United States Department of the Interior
Bureau of Land Management

Environmental Assessment for the Fram Whitewater Unit Master Development Plan

Grand Junction Field Office
2815 H Road
Grand Junction, Colorado 81506

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List of Abbreviations and Acronyms

Δdv	delta-deciview
µeq/l	microequivalents per liter
µg/kg	microgram per kilogram
µg/L	microgram per liter
µg/m^3	micrograms per cubic meter
µS/cm	microseimens per centimeter
ACEC	Area of Critical Environmental Concern
Alpine	Alpine Archeological Consultants, Inc.
amsl	above mean sea level
ANC	acid neutralizing capacity
AO	Authorized Officer
APCD	Air Pollution Control Division
APDs	Applications for Permit to Drill
APE	Area of Potential Effect
AQRVs	Air Quality Related Values
AUM	Animal Unit Month
BACT	Best Available Control Technology
BBS	Breeding Bird Survey
BCC	Birds of Conservation Concern
BCR	Bird Conservation Regions
BEA	Bureau of Economic Analysis
BLM	Bureau of Land Management
BLS	Bureau of Labor Statistics
BMPs	Best Management Practices
BOP	Blowout Preventer
BOR	U.S. Bureau of Reclamation
CAAQS	Colorado Ambient Air Quality Standards
CARMMS	Colorado Air Resources Management Modeling Study
CASTNET	Clean Air Status and Trends Network
CDLE	Colorado Department of Labor and Employment
CDOLA	Colorado Department of Local Affairs
CDOT	Colorado Department of Transportation
CDOW	Colorado Division of Wildlife
CDPHE	Colorado Department of Public Health and Environment
CDWR	Colorado Division of Water Resources
CEAAs	Cumulative Effects Analysis Areas
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response and Liability Act
cfs	cubic feet per second
CH_4	methane

cm	centimeter
CNHP	Colorado Natural Heritage Program
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
COAs	conditions of approval
COGCC	Colorado Oil and Gas Conservation Commission
CPW	Colorado Parks and Wildlife
CSUH	Colorado State University Herbarium
CUH	University of Colorado Herbarium
DATs	deposition analysis thresholds
DAU	Data Analysis Unit
dB	decibels
DOI	U.S. Department of the Interior
DPS	Distinct Population Segment
dv	deciview
EA	Environmental Assessment
EIA	Energy Information Administration
EO	Executive Order
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
^{o}F	degrees Fahrenheit
FEMA	Federal Emergency Management Agency
FLAG	Federal Land Managers' Air Quality Related Values Work Group
FLMs	Federal Land Managers
FLPMA	Federal Land Policy and Management Act
FML	federal mineral lease
FMU	Fire Management Unit
Forest Service	U.S. Department of Agriculture Forest Service
FPD	Fire Protection District
Fram	Fram Operating, LLC
FWS	U.S. Fish and Wildlife Service
GHGs	Greenhouse Gases
GIS	Geographic Information System
GJFO	Grand Junction Field Office
GMS	Grand Mesa Slopes
GMU	Game Management Unit
gpm	gallons per minute
GWP	Global Warming Potential
HAPs	hazardous air pollutants
HNO_3	nitric acid
HUC	hydrologic unit code
IDLH/10	Immediately Dangerous to Life or Health divided by 10
IDT	Interdisciplinary Team
IFMP	Interagency Fire Management Plan
IMPROVE	Interagency Monitoring of Protected Visual Environments
IR	interim reclamation
kg-ha-yr	kilogram per hectare per year
km	kilometer
L	liter
MBTA	Migratory Bird Treaty Act
MDP	Master Development Plan
MEI	maximum exposed individual
mg/L	milligram per liter
MLA	Mineral Leasing Act
MLE	most likely exposure

mmho	micromhos
MMIF	Mesoscale Model Interface Program
MOU	Memorandum of Understanding
mph	miles per hour
MSDS	Material Safety Data Sheets
N	nitrogen
N_20	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NADP	National Acid Deposition Program
NAGPRA	Native American Graves Protection and Repatriation Act
NAIP	National Agriculture Imagery Program
NCA	National Conservation Area
NEPA	National Environmental Policy Act
NH_4	ammonium
NHPA	National Historic Preservation Act
NIOSH	National Institute for Occupational Safety and Health
NO_2	nitrogen dioxide
NO_3	nitrate
NOx	nitrogen oxides
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NSO	No Surface Occupancy
NSPS	New Source Performance Standards
NTN	National Trends Network
O_3	ozone
OHV	off-highway vehicle
OHWM	ordinary high water mark
PBA	Programmatic Biological Assessment
PCE	Primary Constituent Elements
PFC	Proper Functioning Condition
PFYC	Potential Fossil Yield Classification
PL	Public Law
$PM_{2.5}$	particulate matter greater than 2.5 microns in effective diameter
PM_{10}	particulate matter greater than 10 microns in effective diameter
PRPA	Paleontological Resources Preservation Act
PSD	Prevention of Significant Deterioration
PUP	Pesticide Use Proposal
RACT	Reasonably Available Control Technology
RCRA	Resource Conservation and Recovery Act
RELs	Reference Exposure Levels
REX	Rocky Mountain Express
RfCs	Reference Concentrations for Chronic Inhalation
RFD	reasonably foreseeable development
RMH	Rocky Mountain Herbarium
RMP	Resource Management Plan
RMPPA	Resource Management Plan Planning Area
S	sulfur
SAR	sodium absorption ratio
SH	State Highway
SHPO	State Historic Preservation Officer
SMA	Special Management Area
SO_2	sulfur dioxide
SO_4	sulfate
SPCC	Spill Prevention Control and Countermeasure
SQRUs	scenic quality rating units
SRP	Special Recreation Permit

SSURGO	Soil Survey Geographic
SVR	Standard Visual Range
SWH	Sensitive Wildlife Habitats
SWMP	Storm Water Management Plan
TDS	total dissolved solids
tg/yr	terragrams per year
tpy	tons per year
TSP	Trans-Colorado gas pipeline
TVS	Table Value Standards
URF	unit risk factors
USACE	U.S. Army Corps of Engineers
USC	U.S. Code
USGS	U.S. Geological Survey
VIEWS	Visibility Information Exchange Web System
VOCs	volatile organic compounds
VRI	Visual Resource Inventory
VRM	Visual Resource Management
WoUS	Waters of the U.S.
WQCC	Water Quality Control Commission
WRAP	Western Regional Air Partnership
WRCC	Western Regional Climate Center
WRF	Weather Research and Forecasting
WSDOT	Washington State Department of Transportation
YR	year round

CHAPTER 1 - INTRODUCTION

1.1 IDENTIFYING INFORMATION

BACKGROUND: Fram Operating, LLC (Fram) submitted the Whitewater Unit Master Development Plan (Whitewater MDP) for oil and gas exploration to the Bureau of Land Management (BLM) Grand Junction Field Office (GJFO) in August 2011. It was updated in February 2013 with minor clarifying revisions. Fram removed hydraulic fracturing from their proposal in an April 2014 update to the Whitewater MDP. This proposal replaces a much larger development proposal for the Whitewater Unit submitted by Fram in spring 2010 that included lands in both Delta and Mesa counties. Based on existing commodity prices, geology, and other resource concerns, development in the southern portion of the Whitewater Unit is not reasonably foreseeable. The Whitewater MDP proposes a 4 year program of oil and gas exploration on federal leases in Mesa County (the Proposed Action). Fram proposes to drill up to 108 wells on 12 new well pads. The Proposed Action consists of construction, operation, maintenance and abandonment of well pads, wells, roads, gas gathering pipelines, oil gathering pipelines and produced water gathering pipelines.

This Environmental Assessment (EA), prepared by the BLM GJFO, is in response to Fram's proposed Whitewater MDP. Construction and operation of the Whitewater MDP would allow for production of up to 8.7 million barrels of oil over the life of the Project, estimated to be 20 years. Natural gas would be co-produced with oil but is not anticipated to be produced in quantities that could be compressed and sold to markets.

This EA was prepared in conformance with the policy guidance provided in BLM's National Environmental Policy Act (NEPA) Handbook H-1790-1 (BLM, 2008a). The BLM Handbook provides instructions for compliance with the Council on Environmental Quality (CEQ) regulations for implementing the procedural provisions of NEPA (40 CFR §1500-1508) and U.S. Department of the Interior (DOI) Manual 516 DM 1-7 on NEPA compliance (DOI, 2005).

CASEFILE/PROJECT NUMBER: DOI-BLM-CO-130-2012-0003-EA

PROJECT NAME: Fram Whitewater Unit Master Development Plan

PLANNING UNIT: Grand Junction Field Office

1.2 PROJECT LOCATION AND LEGAL DESCRIPTION

The Whitewater Unit (approximately 90,400 acres) is located about 15 miles east and southeast of the City of Grand Junction (Map 1.2-1). The Whitewater Unit is bounded in the northeast by the Grand Mesa Plateau, to the southeast by the City of Delta, to the southwest by U.S. Highway 50 running parallel to the Gunnison River and to the northwest by the City of Grand Junction. The leases that are part of the proposed 4-year program are in the northern half of the Whitewater Unit, in Mesa County only and make up the Project Area. The Project Area contains approximately 52,543 acres of public, split estate and private lands (see Map 1.2-2).

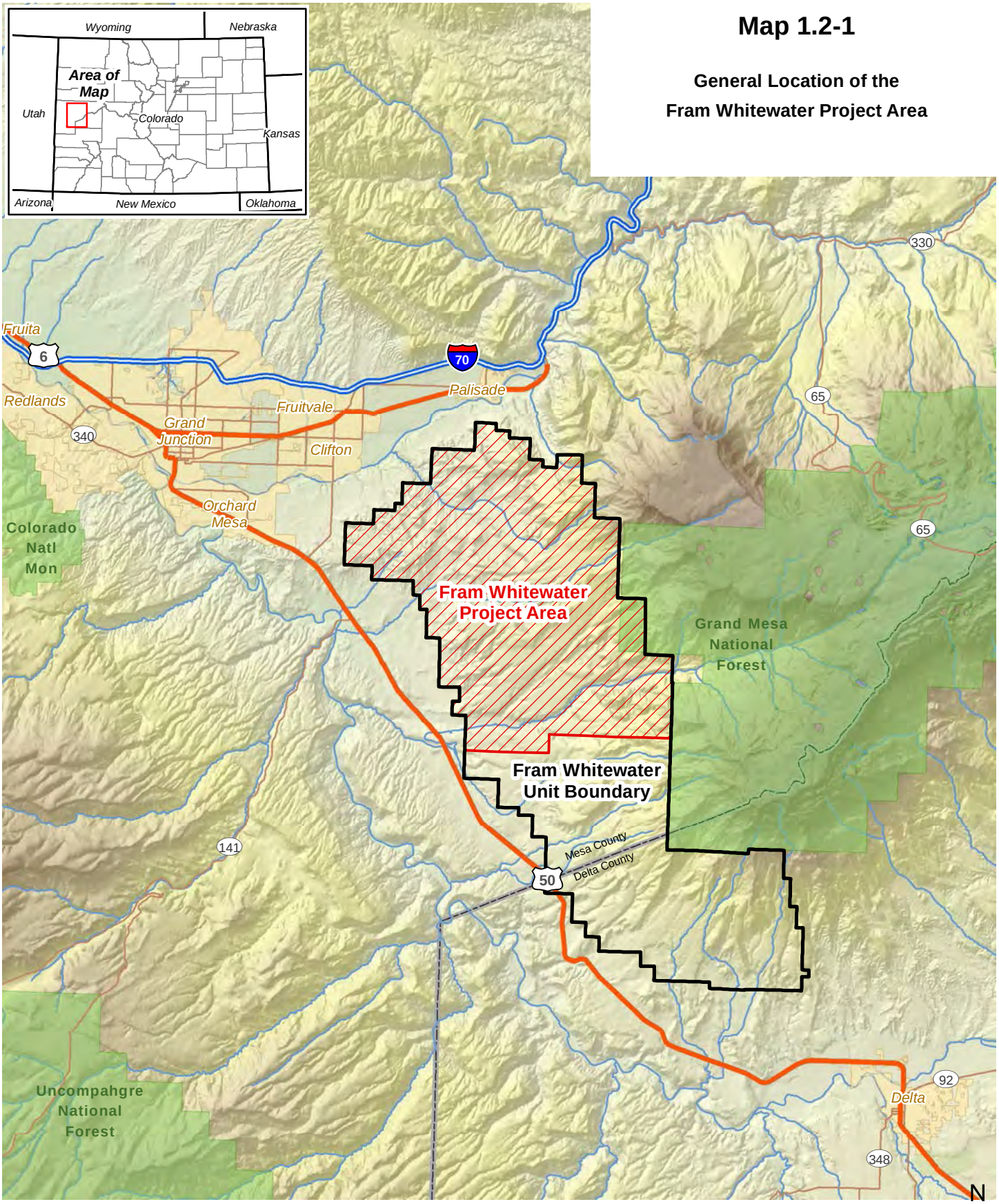
LEGAL DESCRIPTION:

The legal description for the Project Area is provided in Appendix A.

USGS Quadrangle Maps: Whitewater, Juniata Reservoir, Indian Point, Clifton and Palisade.

Map 1.2-1

General Location of the
Fram Whitewater Project Area



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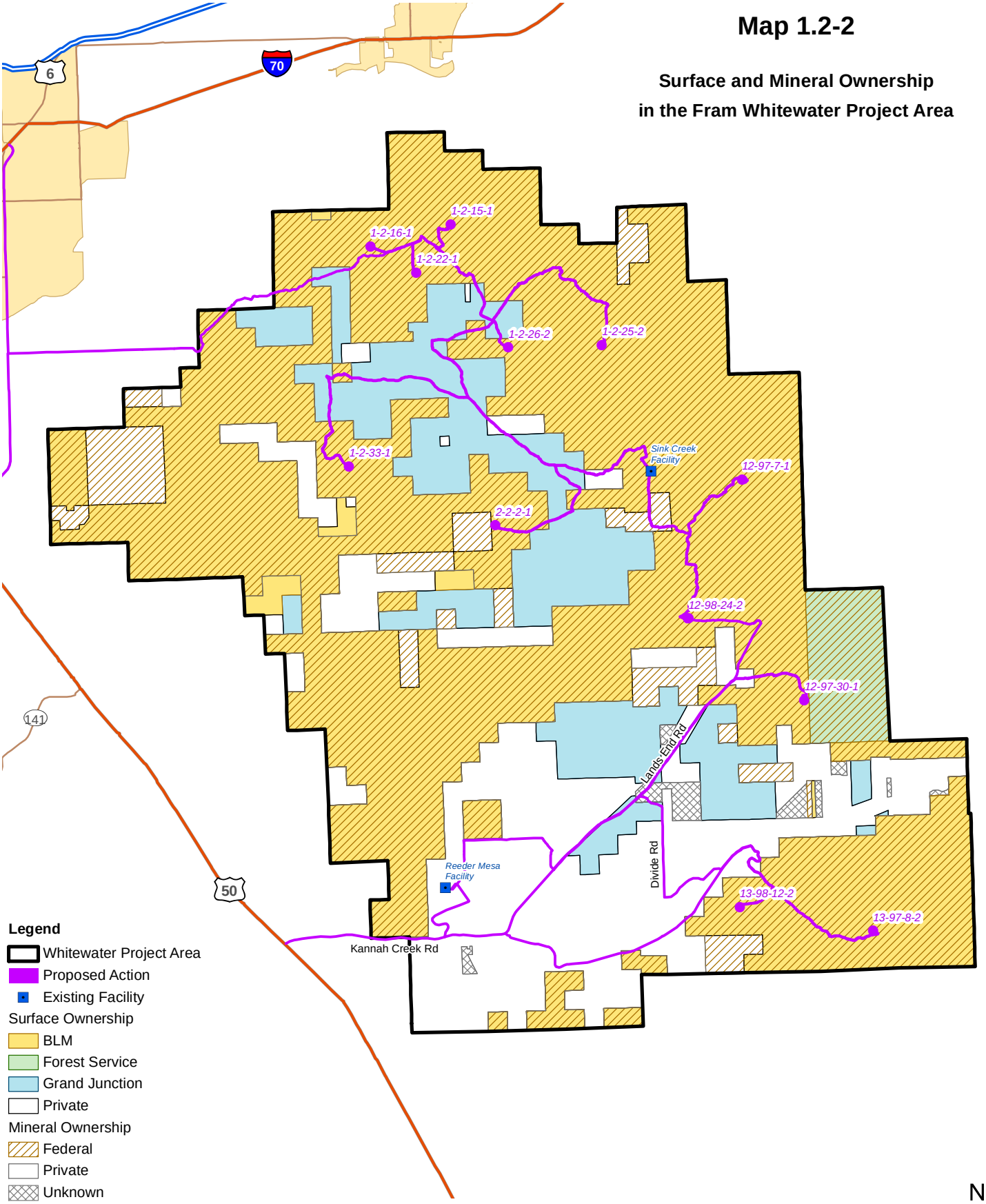
Map 1.2-2

Surface and Mineral Ownership in the Fram Whitewater Project Area



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

1.3 PURPOSE AND NEED

The purpose of the Proposed Action is to provide the applicant the opportunity to develop federal oil and gas resources within the Whitewater Unit consistent with their Federal Oil and Gas lease and unit obligations.

