury emissions are necessary as atmospheric pollution can indirectly affect this endangered species, its critical habitat, and its recovery by ambient air exposure, deposition into aquatic habitat and bioaccumulation in diet and fish tissues." See Exhibit 3, U.S. Fish and Wildlife Service, "Colorado pikeminnow (*Ptychocheilus lucius*) 5-Year Review: Summary and Evaluation" (hereafter referred to as the "Colorado pikeminnow 5-Year Review") at 21.	OSMRE agrees with the findings mentioned in the referenced U.S. Fish and Wildlife Service report. The EA analysis has taken a hard look at the published literature relevant to the region to identify the possible impacts related to mercury on the Colorado River Fish species. The values from Beckvar et al. (2005) that are summarized in the referenced section of Exhibit 3 were present already in section 4.10. The hypothesized population level impacts described by U.S. Fish and Wildlife Service to Colorado pikeminnow have been added to the analysis in the EA. In addition, reference to results from studies by Hamilton et al. (2005) has been added to the selenium analysis for razorback sucker.	**Section 4.10.2, Page 4-48** - Paragraph added at the bottom of the page describing the U.S. Fish and Wildlife Service hypothesized population level impacts. **Section 4.10.2, Page 4-49** - References to the findings of Hamilton et al relative to selenium analysis for the razorback sucker have been added to the second full paragraph on the page.