The need for the Proposed Action is established under the Mineral Leasing Act of 1920 (MLA), the Onshore Oil and Gas Leasing Reform Act of 1987 and the Energy Policy Act of 2005. The MLA, as amended (30 U.S. Code - USC 181 et seq.), authorizes the BLM to issue oil and gas leases for the exploration of oil and gas and permit the development of those leases. Existing leases are binding legal contracts that allow development by the lease holder. The Federal Land Policy and Management Act of 1976 (FLPMA) allows for use of public land for rights-of-way for oil and gas infrastructure, with appropriate consideration of other public resources. It is the policy of the BLM to make mineral resources available for disposal and to encourage development of mineral resources to meet national, regional, and local needs while protecting other natural resources.

PLAN CONFORMANCE REVIEW: The Proposed Action is subject to and has been reviewed for conformance with the following plan (43 CFR § 1610.5, BLM 1617.3):

Name of Plan: GRAND JUNCTION Resource Management Plan

Date Approved: JANUARY, 1987

Decision Number/Page: Page 2-7.

Decision Language: To make federal oil and gas resources available for leasing, except where prohibited by law or where administrative action is justified in the national interest; to make public lands available for economically and environmentally sound exploration and development projects; to avoid health and safety hazards; to protect important sensitive resource values from unacceptable impacts; and to minimize impacts to lessees from sensitive resource protection and hazard avoidance.

The BLM has determined that the alternatives analyzed in this EA would be in compliance with the Oil and Gas Management objectives in the Resource Management Plan (RMP).

In January 1997, the Colorado State Office of the BLM approved the Standards for Public Land Health and amended all RMPs in the State. Standards describe the conditions needed to sustain public land health and apply to all uses of public lands.

Standard 1: Upland soils exhibit infiltration and permeability rates that are appropriate to soil type, climate, land form and geologic processes.

Standard 2: Riparian systems associated with both running and standing water function properly and have the ability to recover from major disturbance such as fire, severe grazing, or 100-year floods.

Standard 3: Healthy, productive plant and animal communities of native and other desirable species are maintained at viable population levels commensurate with the species and habitat's potential.

Standard 4: Special status, threatened and endangered species (federal and state) and other plants and animals officially designated by the BLM and their habitats are maintained or enhanced by sustaining healthy, native plant and animal communities.

Standard 5: The water quality of all water bodies, including ground water where applicable, located on or influenced by BLM lands, will achieve or exceed the Water Quality Standards established by the State of Colorado.

Because standards exist for each of these five categories, a finding must be made for each of them in an environmental analysis. These findings are included in this document.

1.4 PUBLIC PARTICIPATION

1.4.1 Scoping

NEPA regulations (40 CFR §1500-1508) require that the BLM use a scoping process to identify potential significant issues in preparation for impact analysis. The principal goal of scoping is to allow public participation to identify issues, concerns and potential impacts that require detailed analysis.

A letter to the public, a legal ad and a news release were prepared and publicized, outlining the 2011 revised development plan as well as BLM's intent to prepare an EA analyzing the proposal. The news release was posted on November 3, 2011. The legal ad was published in the Grand Junction Daily Sentinel, the newspaper of record for the region, for three consecutive weeks beginning on November 3, 2011. The proposal, the news release and a map were posted to the BLM GJFO website at http://www.blm.gov/co/st/en/fo/gjfo.html. Additionally, 192 letters were mailed on October 28, 2011 to interested parties to solicit their comments on the proposal. The BLM invited the public to provide comments on the proposal for 30 days beginning October 28, 2011 through December 1, 2011. The BLM conducted one public scoping meeting on November 8, 2011 in Grand Junction. The BLM has determined that they will invite the public to comment on the Preliminary EA for 30 days.

1.4.2 Public Scoping Comments

During the comment period, 191 comment letters/emails were received including one from the U.S. Department of Agriculture Forest Service (Forest Service), one from Colorado Parks and Wildlife (CPW), four from local agencies and two from environmental advocacy groups. Individuals provided 183 comments, of which 69 were unique letters and 114 were form letters generated by the Colorado Environmental Coalition website. Comments were categorized by topic and each comment was given an identification number. Comments received during the public comment period have been considered as part of the impact analysis. Issues introduced by the public, industry, interested groups, and other agencies are summarized below:

Air Quality

The public expressed concerns about fugitive dust and overall direct and cumulative impacts to air quality. Comments suggest that air quality issues should be coordinated with the Mesa County Environmental Health Division and mitigation measures should be outlined by the BLM as conditions to approval. Additionally, one comment recommends an air quality impact analysis before issuing any drilling permits. Specific comments and recommendations include estimating drill rig emissions, ensuring compliance with Prevention of Significant Deterioration (PSD) regulations, addressing impacts to ambient air quality standards for ozone and analyzing impacts from the Reeder Mesa Compressor Station. It was noted that the MDP does not have a section that addresses air quality (other than dust suppression) and the commenter asked how Fram would monitor for compliance with air quality regulations. One comment suggested that

Fram should not apply any dust suppression chemicals on roads constructed on City of Grand Junction lands without approval.

Climate Change

Comments suggest that the BLM consider and analyze climate change impacts resulting from oil and gas development. Recommendations include green completions, capturing greenhouse gas emissions, capturing Hazardous Air Pollutants (HAPs), utilization of solar and wind power wherever feasible, dust suppression and use of electric instead of diesel.

Cultural

Concerns were expressed that the proposed development would disturb archaeological artifacts in the area. Recommendations include conducting surveys of known or potential sites, training and monitoring.

Fire Suppression

The City of Grand Junction suggests that the BLM and Fram develop a fire suppression plan as part of the MDP to prevent fires caused by clearing, road and pipeline construction, drilling, reclamation and increased traffic resulting from improved public access.

Fish and Wildlife

Comments express concern for and provide recommendations for the protection of mule deer, antelope and elk winter range, riparian and wetland habitats and disturbance to fish-bearing streams. Additional recommendations were made concerning bears, poaching, fencing, limiting access and about managing vehicle traffic into deer and elk winter range by clustering development into two geographic areas and using access roads that would not or would minimally infringe on winter closures and wintering wildlife. CPW specifically recommends developing a Wildlife Mitigation Plan to minimize impacts to wildlife and habitat. Mitigation recommendations include installing culverts under heavily used roads to provide migration corridors, revegetating with locally adaptive native species preferred by wildlife, limiting access to waterways and wetland habitats and using combustors instead of flaring to eliminate excess gas at well pads.

General

A few comments made by individuals expressed general support for the proposal, citing socioeconomics and the energy needs of the country. Numerous comments were received from individuals who stated opposition to the proposed development and expressed general environmental concerns and/or disagreement with BLM policy.

Geology and Soils

A commenter asked that the BLM identify any and all locations where steep slopes and other topography create a situation of concern. Commenters expressed concern about expansive soils, possible resultant impacts to pipeline integrity and how much is known or unknown about the geology in the area. Two commenters asked about underlying geothermal conditions in the area and how they might adversely affect the proposed project.

Grazing

The City of Grand Junction comments addressed the need for agreements and mitigation for grazing permittees during development and long-term operations. Issues brought forward include effects to grazing and the use of gates, fencing and cattle guards as well as road closures to manage livestock.

Hazardous Materials and Waste

Numerous comments requested that additional information be disclosed regarding the chemical composition of hydraulic fracturing (fracking) fluids and other chemicals used for drilling, as well as the potential for contaminating surface and groundwater. One commenter requested that Fram prepare an Emergency Response Plan to address and report spills and releases of toxic substances and that Fram submit Material Safety Data Sheets for all chemicals transported through or on property owned by the City of Grand Junction.

Human Health

One commenter asked that the BLM analyze and disclose all health impacts associated with the Proposed Action including effects associated with air emissions, use of toxic chemicals, and water quality. Several recommendations for mitigating health effects were suggested including mandating dust suppression, installing alarms for H_2S and other toxic releases, modeling groundwater and adjusting drilling plans if necessary, monitoring programs for ground and surface water, implementing storm water pollution prevention plans and requiring setbacks from all surface waters.

Land Use

One comment asked how Fram would reduce impacts to private landowners. Residential areas and agricultural operations of various socioeconomic scales are located adjacent to and downstream from the proposed project.

Monitoring and Mitigation

One comment asked about monitoring of produced water pipelines and oil pipelines to assure pipe integrity, and about mitigation of pipeline failures that could result in surface or subsurface releases. Numerous comments recommended surface and groundwater quality monitoring.

Noise

Individuals expressed concern about noise from drilling operations and increased traffic and asked about the hours of operation and expected noise levels. One commenter suggested an alternate access route across the desert, east of Orchard Mesa, to avoid disturbing the residents in the Kannah Creek area.

Noxious and Invasive Species

One commenter noted that the BLM inventory of noxious weeds indicates weed problems and asked how the BLM would assure that reseeding was effective and resulted in high quality and appropriate vegetation.

Paleontology

Comments expressed concern for the paleontological resources in the area and asked about surveys and the preservation of such resources.

Process/Policy

Specific comments address process and BLM policy related to permitting, the costs of projects, liability insurance, bonding and monitoring and inspections of operations in the short and long terms. A few comments expressed dislike of the public scoping meeting format.

Proposed Action

Several specific questions and comments were received regarding the Proposed Action including produced water handling, pad location and number of wells, analyzing the impacts of full-field development, required permits, surface use agreements, compliance with the Mesa County land use codes, discussion of Conditions of Approval, instituting a phased or clustered

development approach, oversight and review of site plans, best management plans and criteria used to determine further development.

Reclamation
Comments on the reclamation plan address conservation of topsoil, reclamation goals, using Best Management Practices (BMPs) and wildlife friendly seed mixes; one comment suggested the BLM calculate and disclose in the EA the full costs of reclaiming and cleaning up the area potentially affected by the MDP.

Recreation
Commenters noted that the area is used for scenic driving, hiking and bicycling and asked how the MDP would affect recreation.

Safety and Training
One comment addressed the need for readily available Fram emergency points of contact. Another comment recommended requiring contractors, subcontractors, drivers and personnel to be educated and trained on all permit conditions and to comply with all safety and environmental standards in the Project Area.

Socioeconomics
Commenters asked about how the MDP would affect property values, tourism and recreation. Some comments expressed support of the project citing new jobs and growth for the local economy. One commenter addressed split estate situations where federal minerals underlie private surface and requested that the landowner's rights be protected in this instance.

Special Management Areas
Comments suggest the need to address the stipulations in the Grand Mesa Slopes Management Area Agreement. One commenter asked the BLM to work to mitigate any impacts to the scenic values, air quality, water quality or recreational opportunities in the Forest Service inventoried Roadless Area – Kannah Creek, the Forest Service Research Natural Areas at Coal Creek Basin and Whitewater Basin, the Nature Conservancy Southern Rocky Mountains Ecoregional Plan Portfolio Site–Escalante Creek, Dominguez-Escalante National Conservation Area and Dominguez Canyon Wilderness Area.

Special Status Species
Comments address the need to consider direct and indirect impacts to special status species and recommend that meaningful mitigations be imposed. CPW recommended that all biological surveys be completed as part of the EA and that CPW be consulted prior to surveys taking place. Several comments recommend protections and mitigation measures for Colorado River cutthroat trout habitat; as well as for several other threatened and protected species listed in comment letters.

Transportation and Access
Specific comments and questions addressed access routes, maintenance and design, traffic loads, impacts to residents, permits required, maintenance bonds, road restrictions and minimizing vehicle traffic and access into winter closure areas. One comment asked that Fram provide maps showing proposed roads and existing roads needing improvements.

Visual and Lighting
Comments from Mesa County address specific requirements for nighttime lighting. Others ask how Fram intends to mitigate visual impacts from the proposed development, how the

industrialized view would adversely impact property values and state that Fram should place drill rigs such that they are not visible from highways and population centers.

Vegetation
Comments suggest conducting a survey of the flora and fauna of the Project Area and surrounding ecosystems before any activity is approved.

Water Resources
Concerns about surface and groundwater resources were widely expressed. Specifically, they included impacts to the Kannah Creek and Whitewater Creek watersheds and drinking water used by Grand Junction and Whitewater residents, the occurrence of groundwater and the potential for well contamination, how fracking could impact groundwater and the potential for toxic contamination, effects to surface water by development and road crossings. Recommendations included groundwater modeling and monitoring, moving well pads outside the watershed boundary, construction of culvert or bridge crossings, avoiding low-water crossings of all waterways, the preparation of a Spill Prevention Plan and numerous specific mitigations and requirements in regulations noted in the letter prepared by Western Water & Land, Inc. on behalf of the City of Grand Junction.

1.4.3 Internal Scoping

Internal scoping meetings for the Project were held with the BLM GJFO Interdisciplinary Team (IDT). Maps of the Project Area and description of the Proposed Action were distributed to the IDT and discussed at IDT meetings. Screening of potential impacts to resources was conducted through internal scoping and site visits. Table 3.1-1 in Chapter 3 lists the results of the initial screening process.

1.4.4 Public Comment

A news release seeking public comment on the preliminary EA was posted on the BLM GJFO website at: http://www.blm.gov/co/st/en/fo/gjfo/html on June 28, 2013. The Preliminary EA was also posted. The BLM invited the public to provide comments on the EA for 30 days beginning June 28, 2013 through July 31, 2013. The comment period was extended to August 14, 2013. During the comment period, 208 unique comment letters/emails were received, including one from CPW, five from local agencies, six from business and industry, five from environmental advocacy groups, and 191 from individuals. Additionally, the BLM received 25,833 form letters from the Natural Resources Defense Council, and 75 form letters from other advocacy groups. After the comment period closed, the BLM received an additional comment letter from the Town of Palisade, along with one unique individual letter and 16 form letters. Substantive comments were considered in this analysis. Responses to substantive comments are included in the Fram Whitewater EA Public Comment Response Document which is available at the BLM GJFO.

1.5 DECISION TO BE MADE

BLM decision-makers will decide, based on the analysis contained in this EA, whether or not to authorize the Proposed Action. The Decision Record associated with this EA does not constitute the final approval for all actions, such as approval for individual applications for permit to drill (APDs) and Sundry Notices associated with the Proposed Action. The EA analysis does, however, provide the BLM's Authorized Officer (AO) with information that could be used to inform final approvals for individual Project components such as APDs and Sundry Notices.

CHAPTER 2 - PROPOSED ACTION AND ALTERNATIVES

2.1 INTRODUCTION

The purpose of this chapter is to provide information on the Proposed Action and alternatives. In addition to the Proposed Action, a Single Access Alternative, B Road Alternative, and the No Action Alternative have been carried forward for analysis. Alternatives that have been identified but were not carried forward for analysis are also discussed in this chapter.

2.2 ALTERNATIVES ANALYZED IN DETAIL

2.2.1 Proposed Action

2.2.2 Introduction

Initial drilling within the Whitewater Unit began with an exploration program executed in the 70's and early 80's when Mitchell Energy drilled seven wells in 1974 and 22 wells from 1979 through 1981. In 2002 and 2003, Evertson Operating drilled an additional seven wells and South Oil Company and Aspen Well Drilling drilled 11 wells in 2005. During this activity, hydrocarbons, primarily natural gas, were encountered in all wells within the Dakota and Morrison formations (although a few wells did encounter oil within the Dakota Formation). However, no pipelines were put in place because the small volumes produced were not sufficient to warrant development. As a result, most of the wells were plugged and abandoned. Between 2009 and 2012, Fram drilled 15 wells, almost all on private lands, two of which are currently producing oil (Siminoe L and Mansur K). One of the Evertson wells drilled in 2003 (Federal 12-2-12S-98W), currently produces oil.

The Trans-Colorado gas pipeline (TSP) was constructed in 1996 through the Whitewater Unit and is now connected to the unit at two gathering stations, providing a ready sales channel. The TSP is connected to the Rocky Mountain Express (REX) pipeline which could provide a secure and cost efficient sales channel for Whitewater gas to the eastern coast of the United States. Because of the presence of inert gases nitrogen and carbon dioxide in the produced natural gas and due to the current low market price of natural gas, it is not economically viable to produce natural gas from the unit at this time. The inert gas content in the produced natural gas would require expensive treatment to meet the standards required for introduction to the existing pipelines. Natural gas co-produced with oil would not be compressed and sold, but used to run production equipment on the well pads. Any "excess" natural gas would be combusted at the wellhead, or might eventually be re-injected to increase formation pressure.

Due to the historic lack of sustained production, Fram perceives this area as an exploratory prospect. Fram has discovered oil in the eastern edge of the Whitewater Unit in the Dakota Formation and is investigating to determine whether it has commercial potential. Initially, exploration of the oil prospect would be accomplished through vertical wells, and if the wells proved to be productive, later development would include directional wells. If the market sustains favorable conditions, Fram proposes to explore oil production in the Dakota Formation with four new well pads in the first year and eight new well pads in the second year, with up to nine wells per well pad not to exceed 108 wells total.

The proposal consists of constructing, drilling, completing, operating and abandonment of up to 108 wells. The wells would be drilled on twelve new well pads (see Table 2.2-1). This proposal also includes construction and operation of gathering pipelines for oil, gas and produced water as well as upgraded and new access roads to support drilling, completion, operation and abandonment of the proposed wells. Under the Proposed Action, Fram would exercise the right to develop oil and gas resources under their existing federal leases. Eleven of the well pads would be located on BLM-administered lands and wells drilled from these pads would be into federal minerals for which Fram has existing leases. One well pad would be on private surface, drilling into federal minerals (split estate).

Table 2.2-1
Name and Location of Proposed Well Pads

Proposed Well Pad	Surface/Mineral Ownership	Location	Lease Number	Lease Date
Federal 2-2-2-1	Private/Federal	SENW Section 2, T2S, R2E	COC-61847	06/01/98
Federal 12-97-30-1	Federal/Federal	SENE Section 30, T12S, R97W	COC-62810	06/01/99
Federal 12-98-24-2	Federal/Federal	SENW Section 24, T12S, R98W	COC-62814	06/01/99
Federal 13-97-8-2	Federal/Federal	NWSE Section 8, T13S, R97W	COC-63027	01/01/00
Federal 13-98-12-2	Federal/Federal	NENE Section 12, T13S, R98W	COC-63033	01/01/00
Federal 12-97-7-1	Federal/Federal	NWSW Section 7, T12S, R97W	COC-63929	09/01/00
Federal 1-2-15-1	Federal/Federal	SENE Section 15, T1S, R2E	COC-64949	06/01/01
Federal 1-2-16-1 Federal 1-2-22-1	Federal/Federal	NESE Section 16, T1S, R2E NENW Section 22, T1S, R2E	COC-64950	06/01/01
Federal 1-2-25-2	Federal/Federal	NENE Section 25, T1S, R2E	COC-64951	06/01/01
Federal 1-2-26-2 Federal 1-2-33-1	Federal/Federal	NWNE Section 26, T1S, R2E NESW Section 33, T1S, R2E	COC-64952	06/01/01

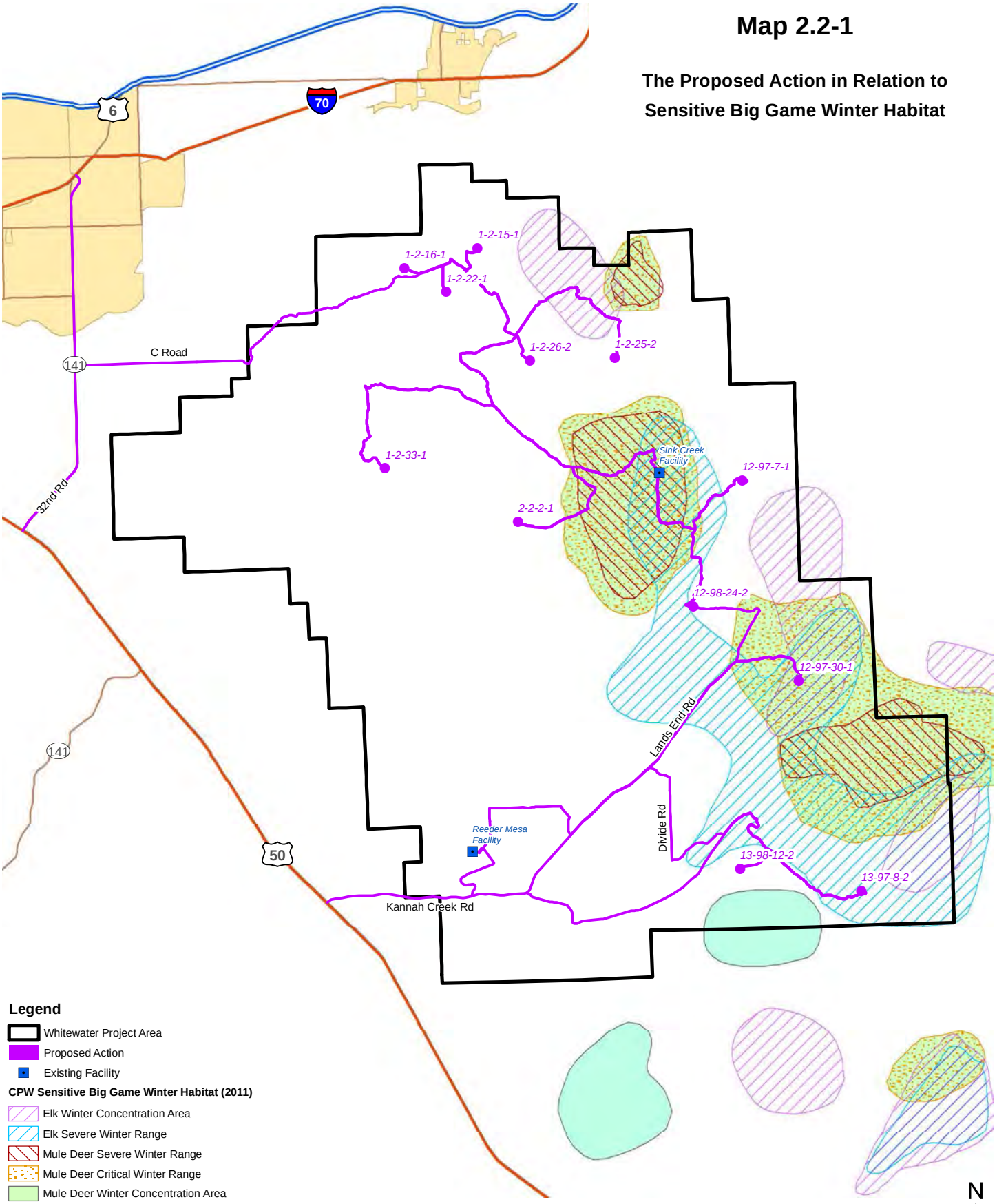
Table 2.2-2 provides a summary of the applicable lease stipulations in the Project Area. A full list of the lease stipulations is provided in Appendix B. Five of the proposed well pads (Federal 13-97-8-2, Federal 12-97-30-1, Federal 12-98-24-2, Federal 12-97-7-1 and Federal 1-2-25-2) would be constructed on leases that have stipulations to protect wintering big game. These leases include a timing limitation which would not allow construction, drilling, completion or work-over activities between December 1 and April 30. Two additional proposed well pads (Federal 13-98-12-2 and Federal 2-2-2-1) would be constructed on leases that do not have federal lease stipulations to protect wintering big game; however, proposed access to them would cross sensitive big game winter habitats (winter concentration areas and severe winter ranges used by mule deer, elk and pronghorn and mule deer critical winter range; see Section 3.3.7.1 for winter range definitions).

A distinction is made here between sensitive big game winter habitats and Sensitive Wildlife Habitats (SWH), defined under Colorado Oil and Gas Conservation Commission (COGCC) Rule 1200 (COGCC, 2009). Briefly, Rule 1200 requires operators of proposed new oil and gas locations that are within SWH to consult with CPW (formerly Colorado Division of Wildlife), the surface owner and the COGCC Director to identify possible COAs (see sections 1202(a), (b) and (c), with exceptions in sections 1202(d) and (e)). Per BLM GJFO's Standard Conditions of Approval - COAs (Appendix C) that relate to federal leases where big game winter range timing limitations would normally apply, a 60 day Timing Limitation from January 1 to March 1 would be applied.

The remaining five proposed well pads (Federal 1-2-15-1, Federal 1-2-16-1, Federal 1-2-22-1, Federal 1-2-26-2 and Federal 1-2-33-1) would be constructed on leases that have no stipulations to protect wintering big game and in winter, would be accessed by roads that do not cross (northern access route) sensitive big game winter habitats (see Map 2.2-1).

Map 2.2-1

The Proposed Action in Relation to Sensitive Big Game Winter Habitat



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

Fram's federal leases include stipulations to protect the outstanding scenic and natural landscapes visible from populated areas and heavily traveled roads. Five of the proposed well pads would be constructed on leases that include stipulations to protect known cultural (historic or archaeological) resource values (Table 2.2-2). Four of the well pads are proposed on leases that have stipulations to protect threatened and endangered habitats. Protection of threatened and endangered species is also required under the Endangered Species Act (ESA), regardless of lease stipulations. One well pad (Federal 12-97-30-1) is proposed on a lease with a No Surface Occupancy (NSO) stipulation to protect water quality of the Grand Junction Municipal Watershed. One well pad (Federal 1-2-25-2) is proposed on a lease with a NSO stipulation to protect views of the Scenic Book Cliffs. Lease stipulations apply to the surface of the ground at the well pad location where the well is drilled, rather than to the surface above the leases from which a well may produce. This generally applies to directional wells rather than vertical wells.

Table 2.2-2
Summary of Applicable Lease Stipulations in the Project Area

Lease Number	Date	Proposed Pads	Stipulation
COC-61847	06/01/98	Federal 2-2-2-1	Scenic and Natural Values Known Cultural Resources Values
COC-62810	06/01/99	Federal 12-97-30-1	No Surface Occupancy – GJ Watershed Scenic and Natural Values Deer and Elk Winter Range
COC-62814	06/01/99	Federal 12-98-24-2	Deer and Elk Winter Range Scenic and Natural Values
COC-63027	01/01/00	Federal 13-97-8-2	Deer and Elk Winter Range Scenic and Natural Values Threatened and Endangered Habitat
COC-63033 (COC-63027)	01/01/00	Federal 13-98-12-2	None[1]
COC-63929	09/01/00	Federal 12-97-7-1	Deer and Elk Winter Range Scenic and Natural Values Threatened and Endangered Habitat
COC-64949	06/01/01	Federal 1-2-15-1	Scenic and Natural Values Known Cultural Resource Values
COC-64950	06/01/01	Federal 1-2-16-1	Scenic and Natural Values Known Cultural Resource Value
		Federal 1-2-22-1	Scenic and Natural Values Known Cultural Resource Value Threatened and Endangered Habitat
COC-64951	06/01/01	Federal 1-2-25-2	No Surface Occupancy- Scenic Book Cliffs VRM Deer and Elk Winter Range Scenic and Natural Values Known Cultural Resource Value
COC-64952	06/01/01	Federal 1-2-26-2	Scenic and Natural Values Known Cultural Resource Value
		Federal 1-2-33-1	Scenic and Natural Values Threatened and Endangered Habitat

[1] A portion of the proposed well pad overlies lease COC-63207; however, none of the listed stipulations would apply.

Fram's Whitewater Unit MDP (Fram, 2014) proposes construction and operation of the Proposed Action in accordance with Project Design Features included in the MDP. For example, Fram proposes to include all measures that BLM applies as GJFO Standard COAs (Appendix C), so the Proposed Action is in accordance with these measures. Fram would implement the Project Design Features on private lands as they would for BLM-administered lands, in accordance with Surface Use Agreements they will put in place with landowners before operations are undertaken on private lands. Fram has prepared a Transportation Plan (Appendix D) and a Biological Resources Protection Plan (Appendix E).

2.2.2.1 Surface Disturbance by Wellfield Component

Table 2.2-3 provides estimates of short-term and long-term disturbance for each wellfield component. The estimates of disturbance in Table 2.2-3 include proposed components on BLM-administered lands and on private lands. It is estimated that approximately 67 percent of proposed disturbances would occur on BLM-administered surface, 14 percent would occur on private surface, and 19 percent on surface owned by the City of Grand Junction.

Table 2.2-3
Estimated Short-Term and Long-Term Surface Disturbance

Project Component	Length (miles)/ or Number	Short-term Disturbance (acres)	Long-term Disturbance (acres)
New Resource Road with Pipeline	1.67	9.07	4.67
Upgraded Existing Road with Pipeline	19.46	73.07	56.17
New Pipeline Only	12.42	30.08	0.00
New Pads	12	50.77	12.0
	Total	**162.99**	**72.84**

[1] Existing road disturbance is not included in new estimates of disturbance.
[2] Pipeline construction disturbance would be reclaimed at the time of installation.

2.2.2.2 Construction

Fram would obtain and comply with all appropriate federal, state, county, municipal and local permits, including all necessary environmental clearances and permits (COGCC, U.S. Army Corps of Engineers - USACE, CPW, U.S. Fish and Wildlife Service - FWS, Forest Service, Colorado Department of Transportation - CDOT, Colorado Department of Public Health and Environment - CDPHE and local government approvals) before commencing any work (GJFO Standard COA).

All construction (well pads, pipelines, roads) would be included in a state-mandated General Construction Permit for storm water discharges from the CDPHE. The permit number for the Whitewater Unit is COR-03B947. A Storm Water Management Plan (SWMP) is currently in place for each of the permitted areas. The plan would be updated as necessary to include all new construction. BMPs as required by the permits and plans would be installed before, during and maintained after construction until the location reached final stabilization following reclamation (see Typical Drawings in Appendix F). All other requirements of the permits would be followed, such as the bi-weekly and post-precipitation event inspections and reclamation of disturbed areas, to stabilize them (GJFO Standard COA). Fram would also follow their Spill Prevention Control and Countermeasure (SPCC) Plan (HRL Compliance Solutions, Inc., 2010).

Well Pads. Fram is proposing to construct twelve well pads; four well pads during the first year and eight well pads during the second year. The working surface (drilling operations area) of the newly constructed well pads would average 360 feet by 300 feet (2.5 acres), and with cut and fill slopes and topsoil storage, surface disturbance per pad would be approximately 4.4 acres. The target zone for the wells is the Dakota Formation, from approximately 4,500 to 5,000 feet below the surface. A large drilling rig is not necessary to reach this depth, which eliminates the need for a larger pad. Construction of twelve well pads would result in an estimated 52.8 acres of new short-term surface disturbance. Following Interim Reclamation, (when the size of the pad is reduced as areas unnecessary for long-term production are reshaped and revegetated), a working area of about 1.0 acre per pad would remain disturbed throughout the long-term production phase of the well(s). Total long-term disturbance for well pads is estimated at 12.0

acres, following Interim Reclamation (see Table 2.2-3). Typical drawings of the proposed well pads during drilling and production are shown in Appendix F.

Each proposed well pad would accommodate up to nine wells (one vertical and up to eight directional). Fram would conduct interim reclamation within 6 months after completion of the last well planned for the well pad or after one year had passed with no new wells drilled.

The proposed well pads would be constructed from native soil and rock materials present at the site, using a bulldozer, grader, front-end loader, or backhoe. The pad would be constructed by clearing vegetation, salvaging and storing topsoil and leveling the drilling area using cut-and-fill techniques. The tops of cut banks and pad corners would generally be rounded to improve appearance and minimize disturbance. All cut and fill slopes would be protected against rilling and erosion with BMPs such as water bars, lateral furrows, pocking, seeding, or additional measures approved by the BLM or as described in the approved SWMP (GJFO Standard COA).

Proposed Access Roads and Gathering Pipelines. Fram proposes to use approximately 16.82 miles of existing, mostly paved roads and approximately 19.46 miles of existing two-track roads for access within the Project Area during construction/drilling. When site conditions are appropriate and when approved by the BLM, these roads may be used as “primitive” two-track roads to drilling locations when it is not certain that the well will be productive, or to producing wells where vehicle traffic is infrequent due to the use of off-site production facilities and automated well monitoring (BLM and Forest Service, 2007). The use of primitive roads is site-specific and would be based on anticipated dry or frozen soil conditions, seasonal weather conditions, flat terrain, low anticipated traffic, and/or driller’s or operator’s access needs. Low vehicle speed (20 mph or less) would be used on primitive roads, which would require four-wheel drive or high clearance vehicles. Minor or moderate grading may occur, but primitive roads would not be flat-bladed. Drainage would be maintained, where appropriate, to avoid erosion or the creation of a muddy, braided road. Primitive roads are not intended for use as all-weather access roads. Any resource damage would be repaired as soon as possible and Fram would consult with the BLM to determine if all or a portion of the road should be upgraded to an all-weather access road.

When an all-weather road would be required, most upgrading would occur within the width of existing road disturbance, but disturbance outside of the existing road footprint could be needed to meet anticipated traffic requirements and all-weather surfacing/design. Existing two-track roads are generally 14 to 16 feet in width and upgrading outside of the disturbance footprint would not exceed 24 feet. Any upgrading of the proposed northern access route (3.42 miles) would be done within existing disturbance to protect sensitive soil and plant resources. Approximately 1.67 miles of new resource roads would be required. New resource roads up to 24 feet in width would be constructed at the same time as the well pads they were to serve. Road construction and upgrades would comply with BLM GJFO Standard COAs and *Surface Operating Standards and Guidelines for Oil and Gas Development*, also known as the Gold Book (BLM and Forest Service, 2007).

In accordance with standards, drainage control would be ensured over the entire road through the use of drainage dips, in-sloping and ditches, natural rolling topography, ditch turnouts, armored crossings or culverts. Site-specific road design measures would consider grades, soils and local hydrology. Where culverts or drainage crossings were needed, they would be designed for a 25-year or greater storm frequency, without development of a static head at the pipe inlet.

Culverts would be constructed to replace low water crossings of municipal ditches on existing roads. BLM Road 7265 crosses Long Mesa Ditch, Lockhart Ditch, and Brandon Ditch and would require culverts at those locations. Design, construction, and maintenance of all stream crossings (and all surface disturbance associated with oil and gas exploration) would adhere to surface operating standards and guidelines in the Gold Book (BLM and Forest Service, 2007).

On constructed roads, Fram would implement the following measures in accordance with the BLM GJFO Standard COAs:

- Roads would be crowned or sloped, drained with ditches, culverts and/or water dips and constructed, sized and surfaced in compliance with BLM Gold Book standards (pp. 24-28).
- Water outlets and roadside ditches would incorporate BMPs such as rip-rap, sediment catchments and anchored check structures that slow water velocity, to prevent erosion and sediment transport. Ditches may be revegetated and/or include large rocks or other BMPs to slow water and settle sediment. Ditch revegetation may be required in erodible soils. All drainage ditches and culverts would be kept clear and free flowing, and would be maintained in good condition.
- Road use and construction would halt under conditions of undue damage and erosion to soils, roads and/or locations. When saturated soil conditions exist on access roads or location, or rutting deepens past 3 inches, construction and travel would halt until soil material dries out, is frozen sufficiently or is otherwise brought to standards that provide for resource protection. Where applicable, initial road base/gravel application would be of CDOT Class 6 aggregate or equivalent, to a minimum depth of 6 inches.
- Where roads are located near drainages, vegetated buffer strips would be left between areas of disturbance and drainages.
- All cut and fill slopes for roads (and well pads and related locations) would be protected against rilling and erosion with BMPs such as soil texturing and seeding or additional measures approved by the BLM. Measures may include geotextiles, weed-free straw crimping/ bales/ wattles/ matting, as needed or as detailed by storm water plan or BLM permit. BMPs would be monitored and maintained in functional condition.
- Roads accessing active construction and drilling sites would be posted with warning signs to alert hunters and recreational vehicle users to Project personnel and vehicles in the area. Project personnel would restrict activities and travel to permitted roads and sites.
- Speed control measures would be installed on Project-related unpaved roads and enforced with Project personnel.
- Routine timely maintenance of roads would be provided. Regular maintenance would include, but not be limited to dust abatement, reconstruction of the crown, slope, or water dips/bars; blading or resurfacing; clean-out of ditches, culverts, catchments and other BMPs. When rutting of the travel-way deepens to 3 inches, maintenance or upgrade would be conducted as approved by BLM.

Fram would coordinate with the Road and Bridge Department of Mesa County Public Works to ensure that use of county roads conformed with issued use permits, rights-of-way, maintenance, upgrading and other county requirements. Paved roads are not likely to require improvement or maintenance prior to or during Project development. Paved roads used for access would be maintained by CDOT and Mesa County. Additionally, Mesa County maintains Whitewater Creek Road, which is unpaved (see Transportation Plan – Appendix D). Fram would maintain other gravel or dirt roads, including C Road east of 34 Road, during construction and operation.

Fram would restrict activities and travel to permitted roads and sites. Speed limits would be posted and followed. Where there is no posted speed limit, speeds on unpaved access roads and disturbed areas would not exceed 20 miles per hour.

Proposed gathering lines (water, gas, oil) would be constructed within or immediately adjacent to roads, generally along the uphill side of the road. In some cases, it might be necessary to install the pipelines in the road to protect sensitive resources. Approximately 6 miles of new gathering lines would be installed adjacent to existing improved roads (no upgrading needed) requiring 20 feet (width) of short-term construction disturbance that would be revegetated following construction. Approximately 25.5 miles of gathering lines would be constructed adjacent to existing two-track roads planned for upgrading. This would also require up to 20 feet (width) of short-term disturbance. Topsoil would be salvaged and windrowed separately from the underlying subsoil and stored along the road until the trench was backfilled. All pipelines would be buried to a minimum depth of 3 feet from surface to top of pipe. The pipeline trench would be excavated mechanically; pipe segments would then be welded together and tested, lowered into the trench and covered with excavated material (GJFO Standard COA). Generally, one mile of pipeline would be constructed in 4 to 7 days.

The three pipelines (oil, water, and natural gas) would be co-located in the same trench. Although not considered under this proposal, Fram anticipates that economic quantities of natural gas could someday be produced within the Whitewater Unit and therefore proposes to install the natural gas gathering system at the same time as the oil and water pipelines, to minimize future disturbance.

Each pipeline would be pressure tested with fresh water and/or nitrogen gas to locate leaks. Fresh water would be purchased from the City of Grand Junction. Water would be transported to the testing location by truck. If nitrogen were used for testing, it would be obtained through a third-party contractor, such as Halliburton or BJ Services, which would then be on location to pump the nitrogen test. After testing, if fresh water was used, the water would either be discharged to an upland location or would be disposed of in a commercial facility. BLM and State approval would be obtained prior to discharge.

2.2.2.3 Drilling and Completion

Up to 108 wells would be drilled under this proposal. Fewer wells could be drilled than are proposed due to geologic and market uncertainties. Initially, wells would be drilled vertically; additional wells on a pad might be drilled directionally.

Fram drilling operations would be conducted in compliance with all Federal Onshore Oil and Gas Orders, as well as with all other applicable rules and regulations. Drilling would target oil production zones at depths of approximately 4,500-5,000 feet.

Surface casing would be run to a minimum depth of 100 feet below freshwater aquifers located within one mile. The surface hole would be cased with steel casing and cemented in place entirely from ground level to the depth specified in that well's APD. Prior to drilling below the surface casing, a Blowout Preventer (BOP) would be installed on the surface casing and both the BOP and the surface casing would be tested for pressure integrity. The BOP and related equipment would meet the requirements of Federal Onshore Oil and Gas Order No. 2 and the BLM would be notified in advance of all pressure tests.

After drilling the hole to its final depth, logging tools would be run into the well to evaluate the potential hydrocarbon resource. If the evaluation indicated that adequate hydrocarbon resources were present and recoverable, steel production casing would be run and cemented into place in accordance with the well design as approved by the BLM. The proposed casing

and cementing program would be designed to protect and/or isolate all usable water zones, potentially productive zones, lost circulation zones, abnormally pressured zones and any prospectively valuable deposits of minerals. BLM approval is required prior to the use of any isolating medium other than cement.

After production casing was cemented in place, the drilling rig would be removed and replaced by a completion rig. Well completion consists of running a cement bond log to evaluate cement integrity and to correlate the cased hole logs to the open hole logs. The casing would then be perforated across the hydrocarbon producing zones.

If directional wells are drilled, specific directional plans for each well would be included with site-specific APDs. Downhole operations would be done with tools to facilitate proper direction and path of the well bore.

Fram would not use pits for drill cuttings, because a closed-loop drilling system produces fairly dry cuttings in order to allow the rig to recycle drilling water. Drill cuttings would be placed on impervious liners within concrete 'jersey barriers' until they were completely dry. Fram would background test soils for arsenic and sodium absorption ratio (SAR). If allowed by the State and BLM after testing, Fram would use the drill cuttings for fill. The jersey barriers would serve as raised containment barriers to support the liner and contain the cuttings until they were removed. Both BLM and COGCC permit requirements would define standards for liners and cuttings management.

A well is anticipated to require approximately 10 days of drilling and 5 days to complete. Without recycling, approximately 1,950 barrels of water would be required for drilling and completion of each well. Whenever possible, Fram would recycle water, saving approximately 800 barrels per well. The water would be purchased from the City of Grand Junction and hauled to the well location by truck. Water take points are shown on Map 3 in the Transportation Plan (Appendix D). These are locations identified by the City of Grand Junction where Fram can obtain water. A small water truck, also known as a bobtail, can carry approximately 80 barrels per trip; a larger water transport truck can carry up to 120 barrels per trip. Water volume used for drilling is dependent on the depth of the well and any losses that might occur during drilling.

2.2.2.4 Production – Operation and Maintenance

Existing Facility Locations. Two existing natural gas facilities are located in the Project Area; the Reeder Mesa Facility (on private land) and the Sink Creek Facility (on BLM land). The facilities would be used for storage of oil and produced water. The existing compressor at the Reeder Mesa Facility has obtained a CDPHE air permit, but under this proposal no natural gas would be sold, so the compressor would not be used. Although installation of natural gas gathering lines is included in the Proposed Action, further NEPA would be required before the gas could be compressed and delivered to markets. A compressor previously located at the Sink Creek Facility has been removed. No additional disturbance would be required at either of the existing facilities.

Oil, Water and Gas Production. Fram estimates that oil production from a single well could begin at 50 barrels per day and would decline from that point. In the fourth year of operation, oil production could be reduced to half of initial production. Produced water could be 3 to 5 barrels per day per well. Storage tanks for oil and produced water would be installed at each well pad. Oil and produced water could also be delivered via gathering lines to the existing Reeder Mesa and Sink Creek facilities.

From May 1 to November 30, oil and produced water would be gathered in the proposed pipelines and delivered to the facilities by gravity feed. Produced water and oil from three proposed well pads (Federal 13-98-12-2, Federal 13-97-8-2 and Federal 12-97-30-1) would flow

to the Reeder Mesa Facility and produced water and oil from all other facilities would flow to the Sink Creek Facility.

In the winter months (December 1 to April 30), oil and produced water would continue to flow by pipeline from wells Federal 13-98-12-2 and Federal 13-97-8-2, rather than being collected by trucks, to minimize traffic within sensitive big game winter habitats. Produced water and oil from well pads located outside sensitive big game winter habitats (Federal 1-2-16-1, Federal 1-2-15-1, Federal 1-2-22-1, Federal 1-2-26-2 and Federal 1-2-33-1) would be collected directly from each well pad using the proposed northern access route. Produced water and oil from four well pads located (or with access located) in sensitive big game winter habitats would continue to flow to the Sink Creek Facility and would be picked up using the northern access route.

Oil would be collected and delivered by truck directly to markets. Produced water would be collected and delivered by truck to the Deer Creek Facility owned by Alanco Energy Services. The Deer Creek Facility is located within Whitewater Unit, south of the Project Area.

Fram anticipates that natural gas would be co-produced with the oil. Most of the natural gas produced would be used to run equipment at each individual well pad. Any excess gas would be combusted at the well pad by combustors with 99 percent efficiency. No flaring of natural gas would take place. Eventually, excess natural gas could be re-injected into the formation to increase pressure.

Proposed Surface Facilities. Surface facilities at each well pad location would consist of wellheads, separator units, gas metering units and aboveground oil and produced water tanks with approximately 100 to 400 barrel capacities. Multi-well locations would share production equipment, as feasible, to minimize surface occupancy/disturbance. All production equipment with a chimney, vent or stack would be fitted with a device that would prevent birds from entering the chimney, such as an excluder cone or equivalent.

Production facilities/equipment would be located and arranged to facilitate safety and maximize interim reclamation opportunities, e.g. located at the access road end of the pad, with tanks in cut (see Typical Drawings in Appendix F). As practical, the access to production facilities would be provided by a teardrop-shaped road through the production area, so that the driving area might be clearly defined and limited so that the teardrop center may be revegetated (GJFO Standard COA).

All permanent aboveground facilities would be painted a natural color to blend with the background landscape, in a non-reflective finish. A BLM Standard Environmental Color might be specified. Where necessary, production equipment would be located or designed to minimize visual impacts. On split estate lands, the surface equipment would be painted in accordance with BLM requirements unless the private surface owner requested differently.

Telemetry equipment would be used to remotely monitor wells and would reduce traffic to and from the well locations in order to minimize impacts on sensitive soils, wildlife and plants. A pumper truck would periodically visit the pads based upon information gathered from telemetry equipment.

All production facilities (storage tanks, loadouts, separators, treating units, etc.) with the potential to leak or spill oil, produced water, glycol, or other fluids which might be a hazard to public health or safety would be placed within secondary containment structures. Secondary containment structures would consist of corrugated steel containment berms or earthen berms. Compaction and construction of earthen berms surrounding the tank batteries would be performed to prevent lateral movement of fluids through the utilized materials. Secondary containment would be sized to contain a minimum of 110 percent of the storage capacity of the

largest tank within the berm. All loading lines would be placed inside the containment berm. Chemical containers would be clearly labeled, maintained in good condition and placed within secondary containment. They would not be stored on bare ground, nor exposed to sun and moisture (GJFO Standard COA).

Work-overs or Recompletions. Periodically, the work-over or recompletion of a well might be required to ensure that efficient production was maintained. Work-overs can include repairs to well bore equipment (casing, tubing, rods or pump), a wellhead or production facilities. Repairs would usually be completed during daylight. The frequency of this type of work cannot be accurately predicted because the need for work-overs varies from well to well.

Water Supply and Use. Fram would purchase water for drilling, dust control and hydrostatic testing from the City of Grand Junction. Approximately 1,950 barrels (81,900 gallons) of water would be required for drilling each well, totaling 8.8 million gallons or 27.1 acre-feet. When possible, Fram would recycle water, saving about 800 barrels per well. During the construction phase, water would be required for hydrostatic testing of pipelines (estimated 774 gallons or 2.38 acre-feet). Once all wells were in the production phase, the only water use would be for dust control. At peak field-wide production, dust control is estimated to require approximately 1.5 million gallons or 4.7 acre-feet of water per year. Because oil production is expected to peak in the early years of a well's productive life and decline rapidly thereafter, water use for dust control is expected to decline over the life of the Project.

The City of Grand Junction holds water rights in the North Fork of Kannah Creek, Whitewater Creek, and Brandon Ditch (Table 2.2-4). Water trucks would pump water directly from creeks or ditches with City water rights and then haul water to locations where it is needed. Water would be pumped only from points of diversion identified in the City's water rights decree. Three water withdrawal locations are under consideration (see Map 2 in Transportation Plan, Appendix D). Water Take Point 1 would be in the North Fork of Kannah Creek, adjacent to Lands End Road, just downstream of the City of Grand Junction watershed area. This location would be the main supply source and is located on a pull-out along Lands End Road below a diversion in the North Fork, at a cement flume (City Ditch Bypass Measuring Point, Table 2.2-4). Water Take Point 2 would be on an unnamed intermittent tributary to the North Fork, at a low-water crossing of a gravel road (BLM 7265) turning off Lands End Road. This water withdrawal location could be used when flow in this tributary was sufficient. Water Take Point 3 would be in Brandon Ditch. Brandon Ditch diverts water from Whitewater Creek at a point about 0.5 miles east and upstream of the Project Area boundary to another diversion, where part of the water enters a buried municipal pipeline delivering water to the City. Water remaining aboveground in Brandon Ditch is used for irrigation and stock water. Water Take Point 3 in Brandon Ditch would be just upstream of the existing road (BLM 912) crossing, but downstream of the pipeline diversion.

For all Project activities, only Grand Junction City water would be used (Table 2.2-4). If the three proposed water take points (Map 2 in Transportation Plan, Appendix D) were not available, Fram would purchase water from the City of Grand Junction and obtain it at an alternate source (e.g., hydrants).

Table 2.2-4
City of Grand Junction Water Rights near the Project Area

City of Grand Junction Water Right Name	Point of Diversion Structure ID	Source	Location (UTM NAD 83)		Case/Priority Number	Amount (cfs)	Type
			Northing	Easting			
City Ditch	512	North Fork Kannah Creek	4319737	214966.4	CA15487/1	0.9000	Absolute
					CA15487/2	0.9500	Absolute
					CA15487/3	5.7600	Absolute
					CA15487/4	1.4000	Absolute
					CA15487/5	1.9600	Absolute
					94CW0020	22.8000	Absolute
City Ditch Bypass Measuring Point	903	North Fork Kannah Creek	4319737	214966.4	NA	NA	NA
Laurent Ditch	554	North Fork Kannah Creek	4321302	216086.2	CA5812	15.3200	Absolute
					CA5812	18.4000	Absolute
					CA8303	1.0000	Absolute
Brandon Ditch	509	Whitewater Creek	4324935	218032.4	CA2635	0.5300	Absolute
					CA2635	1.6000	Absolute
					CA2635	3.5500	Absolute
					CA0273	0.3600	Absolute
					W3422	0.7200	Absolute
					W3482	0.3600	Absolute
					W3433	2.5500	AP/EX
					W3482	3.6000	AP/EX
					CA8303	2.3400	Absolute
					CA8303	5.0000	Absolute
					W2536	2.5000	Absolute
					CA13368	3.8000	Absolute
					CA13368	24.8000	Absolute
					85CW0222	1.0000	Absolute
					85CW0282	1.0000	Absolute
					85CW0199	15.0000	Conditional

Colorado Division of Water Resources – CDWR, 2012a.

Waste Handling. Wastes associated with the Proposed Action may include produced water, garbage, sewage, drill cuttings and other waste materials associated with drilling and completion. The following measures are proposed regarding handling waste, including those for hazardous materials management:

- Produced Water would be disposed of off-site in a commercial disposal facility (Deer Creek Disposal Facility).

- Garbage, trash and other waste materials would be collected in portable, self-contained and fully-enclosed trash cage during drilling and completion. Upon completion of operations (or as needed) the accumulated trash would be disposed of at an authorized sanitary landfill. No trash would be burned on location.
- Self-contained, chemical toilets would be provided for human waste. Upon completion of operations, or as needed, the toilet holding tanks would be pumped and the contents thereof disposed of in the nearest, approved sewage disposal facility.
- Drill cuttings would be placed on liners within jersey barriers until they are completely dry. Soils would be background tested for arsenic and sodium absorption ratio (SAR) before installation of cuttings containment. If allowed by the BLM, the drill cuttings would be used for cut and fill.
- Immediately after the removal of the drilling rig, all debris and other waste materials not contained in the trash cage would be cleaned up and removed from the well location.
- Hazardous materials would be handled in the following manner:
    - Project-related activities involving hazardous materials would be conducted in a manner that minimizes potential environmental impacts. A file would be maintained containing current Material Safety Data Sheets (MSDS) for all chemicals, compounds and/or substances that are used in the course of construction, drilling, completion, production and reclamation.
    - Hazardous substances, as defined by Comprehensive Environmental Response Compensation Liability Act (CERCLA), would not be used during construction or drilling. Commercial preparations, which may contain hazardous substances, might be used during production and would be transported within the Project Area. Any materials containing hazardous substances would be handled appropriately, to minimize the potential for leaks and spills. The Resource Conservation and Recycling Act (RCRA) states that hazardous wastes not be generated by well-drilling operations. Only RCRA exempt materials (cuttings) would be left on site.
    - Spills of oil, gas, or any other potentially hazardous substance would be reported immediately to the BLM and other responsible parties. Spills would be mitigated immediately. Appropriate measures for cleanup would be implemented, and spilled material removed to an approved disposal site according to the SPCC Plan. Any release of toxic substance (leaks, spills, etc.) in excess of the reportable quantity established by 40 CFR, Part 117 would be reported per the Comprehensive Environmental Response Compensation and Liability Act of 1980, Section 102b (CERCLA). Copies of any report to any Federal agency or State government as a result of a reportable release/spill of any toxic substances would be furnished to the BLM, concurrent with the filing of the reports to any Federal agency or State government.

2.2.2.5 Schedule

Once all BLM and other federal, state and local approvals were obtained, Fram proposes to construct four well pads during the first year and eight well pads during the second year, drilling up to 108 wells from 12 well pads over four years. On average, Fram would drill approximately 25 wells per year. Fram expects to begin construction as soon as all approvals are obtained.

2.2.2.6 Workforce

Fram estimates the number of workers per rig at 12 per day during drilling. The rig would drill 24 hours per day, 7 days per week. Fram also estimates that 5 workers would be required per well

during completion and that, completion crews would work during daylight hours, 7 days per week. Table 2.2-5 provides an estimate of the peak construction and operations workforces.

Table 2.2-5
Estimated Peak Construction and Operations Workforces

Workforce Category	Number of Workers
Construction	
Well pad construction[1]	4
Well drilling[2]	12
Well completion[3]	5
Reclamation (interim)	2
Road/pipeline construction	21
Total	**44**
Operations	
Pumpers[4]	1
Maintenance[5]	1
Oil Truck Drivers[6]	17
Produced Water Truck Drivers[7]	2
Total	**21**

[1] Assumes one three to four man crew working 7 to 10 days on well pad construction.
[2] Assumes one drilling rig with two four-man crews (crews would work 24 hrs/day) and two supervisory workers per crew.
[3] Assumes that a typical completion would require one five-man crew working during daylight hours.
[4] Assumes one pumper can visit 20 wells per day.
[5] Assumes 5 day maintenance period per well per year.
[6] Assumes between two and 17 trucks (200 barrel capacity) would be required to transport field-wide production to markets and that maximum field production occurs in Year 4.
[7] Assumes between one and four water trucks (120 barrel capacity) hauling produced water to an off-site disposal facility. Although produced water truck traffic peaks at four vehicles in Year 5, total operational traffic peaks in Year 4 and declines thereafter due to declining well production.

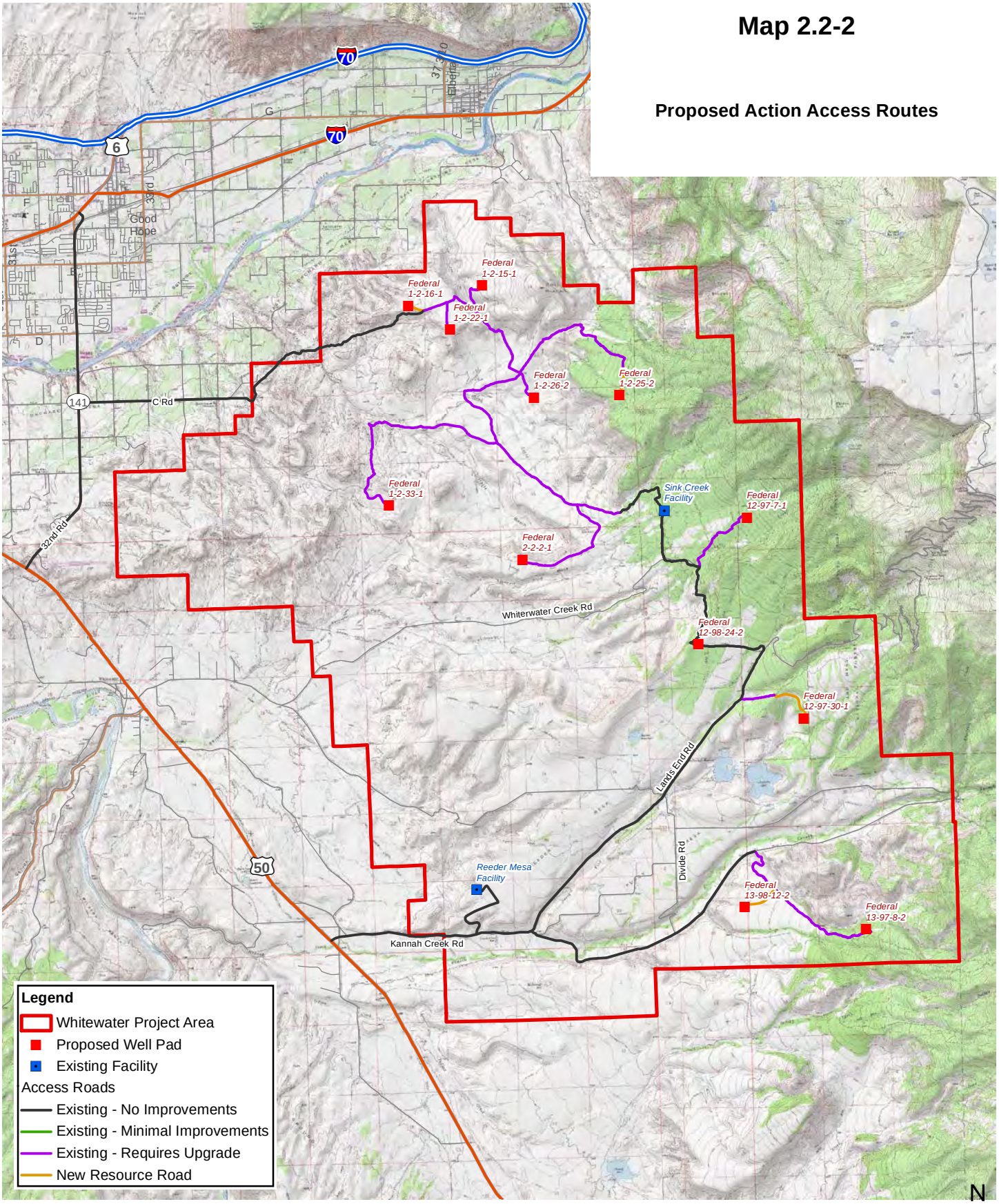
2.2.2.7 Access and Traffic

Access. Access routes associated with the Proposed Action are shown on Map 2.2-2. From Interstate-70, access to the Project Area is via the Interstate-70 Business Loop, State Highway (SH) 141 and U.S. Highway 50. The primary (southern) access route enters the southern portion of the Project Area from U.S. Highway 50 via Kannah Creek and Lands End roads. A secondary (northern) access route leading off of Mesa County C Road is proposed for use in winter months (December 1 to April 30) to access northern portions of the Project Area without crossing sensitive (elk and mule deer) winter habitats, to reduce impacts and stress to big game.

Both access routes exit Interstate-70 onto the Interstate-70 Business Loop in Clifton (Exit 37) and proceed south for approximately 1.5 miles to SH 141. The routes turn south onto SH 141 and proceeds approximately 0.25 mile, at which point SH 141 merges with 32 Road. The routes continue on SH 141/32 Road for another 2.0 miles to cross the Colorado River. Approximately 0.43 mile south of the river, SH 141/32 Road intersects C Road. The northern access route to and within the Project Area from the intersection of C and 32 roads is described in the sections below. The primary (southern) access route continues south on SH141/32 Road for approximately 2.6 miles to intersect U.S. Highway 50, where the route turns left and follows U.S. Highway 50 southward for approximately 6.9 miles and then turns east onto Kannah Creek Road, which becomes Lands End Road.

Map 2.2-2

Proposed Action Access Routes



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

Under the Proposed Action, the southern access route would be used for all traffic from May 1 to November 30. To minimize traffic in sensitive big game winter habitats located generally within the southern portion of the Project Area (see Map 2.2-1), Fram is proposing to use a northern access route during the winter months (December 1 through April 30). Table 2.2-6 provides a listing of seasonal access routes by well pad for construction/drilling and during operation/production.

Construction. During construction (including drilling and completion), the southern access route would be used to access all well pads from May 1 to November 30 and to access well pad Federal 13-98-12-2 in the winter (except January 1 to March 1). During winter (December 1 through April 30), traffic would use the northern access route for construction of five well pads (Federal 1-2-16-1, Federal 1-2-15-1, Federal 1-2-22-1, Federal 1-2-26-2 and Federal 1-2-33-1) that are not located within sensitive big game winter habitats, do not have lease stipulations for wintering big game, and are not accessed by roads crossing through sensitive big game winter habitat (see Map 2.2-1). A sixth well pad (Federal 2-2-2-1) could be accessed and constructed during the winter but construction would not occur between January 1 and March 1 because access to this well pad is proposed across sensitive big game winter habitat where the Timing Limitation from January 1 to March 1 would apply.

The drill rig would be brought into the northern portion of the Project Area using the southern access route prior to December 1 to avoid travel through sensitive big game winter habitat during winter. Traffic associated with rig mobilization and de-mobilization would not travel on the northern access route. Personal vehicles, water supply trucks and trucks delivering supplies would use the northern access road. During winter, water would either be taken from a point on Lands End Road (along the main paved road) or from an off-site location. Water from the Lands End take point would be transported outside the Project Area via the southern access route, north on U.S. Highway 50 and SH 141 and back into the northern portion of the Project Area on C Road. Water might also be obtained from alternate locations (hydrants) in the City of Grand Junction and hauled into the unit via the northern access route.

Operations. During operations (production), from May 1 to November 30, pumper and maintenance trucks would use the southern route to access all well pads. Gathering lines would transport oil and produced water to the Sink Creek or Reeder Mesa facilities, where oil and water would be picked up and transported off-site by truck via the southern access route (see Map 2.2-1). In the winter (December 1 through April 30), pumper and maintenance trucks would use the southern route to directly access five well pads (Federal 13-98-12-2, Federal 13-97-8-2, Federal 12-97-30-1, Federal 12-98-24-2 and Federal 12-97-7-1). Pumper and maintenance traffic would use the northern access route in the winter (December 1 to April 30) to access seven well pads: Federal 1-2-16-1, Federal 1-2-15-1, Federal 1-2-22-1, Federal 1-2-26-2, Federal 1-2-33-1, Federal 1-2-25-2 and Federal 2-2-2-1 (see Table 2.2-6). During winter months (December 1 through April 30), Fram would be responsible for maintaining locked BLM gates that restrict general travel within sensitive big game winter habitat.

Oil and produced water from three well pads (Federal 13-98-12-2 and Federal 13-97-8-2 and Federal 12-97-31-1) would flow year-round through gathering lines to the Reeder Mesa Facility, where trucks would pick up the fluids and transport them off-site using Kannah Creek Road (see Map 2.2-1). In order to avoid or minimize traffic within sensitive big game winter habitat from December 1 through April 30, trucks would collect oil and produced water directly from well pads Federal 1-2-15-1, Federal 1-2-16-1, Federal 1-2-22-1, Federal 1-2-26-2 and Federal 1-2-33-1 rather than letting the fluids flow to the Sink Creek Facility, which is located within sensitive big game winter habitat. Oil and produced water from well pads Federal 1-2-25-2, Federal 2-2-2-1, Federal 12-97-7-1 and Federal 12-98-24-2 would continue to flow to the Sink Creek Facility, where the fluids would be picked up and transported off-site by truck using the northern access route, which would reduce operational traffic within sensitive big game winter habitat by not utilizing the southern route (see Table 2.2-6).

Table 2.2-6
Proposed Seasonal Access Routes for Construction and Operation

Proposed Well Pad	Sensitive Big Game Winter Habitats[1]	Big Game Lease Stipulation	Timing Limitation for Construction[2]	Construction Traffic Access[3]	Operational Traffic Access[4]	Oil/Water Production[3,5]
Federal 13-98-12-2	Access only	No	1/1 - 3/1	Southern - 3/2 – 12/31	Southern - YR	Flows to Reeder Mesa YR
Federal 13-97-8-2	Yes	Yes	12/1 - 4/30	Southern - 5/1-11/30	Southern - YR	Flows to Reeder Mesa YR
Federal 12-97-30-1	Yes	Yes	12/1 - 4/30	Southern - 5/1 -11/30	Southern – YR	Flows to Reeder Mesa YR
Federal 12-98-24-2	Access Only	Yes	12/1 - 4/30	Southern - 5/1 -11/30	Southern – YR	Flows to Sink Creek YR
Federal 12-97-7-1	Access Only	Yes	12/1 - 4/30	Southern - 5/1 -12/1	Southern – YR	Flows to Sink Creek YR
Federal 1-2-15-1	No	No	None	Southern - 5/1 – 11/30 Northern - 12/1 – 4/30	Southern - 5/1 – 11/30 Northern - 12/1 – 4/30	Flows to Sink Creek – 5/1 – 11/30 Wellhead – 12/1 – 4/30
Federal 1-2-16-1	No	No	None	Southern - 5/1 – 11/30Northern - 12/1 – 4/30	Southern - 5/1 – 11/30 Northern - 12/1 – 4/30	Flows to Sink Creek – 5/1 – 11/30 Wellhead – 12/1 – 4/30
Federal 1-2-22-1	No	No	None	Southern - 5/1 – 11/30 Northern - 12/1 – 4/30	Southern - 5/1 – 11/30Northern - 12/1 – 4/30	Flows to Sink Creek – 5/1 – 11/30 Wellhead – 12/1 – 4/30
Federal 1-2-26-2	No	No	None	Southern - 5/1 – 11/30Northern - 12/1 – 4/30	Southern - 5/1 – 11/30 Northern - 12/1 – 4/30	Flows to Sink Creek – 5/1 – 11/30 Wellhead – 12/1 – 4/30
Federal 1-2-33-1	No	No	None	Southern - 5/1 – 11/30 Northern - 12/1 – 4/30	Southern - 5/1 – 11/30 Northern - 12/1 – 4/30	Flows to Sink Creek – 5/1 – 11/30 Wellhead – 12/1 – 4/30
Federal 1-2-25-2	Access only	Yes	12/2 – 4/30	Southern – 5/1 – 11/30	Southern - 5/1 – 11/30 Northern - 12/1 – 4/30	Flows to Sink Creek YR
Federal 2-2-2-1	Access only	No	1/1 - 3/1	Southern – 5/1 – 11/30 Northern 12/1 – 12/31 Northern 3/2 – 4/30	Southern - 5/1 – 11/30 Northern - 12/1 – 4/30	Flow to Sink Creek YR

[1] Sensitive Big Game Winter Habitat considers both 1) CPW 2011 mule deer and elk severe winter range, winter concentration area and/or mule deer critical winter range and 2) COGCC 2008 sensitive wildlife habitat coverage for mule deer critical winter range and elk winter concentration area. Within the Project Area, the CPW and COGCC GIS coverages overlap entirely.
[2] Construction includes well pad construction and drilling and completion.
[3] The southern route provides year round access to Reeder Mesa Facility.
[4] YR=year round.
[5] Access to Sink Creek Facility for oil and produced water collection is southern route from May 1 to November 30 and northern route from December 1 to April 30.

Traffic. Traffic levels during construction and operation are described in detail in Fram's Transportation Plan (Appendix D). Traffic levels would peak in Year 2 with a combination of construction and operational vehicles. Peak traffic would occur with one well pad and its associated roads and pipelines under construction; one well being drilled; one well in completion; dust control, interim reclamation and deliveries taking place; and approximately 50 wells in production. Under these conditions, peak traffic could be expected to occur during the summer, with up to 48 vehicle round-trips per day on the southern access route (see Table 2.2-7). Assuming that pad construction, drilling and completion activities were taking place in the northern part of the unit during the winter, peak winter traffic on the southern access route could include four vehicle round-trips per day; and peak winter traffic on the northern access route could include 31 vehicle round-trips per day. Peak summer traffic levels would begin to decline in or after Year 3, when construction of well pads, access roads and pipelines would be complete. Following Year 5, traffic volumes would decline continuously due to expected declines in field-wide production and the completion of reclamation activities. Between Year 6 and Year 20, during the summer, average daily traffic would include 15 vehicles, all which would use the southern access route. In the winter, traffic on the northern access route would average 11 vehicle round-trips per day, and traffic on the southern access route would average four vehicle round-trips per day.

Table 2.2-7
Estimated Peak Traffic Levels (Year 2)

Access Route and Project Activity	Peak Vehicle Round-Trips per Day					
	Summer (May - Dec 1)			Winter (Dec 2 – Apr 30)		
	Light Vehicles	Heavy Vehicles	Total Vehicles	Light Vehicles	Heavy Vehicles	Total Vehicles
Southern Access Route						
Construction Traffic[1]	18	16	34	0	0	0
Operational Traffic[2,3]	2	12	14	1	3	4
Total Traffic	**20**	**28**	**48**	**1**	**3**	**4**
Northern Access Route						
Construction Traffic[4]	0	0	0	11	10	21
Operational Traffic[2,3]	0	0	0	1	9	10
Total Traffic	**0**	**0**	**0**	**12**	**19**	**31**

[1] Includes all construction activities.
[2] Assumes that pumper and maintenance vehicles do not use the same access routes on the same days.
[3] Although operational traffic volumes increase through Year 4 due to more wells coming into production, total traffic volumes (construction and operational traffic) peak in Year 2 because of the higher volume of vehicles associated with well pad, road and pipeline construction.
[4] Assumes that pad construction, drilling, completion and deliveries occur during the winter and that dust control, interim reclamation and road and pipeline construction activities do not.

2.2.2.8 Abandonment and Reclamation

Well Plugging and Abandonment. New dry/non-producing wells would be plugged, abandoned and reclaimed within 90 days of well completion, weather permitting. Upon abandonment, each borehole would be plugged, capped and its related surface equipment removed. Subsurface pipelines would be purged and plugged at specific intervals. A Sundry Notice would be submitted by Fram to the BLM proposing the engineering, technical and/or environmental aspects of final plugging and abandonment. This notice would include final reclamation procedures and mitigation measures. The BLM and the COGCC standards for plugging would be followed. A configuration diagram, a summary of plugging procedures and a job summary with techniques used to plug the wellbore (e.g., cementation) would be included in the Sundry Notice (GJFO Standard COA).

Interim Reclamation. The objectives of interim reclamation, which reestablishes vegetation, ecological function and other natural resource values during the productive life of a well pad, are to restore vegetative cover and a portion of the landform sufficient to maintain healthy, biologically active topsoil, to control erosion and sediment transport, and to minimize loss of habitat, forage, and visual resources throughout the Project life (BLM, 2013). Fram would comply with the following BLM GJFO Standard COAs:

Deadlines and Objectives

- Interim reclamation would restore landforms; reestablish/maintain biologically active topsoil, including vegetative cover; control erosion and sediment transport; and minimize losses of habitat, visual resources, and forage throughout the life of the well.

- Within 6 months following completion of the last well planned on a pad, or after a year has passed with no new wells drilled, IR would be completed to reduce the well pad to the smallest size needed for production. IR would include earthwork, seeding and BMPs.

- Interim reclamation would restore landforms; reestablish/maintain biologically active topsoil, including vegetative cover; control erosion and sediment transport; and minimize losses of habitat, visual resources, and forage throughout the life of the well.

- Prior to interim reclamation, Fram would meet with the BLM to inspect the disturbed area, to review the existing reclamation plan and agree upon any revisions to the plan.

- Seed tags would be submitted for BLM approval at least 14 days before proposed seeding date.

- BLM would be notified at least 48 hours prior to beginning any reclamation work.

- Weed-free certification, seed tags, and a Subsequent Report Sundry Notice describing the reclamation would be submitted to the Grand Junction Field Office within 30 days of seeding.

    - Interim reclamation performance standards would be considered met when disturbed areas not needed for long-term production operations or vehicle travel have been
    - recontoured and stabilized, and
    - revegetated with a self-sustaining, vigorous, diverse, native (or otherwise approved) plant community that anchors soils, minimizes visual impacts, and provides forage.

- At a minimum, the established plant community would consist of species included in the seed mix and/or desirable species which occur in the surrounding natural vegetation. Permanent vegetative cover would be determined successful when the basal cover of desirable perennial species is at least 80 percent of the basal cover of the adjacent undisturbed area or of potential basal cover as defined in the National Resource Conservation Service Ecological Site(s) for the area.

- Operators and right-of-way holders are required to meet reclamation performance standards. Successful compliance with standards is determined by the BLM. If revegetation is unsuccessful, subsequent treatments and reseedings would be required until standards are met.

Recontouring and Seedbed Preparation

- Leaving in place only the areas needed for production, the fill slope soils would be pulled up and returned to cut areas, pushing up and over the edges of the cut. Compacted areas to be reclaimed would be ripped in two passes at opposite directions before being reshaped.

- Following recontouring, evenly redistribute salvaged topsoil. Soil amendments may be permitted or required. Seedbed preparation would consist of scarifying (roughening) spread topsoil prior to seeding, unless seeding takes place immediately or is drilled. Seedbed preparation techniques may include pocking, ripping, disking or other soil roughening techniques. If contour cultivating is approved, it would be 4-6 inches deep or to the depth of redistributed topsoil. If pocking, pit the surface with small depressions to form micro-basins, in a "fish scale" pattern. Construct them along the contour, across (not parallel with) the natural flow of water and/or prevailing wind.

Seed Mixes

- All disturbed areas would be seeded with a seed mixture approved by the BLM, consistent with BLM standards in terms of species and seeding rate for the specific habitat type within the Project Area.

    - Seed would contain no noxious, prohibited or restricted weed seeds and contain no more than 0.5 percent by weight of other weed seeds.
    - Only viability-tested, certified seed for the current year, with a minimum germination rate of 80% and a minimum purity of 90% would be used.
    - Seed that does not meet the above criteria would not be applied to public lands.

Seeding Procedures

- Seeding would be conducted no more than 24 hours following final seedbed preparation. If interim revegetation is unsuccessful, Fram would implement subsequent reseedings until interim reclamation standards are met.

- Where possible, drill seed ½ inch deep, following the contour of the site. Follow drill seeding with culti-paction or crimped weed-free straw mulch, to enhance seed-to-soil contact and prevent loss of seeds and soil. In areas that cannot be drilled, broadcast seed at 2.0 times the application rate, within 24 hours of soil work. If seeding takes place later than within 24 hours of dirt work, cover seed ½ to 1 inch deep with a harrow or drag bar, unless pocking. When pocking is used as seedbed preparation, seed must be broadcast within 24 hours of soil prep.

Erosion Control

- Cut-and-fill slopes would be protected against erosion with the use of pocking/ pitting, lateral furrows, hydromulch or other measures approved by the BLM. Near drainages or in areas with high erosion potential, additional revegetation, BMPs or methods may be required, to reduce soil erosion and sediment transport.

Fencing and Site Protection

- The pad would be fenced to BLM standards to exclude grazing livestock for the first two growing seasons or until seeded species are firmly established, whichever comes later. The BLM would approve the type of fencing.

- In deer and elk habitat, fences for livestock exclusion would not exceed 40 inches. The four-strand fence would have smooth top and bottom wires. Distance from the ground to the bottom smooth wire would be no less than 16 inches. Distance from the top wire to the second wire would be no less than 12 inches. Middle wires would be barbed, with 6 inch spacing.

Monitoring

- Fram would regularly monitor, for reclamation success and for invasive species, all sites categorized as "operator reclamation in progress" and would submit an annual monitoring report of these sites to the BLM by December 1 of each year. The annual report would document whether attainment of reclamation objectives appears likely. If objectives appear unlikely to be achieved, the report would identify appropriate corrective actions. Upon review and approval of the report by the BLM, Fram would be responsible for implementing approved or specified measures.

Final Reclamation. The long-term objective of final reclamation is to return the land, following authorized use, to a condition approximating that which existed prior to disturbance. This includes restoration of the landform and natural vegetative community, hydrologic systems, visual resources, and wildlife habitats.

A well pad that no longer has a producing well would undergo final reclamation within no more than 1 year following plugging and abandonment of the final well on that pad. Buried pipelines would be reclaimed to final reclamation standards at the time of installation.

Prior to final reclamation of the well pad, Fram would meet with the BLM to inspect the disturbed area, review the existing reclamation plan and agree to any changes to the plan.

Fram would notify the BLM at least 48 hours prior to commencing any reclamation work and within 48 hours of completion of reclamation work.

Prior to recontouring and reseeding the well pad, Fram would complete the following:

- All equipment, facilities and trash would be removed from the location.
- Each borehole would be plugged, capped and its related surface equipment removed.
- Subsurface pipelines would be purged and plugged at specific intervals.
- Dry hole markers would be subsurface, to prevent their use as perching sites by raptors.

Recontouring for final reclamation would consist of returning the pad, material storage piles, cut-and-fill slopes and storm water control features to natural contours that blend with adjacent undisturbed areas, as specified in the final reclamation plan or final reclamation plat approved by the BLM.

Requirements for seedbed preparation, soil amendments, seed, seeding procedures, mulching, erosion control, fencing, security and monitoring would be as specified for interim reclamation.

2.2.2.9 On-Site Inspections

On-site inspections were held on December 11 and 12, 2012 for the following proposed well pads: Federal 12-97-30-1, Federal 12-98-24-2, Federal 12-97-7-1, Federal 2-2-2-1, Federal 13-97-8-2, Federal 1-2-15-1, Federal 1-2-22-1, Federal 1-2-16-1, Federal 1-2-26-2 and Federal 1-2-25-2. Proposed well pads Federal 13-98-12-2 and Federal 1-2-33-1 and associated access roads were not inspected, but would be at the time a site-specific APD was submitted. Minor adjustments were made to proposed well pad locations based on the on-site inspections. On-site inspection notes are included as Appendix G and include protective/mitigation measures as they apply to individual well pads.

2.2.2.10 Site-Specific Resource Surveys

Biological Surveys. Where survey permission was granted, WestWater Engineering conducted surveys from 2010 through 2014 for the following biological resources within the Project Area: 1) federally-listed and BLM-sensitive botanical species and/or habitat; 2) nesting raptors; 3) incidental observations of BLM-sensitive animal species; 4) Birds of Conservation Concern (BCC) habitat and incidental observations, nest sites, and habitat; 5) noxious and invasive weed species and 6) potential USACE Waters of the U.S (WoUS) including wetland areas. BLM-sensitive and federally-listed botanical species were generally surveyed during their flowering periods. Surveys took place within 100-meters each side of proposed linear features (roads, pipelines) and within 200-meters of proposed well pads. Raptor surveys were conducted within 0.25 mile and 0.5 mile of Project features within woodland and cliff habitat, respectively, during the nesting season. Noxious weeds were surveyed within 100 feet of Project features. Potential USACE jurisdictional areas were recorded when encountered along the proposed alignments and within the proposed well pads. During all survey efforts, BLM-sensitive wildlife species and/or sign were documented. Surveys were conducted in accordance with current BLM GJFO protocols, with the exception of the proposed northern access route, which was surveyed out of season. Survey efforts along that route were modified following consultation with BLM resource staff.

Separate surveys were conducted along the B Road Alternative in 2013 and 2014 (WestWater Engineering, 2013 and 2014).

Cultural Resource Surveys. Alpine Archaeological Consultants, Inc. (Alpine) conducted a file search and a Class III cultural resource inventory of lands within the Project Area (Landt et al., 2013; Landt and Omvig, 2013). Alpine assessed 40-acre parcels around Fram's proposed 4.4-acre well pads and 100 feet either side of the centerline of proposed access roads as the Project's Area of Potential Effect (APE). The cultural resource inventory was completed in multiple phases; areas south of Kannah Creek were inventoried in 2010 and lands north of Kannah Creek were inventoried in 2011 and 2013.

Separate cultural surveys of 118 acres along the B Road Alternative were conducted in 2013 (Lindland and Landt, 2014; Mueller, 2014).

2.2.2.11 Project Design Features

Fram's Whitewater Unit MDP proposed multiple proactive Project Design Features to protect sensitive resources. They include, but are not limited to:

<u>General</u>

- Multi-well pads (up to nine wells per pad) will reduce overall surface disturbance.
- Multi-well pads will share production equipment, to reduce overall surface disturbance and air emissions.

- SWMPs, BMPs, and and SPCC Plan will be implemented.

Air Quality

- Fugitive dust from traffic, equipment operations, and wind events will be abated by watering and by controlling speed limits. Surfactants, binding agents, or other dust suppression chemicals will not be used on roadways within public lands without BLM approval. Where there is no posted speed limit, speeds on unpaved access roads and disturbed areas will not exceed 20 miles per hour.
- Tier 2 drill rig engines will be used to minimize impacts to air quality.

Soils

- Storm water BMPs are included in the SWMP and will be implemented, monitored and maintained to minimize erosion and sediment transport. Measures may include geotextiles, weed-free straw crimping/bales/wattles/matting run-on/run-off controls, swales, ditches or berms, sediment catchments and anchored erosion barriers. BMPS will also include soil texturing and seeding or additional measures approved by the BLM.

Hydrology and Water Quality

- Monitoring will occur at all well pad locations according to Rule 609, Statewide Groundwater Baseline Sampling and Monitoring (COGCC, 2013a). Up to four initial baseline samples and subsequent monitoring samples will be collected from water sources within a one-half mile radius of a proposed well pad. Initial sampling will be conducted within 12 months prior to setting conductor pipe in the first well on a pad.
- Diversion ditches will be designed and constructed to capture and divert sheet flows away from disturbed areas and incorporate rip-rap, sediment catchments and anchored check structures to slow water velocity, preventing erosion and sediment transport.
- Ditches will be allowed to vegetate and/or would include large rocks or stones to slow the drainage velocity and allow sediment to settle out. Ditches may be seeded where soils are erodible.
- Vegetative strips to filter sediment will be placed on the uphill side of disturbed areas to prevent storm water run on.
- For disturbed areas along proposed road reaches that lie within 100 feet of stream channels, erosion protection and silt retention techniques such as silt catchment dams, culverts or drainage dips, armored stream crossings and approaches, placement of straw bales and/or matting will be used.
- In areas within 100 feet of an intermittent drainage, an adequate vegetative buffer, artificial buffer, (e.g., straw bales, matting, etc.), or filter strip will be maintained between the road and the drainage, to minimize sediment transport into the drainage.
- Construction at perennial, intermittent and ephemeral drainage crossings (e.g. burying pipelines, installing culverts) will consist of a dry open-cut crossing timed to avoid high flow conditions.
- Requirements associated with the USACE Nationwide Permit 12 (USACE, 2012b) for stream crossings by utility lines and associated access roads will be followed. The USACE will be notified of the intention to construct the Project under Nationwide Permit 12 and abide by any additional Project-specific conditions imposed by the USACE.

- On perennial and intermittent streams, culverts will be designed to allow for passage of aquatic biota. The minimum culvert diameter in any installation for a drainage crossing or road drainage will be 24 inches according to the Gold Book standards.
- To minimize erosion and sediment transport, access road water dips will be spaced using the Gold Book standards (pp. 32-33, Figures 5 and 6). Additional water dips, water turn-outs or culverts may be required based on road conditions. Water outlets will incorporate erosion control structures, such as rip-rap and anchored straw bales, to slow water velocity and prevent erosion. All drainage ditches and culverts will be kept clear and free flowing, and will be maintained in good condition.
- All installed production facilities (storage tanks, load outs, separators, treating units, etc.) with the potential to leak or spill oil, condensate, produced water, glycol, or other fluid which may be a hazard to public health or safety will be placed within an appropriate impervious secondary containment structure that will hold 110 percent of the capacity of the largest single container within it for 72 hours. Chemical containers will be clearly labeled, maintained in good condition and placed within secondary containment. They will not be stored on bare ground, nor exposed to sun and moisture.
- Any release of toxic substances (leaks, spills, etc.) in excess of the reportable quantity established by 40 CFR, Part 117 will be reported as required by the Comprehensive Environmental Response, Compensation and Liability Act of 1980, Section 102b. A copy of any report required or requested by any federal agency or state government as a result of a reportable release or spill of any toxic substances will be furnished to the BLM AO concurrent with the filing of the reports to the involved federal agency or state government.
- At the time of final reclamation, well locations and access roads will be restored to approximately their original contours. During reclamation of these sites, fill material would be pushed into cuts and over the backslope. No depressions will be left that would trap water or form ponds, except those designed to support reclamation objectives, such as pocking. Upon completion of backfilling, leveling and recontouring, the salvaged topsoil will be evenly spread over the reclaimed area(s).
- To protect groundwater, drilling operations will be conducted in compliance with all Federal Onshore Oil and Gas Orders (BLM, 2005), as well as all other applicable rules and regulations by the BLM GJFO and the COGCC (2012).
- Closed loop drilling systems will be used; no pits will be used.
- Surface casing will be run to a minimum depth of 100 feet below freshwater aquifers within one mile radius of the well. The surface hole will be cased with steel and cemented in place entirely from ground level to the depth determined in the APD.
- Prior to drilling below the surface casing, a BOP will be installed on the surface casing and both the BOP and the surface casing will be tested for pressure integrity. The BOP and related equipment will meet the minimum requirements of Federal Onshore Oil and Gas Order No. 2 and the BLM would be notified in advance of all pressure tests.
- The proposed casing and cementing program will be designed to protect and/or isolate all usable water zones, potentially productive zones, lost circulation zones, abnormally pressured zones and any prospectively valuable deposits of minerals. BLM approval is required prior to the use of any isolating medium other than cement.
- Produced water will be stored in sealed tanks with secondary containment structures to prevent off-site migration of produced water and protect shallow groundwater from

accidental releases. Any accidental releases of hydrocarbons or other hazardous materials will be cleaned up immediately along with any contaminated soils and disposed at an authorized landfill.

- To protect groundwater, wells will be cased to specifically prevent hydrocarbon migration from gas producing strata penetrated by the wellbore during drilling, initial production and following well completion. Identification of potential fresh-water bearing zones, aquifers, gas producing zones and under- and over-pressured formations will be incorporated into drilling plans for the proposed wells. Estimates of the depth of these zones will be used to determine surface casing depths and production planning. In the Project Area, the proposed casing and cementing program will be designed to protect and isolate all usable water zones, potentially productive zones, lost circulation zones and abnormally high-pressure zones.
- Specific casing depths will vary depending on well location and drilling conditions, to protect and isolate usable water zones. The boreholes/wells below the surface casing will be cemented to total depth to provide further protection of any groundwater zones that could be of practical beneficial use. Cement will be circulated to the surface to assure an adequate seal between the pipe and the rock formations. If a water bearing, gas productive, lost circulation or pressured zone was encountered, cement volumes will be adjusted to isolate that zone or zones. Such configuration is designed to prevent accidental contamination or leakage of hydrocarbons from reaching usable groundwater.
- Certain measures in the City of Grand Junction Watershed Protection Plan will be implemented to minimize potential impacts to proposed well pads 12-97-7-1 and 12-97-30-1.
- Fram will drill a water quality monitoring well for the City of Grand Junction, to the depth of Juniata Reservoir, near proposed Well Pad 12-97-30-1.

Invasive, Non-native Species

- Noxious weeds or other undesirable plant species will be regularly monitored and controlled as set forth in the joint BLM/Forest Service Noxious and Invasive Weed Management Plan for oil and Gas Operators (BLM, 2007a), to reduce or eliminate noxious weeds identified on BLM-administered lands within the Project Area and prevent the spread of weeds, including:
- The Project Area will be inventoried prior to ground-disturbing activities. If Class A or Class B noxious weeds are documented within 100 feet of proposed disturbance, they will be treated or removed prior to ground-disturbing activities (Class B and Class C weeds were documented within 100 feet of the proposed Project on BLM-administered lands; see WestWater Engineering, 2010, 2011, 2012a and 2012b).
- Before any mobilization of equipment onto public lands, in order to prevent the spread of invasive species, Fram will ensure that all construction equipment and vehicles are clean and free of soil, mud, vegetative or any material that could transport weed seeds. All maintenance vehicles would be regularly cleaned of soil. Vehicles will avoid driving through or parking on weeds.
- BMPs, straw mulch, seeds and all materials used on BLM lands will be certified weed-free.
- Treatment strategies for weedy species documented would consider effective methods and timing for preventing seed production of that species and could include hand or

machine pulling, cutting roots just below soil level, treatment with herbicides, or mowing, as directed by the BLM.

- Disturbance will be revegetated as soon as possible after construction/disturbance. Pipelines will be reclaimed at the time they are completed, well pad disturbances will require immediate temporary seeding, and road disturbance will be revegetated at the conclusion of construction. Such rapid revegetation/reclamation would minimize the potential for the disturbed areas to be infested with invasive and noxious weeds.
- Surface disturbances will be reseeded at the appropriate time and with palatable, native species desirable to wildlife, including shrubs and forbs. An annual report to the BLM GJFO identifying the extent of noxious weed infestations and treatment used to eradicate or minimize undesirable species will be provided to the BLM by December 1, annually. Prior to the use of herbicides, a Pesticide Use Proposal (PUP) will be approved by the BLM.

Vegetation

- Brush-hogging techniques would be used for clearing in big sagebrush shrublands, where appropriate, to leave root structures intact, to preserve seed stock and promote faster sagebrush revegetation.
- Fugitive dust would be controlled on the access roads and disturbed surfaces, to minimize effects to adjacent vegetation. Speed limits will be enforced from the beginning of construction throughout the life of the Project, and where speed limits are not posted on unpaved access roads, speeds will not exceed 20 miles per hour.

Special Status Species Animals

- See Biological Resources Protection Plan (Appendix E) for details.

Special Status Species Plants

- See Biological Resources Protection Plan (Appendix E) for details.

Migratory Birds

- Nests documented within 0.5 mile of proposed Project components during 2013 surveys will be revisited to determine status prior to construction. If a nest is determined to be occupied, Fram would adhere to the spatial and temporal buffers for each species as identified in Table 3.3-16 and the Biological Resources Protection Plan.
- Vegetation clearing will not occur between May 15 and July 15.

Wildlife

- See Biological Resources Protection Plan (Appendix E). Exhibit 1 to the Biological Resources Protection Plan is the Wildlife Mitigation Plan which includes additional measures for protection of wildlife as agreed to by Fram and CPW.
- Bear-resistant containers will be used. Refuse will be collected frequently to minimize potential for conflicts with bears.

Transportation

- Fram has prepared and would follow measures included in a Transportation Plan (Appendix D) to minimize impacts to transportation and access.

- If wells prove productive, gathering pipelines will be installed for oil and produced water, reducing heavy truck traffic.
- Existing roads will be used as much as possible, with gathering pipelines installed alongside existing and new roads, to minimize disturbance.
- Fram will use a northern access route during the winter (December 1 through April 30) to protect sensitive wildlife and habitats.
- Workers will carpool to drilling locations.
- Remote telemetry will be used to report well conditions, rather than sending an employee, wherever possible.
- Speed limits will be enforced from the beginning of construction throughout the life of the Project and where speed limits are not posted on unpaved access roads, speeds would not exceed 20 mph.
- Fram employees, contractors, and independent fuel haulers will comply with all requirements and regulations concerning the transport of hazardous materials as set forth by the U.S. Department of Transportation (USDOT) Federal Motor Carrier Safety Administration, Colorado Department of Public Health and Environment, and other appropriate regulatory authorities.

2.2.2.12 Monitoring

Reclamation. To determine progress and/or success of reclamation, Fram would conduct annual monitoring surveys of all sites categorized as "operator reclamation in progress". An annual report would be submitted each year by December 1 until reclamation is considered successful by the BLM. The annual report would document whether attainment of reclamation objectives appeared likely. If achievement of one or more objectives appeared unlikely, the report would identify and propose corrective actions, such as reseeding an area. Upon review and approval of the report by the BLM, Fram would be responsible for implementing the corrective actions or other measures specified (GJFO Standard COA).

Weeds. As set forth in the *Noxious and Invasive Weed Management Plan for Oil and Gas Operators* (BLM, 2007a), Fram would regularly monitor and promptly control noxious weeds and other undesirable plant species. Prior to ground-disturbing activities, during construction and post-construction, Fram would map weed infestations, promptly control noxious weeds or other undesirable plants using methods approved by the BLM and regularly monitor known/treated infestation and retreat, if necessary. Fram would provide an annual report to BLM GJFO that identified the extent of noxious weed infestations and treatments used to eradicate or minimize undesirable species. Reports would be provided by December of 1 each year until the BLM determined that the desired level of control had been achieved. Prior to the use of herbicides, a PUP would be approved by the BLM.

Special Status Plants. A biological monitor would be on-site during all ground-disturbing activities within 100 meters of Colorado hookless cactus, including installation of BMPs and reclamation activities to ensure unauthorized disturbance of special status plants would be avoided.

Groundwater Quality. Fram would conduct monitoring at all well pad locations according to Rule 609, Statewide Groundwater Baseline Sampling and Monitoring (COGCC, 2013a). Up to four initial baseline samples and subsequent monitoring samples will be collected from water sources within a one-half mile radius of a proposed well pad. Initial sampling will be conducted within 12 months prior to setting conductor pipe in the first well on a pad.

As requested by the City of Grand Junction, Fram proposes to drill a monitoring well below the proposed location for Well Pad 12-97-30-1 on BLM-administered lands. The well would be completed to the depth of Juniata Reservoir. Fram would be responsible for permitting and authorization to construct the monitoring well through the State of Colorado. The City of Grand Junction would conduct all well monitoring.

2.2.3 Single Access Alternative

Under the Proposed Action, Fram proposed an additional access route (northern access route) to minimize traffic within sensitive big game winter habitats from December 1 through April 30. The northern access route was added to the Proposed Action in response to public scoping comments by CPW, which asked for minimized traffic and activity within sensitive big game winter habitats at certain times of year.

The northern access route is not included in the Single Access Alternative. Most elements described under the Proposed Action, above, would still occur under the Single Access Alternative with the exception of access, traffic and schedule as discussed below.

Fram would conduct all construction activities between May 1 and November 30 with the exception of well pad Federal 13-98-12-2, which is located outside sensitive big game winter habitats. This well pad does not have a lease stipulation to protect wintering big game, but the proposed access route to the well pad (see Map 2.2-1) crosses sensitive big game winter habitats. Absent a lease stipulation, the BLM would impose a 60 day timing limitation for this well pad (January 1 to March 1). Therefore, the only construction that would be allowed outside the seven-month period from May 1 to November 30 would be construction, drilling and completion of well pad Federal 13-98-12-2 from December 1 to December 31 and/or from March 1 to April 30. All other proposed well pads are either located within sensitive big game winter habitats or have access through sensitive big game winter habitats. Because most construction and drilling would not be allowed during the winter months, Fram would be able to drill about 15 wells per year, rather than 25 wells per year under the Proposed Action. This could extend the construction and drilling period to 7 years rather than 4 years.

Construction traffic levels would be the same as those for the Proposed Action but would occur only from May 1 to November 30 (and possibly select periods for well pad Federal 13-98-12-2). Once well pads were constructed and wells in production, operational traffic (pumper and maintenance) would be allowed to travel within sensitive big game winter habitats to visit each well pad. Produced oil and water would flow year-round in gathering pipelines to the Reeder Mesa and Sink Creek facilities. Peak traffic levels (see Table 2.2-5) would be lower than under the Proposed Action because oil and water production would increase at a slower rate on a 7 year rather than 4 year schedule.

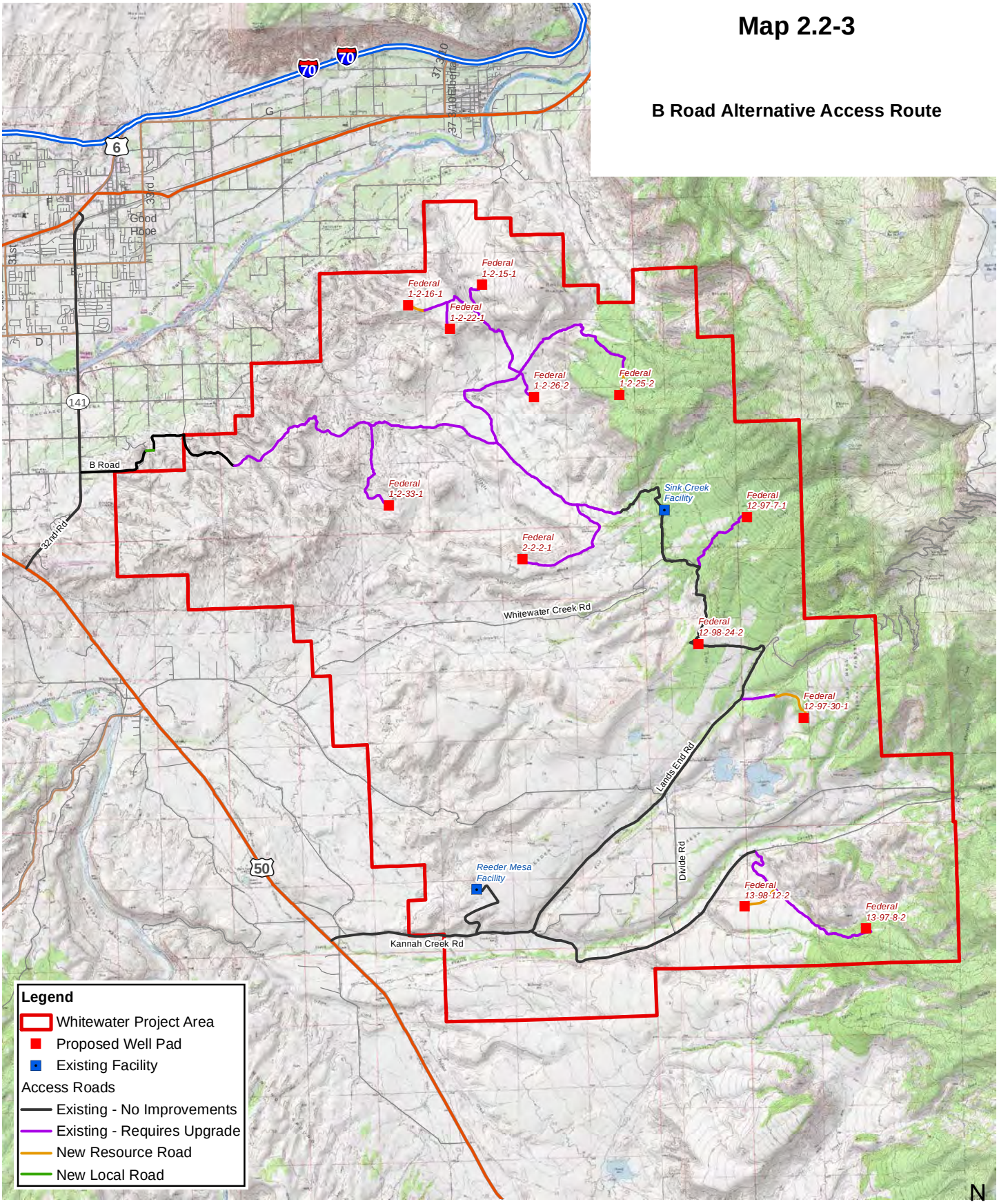
Under this alternative, peak traffic levels would vary between 33 and 42 vehicles for 8 years between May 1 and November 30 and drop to 15 vehicles in Year 9. This peak traffic level would continue for 3 more years than it would under the Proposed Action, though it would be limited to 7 months of the year rather than 12 months of the year.

2.2.4 B Road Alternative

In response to public comment on the preliminary EA, BLM has identified the B Road Alternative. This alternative differs from the Proposed Action in that it would use Mesa County B Road, rather than Mesa County C Road, to access northern portions of the Project Area during the winter (December 1 to April 30) in order to avoid crossing sensitive (elk and mule deer) winter habitats (see Map 2.2-3). Other components of the Proposed Action, such as proposed disturbance, workforce, traffic, construction schedule, and production levels would be the same as those for the Proposed Action.

Map 2.2-3

B Road Alternative Access Route



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Under this alternative, traffic from I-70 and Grand Junction would continue south on 32 Road for 1 mile beyond C Road and turn left (east) onto B Road for winter access to well pads in the northern portion of the Project Area. This route would follow B Road, which is paved, for 0.76 mile and turn left (north) onto Valley View Drive, which is unpaved. The route would follow Valley View Drive in a generally northeastern direction for 0.35 mile and continue for 0.11 mile on a new road segment that would be constructed to link the route with an existing unpaved road. The route would turn left onto this road and proceed north for 0.22 mile, at which point the route would turn right onto an existing unpaved road that is east of and separated from B-½ Road by an irrigation ditch. The access route would follow this road 0.44 mile east to enter the Project Area and continue for 3.62 miles in a generally eastern direction to join the access road leading to well pad Federal 1-2-33-1, as described in the Transportation Plan. Beyond this point, the B Road Alternative would access well pads Federal 1-2-33-1, Federal 2-2-2-1, Federal 1-2-26-2, Federal 1-2-22-1, 1-2-16-1, and Federal 1-2-15-1 as described in Section 1.2.3 of the Transportation Plan.

Map 2.2-3 shows the new and existing roads that would be used for Project access under the B Road Alternative. Map 2.2-4 highlights the road segments that comprise the B Road access route and replace the C Road northern access route. Seasonal access routes by well pad during construction/drilling and operation/production would be the same as the northern and southern routes discussed under the Proposed Action (Section 2.2.2.7) and shown in Table 2.2-6, with B Road replacing C Road as the northern access route.

The B Road Alternative would require 0.11 mile of new construction on private lands and 2.63 miles of upgraded road on federal lands (see Map 2.2-4). A total of 7.91 additional acres would be disturbed under this alternative. Cultural and biological surveys have been conducted for the B Road Alternative.

2.2.5 No Action Alternative

In accordance with the NEPA and CEQ regulations, which require that a No Action Alternative be presented in all environmental analyses in order to serve as a "base line" or "benchmark" from which to compare all proposed "action" alternatives, a No Action Alternative is analyzed in this EA. Under the No Action Alternative, Fram would not construct well pads, drill and complete wells, or upgrade and construct new access roads as described in the Whitewater Unit MDP.

2.3 ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DETAIL

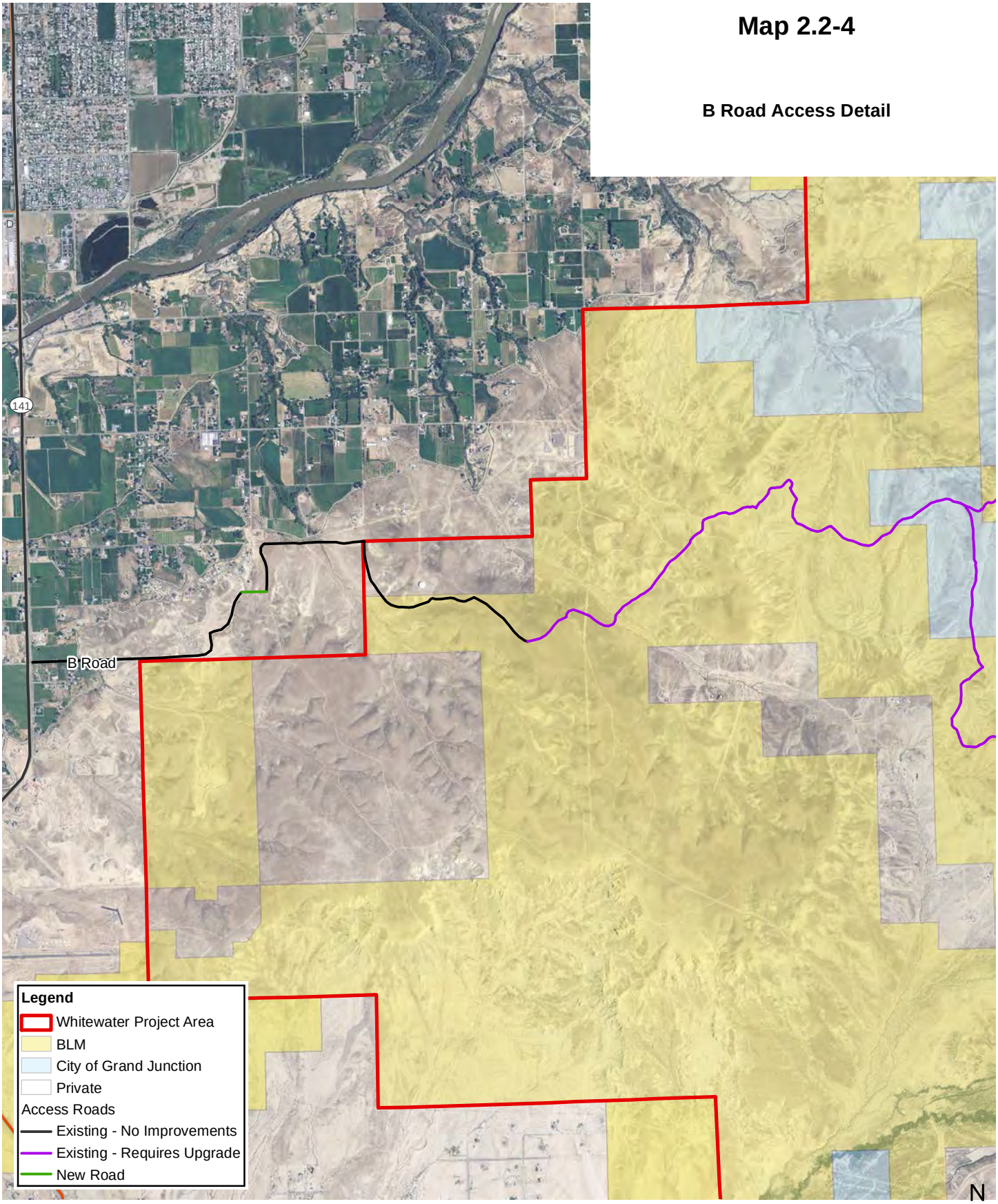
If an alternative is considered during the environmental analysis process, but the agency decides not to analyze it in detail, the agency must identify such alternatives and briefly explain why they were eliminated from detailed analysis (40 CFR § 1502.14). An action alternative may be eliminated from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

- it is ineffective (does not respond to the Purpose and Need for the Proposed Action);
- it is technically or economically infeasible (considering whether implementation of the alternative is likely, given past and current practice and technology);
- it is inconsistent with the basic policy objectives for the management of the area (e.g., not in conformance with the RMP);
- its implementation is remote or speculative;
- it is substantially similar in design to an alternative that is analyzed; and/or
- it would result in substantially similar impacts to an alternative that is analyzed.

In addition to the B Road Alternative, the BLM considered two other alternative routes to the northern access route (C Road) included in Fram's proposal (see Map 2.3-1). Both of the routes entered the Whitewater Unit from the north on local roads from Interstate-70. One route (Alternative Access Route 1) traveled through sensitive big game winter habitat and therefore, would not provide an alternate access in the winter, and the other route (Alternative Access Routes 2A and 2B) could not provide adequate access for Fram's proposal (tight turns and curves). For these reasons, these alternatives to the northern access route were not carried forward for analysis.

Map 2.2-4

B Road Access Detail



3,000 0 3,000 Feet

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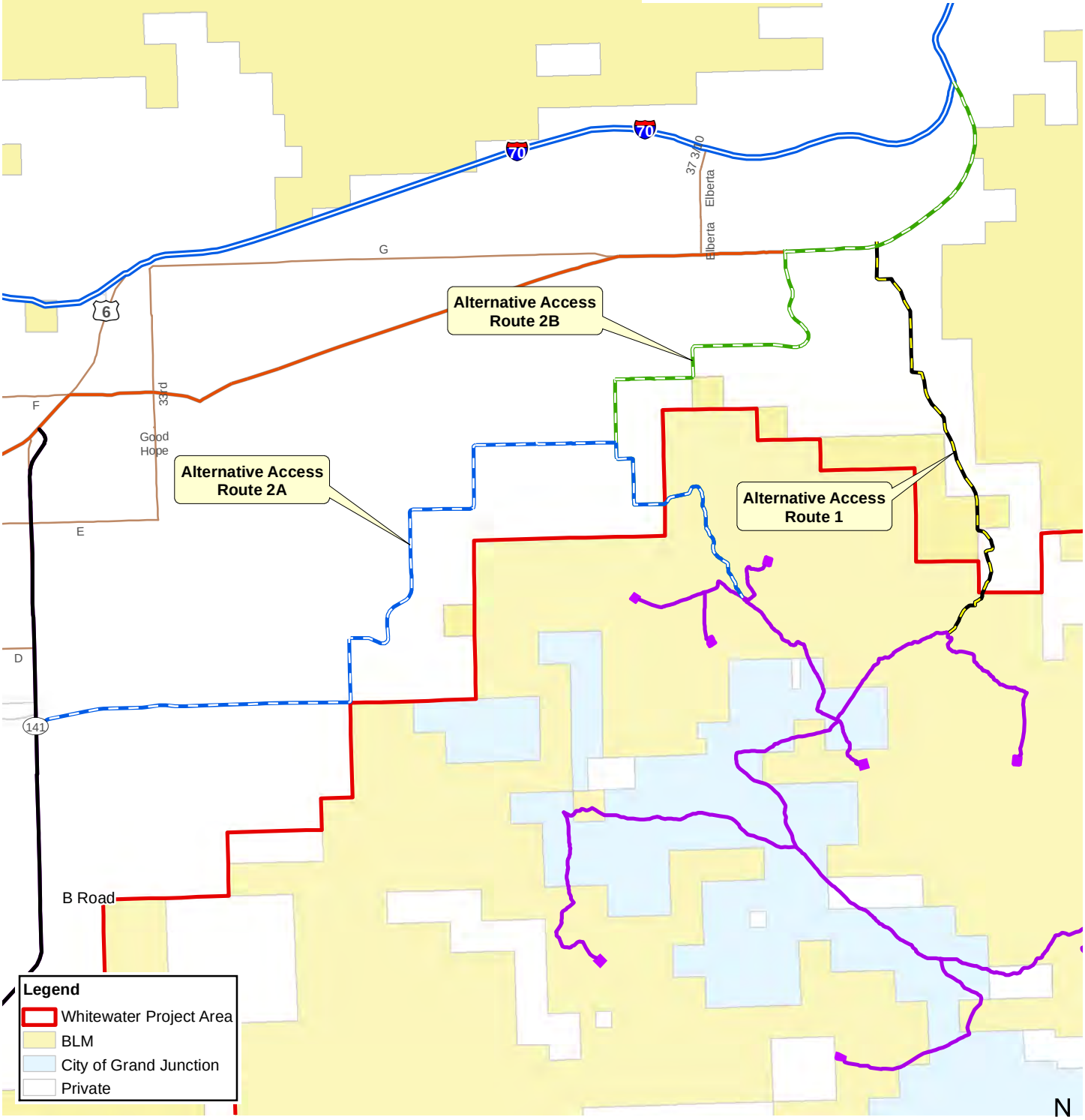
Map 2.3-1

Alternative Northern Access Routes Considered but not Carried Forward for Analysis



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CHAPTER 3 - AFFECTED ENVIRONMENT AND EFFECTS

3.1 INTRODUCTION

This section provides a description of the human and natural environmental resources that could be affected by the Proposed Action and presents comparative analyses of the direct and indirect effects on the affected environment stemming from the implementation of the actions under the Proposed Action and other alternatives analyzed. This EA draws upon information compiled in the Grand Junction Resource Area RMP (BLM, 1987). Table 3.1-1 provides a list of potentially impacted resources which are analyzed in this EA.

Table 3.1-1
Potentially Impacted Resources

Resources	Not Present on Location	No Impact	Potentially Impacted
PHYSICAL RESOURCES			
Air and Climate			X
Geological		X	
Mineral Resources			X
Soils			X
Water (surface & subsurface, floodplains)			X
Noise			X
BIOLOGICAL RESOURCES			
Invasive, Non-native Species			X
Sensitive Species			X
Threatened or Endangered Species Fish and Wildlife Species			X
Threatened or Endangered Species Plant Species			X
Vegetation, Forestry			X
Wetlands/Riparian Zones			X
Wildlife			X
HERITAGE RESOURCES AND HUMAN ENVIRONMENT			
Cultural or Historical			X
Paleontological			X
Tribal & American Indian Religious Concerns			X
Visual Resources			X
Socioeconomic			X
Environmental Justice			X
Transportation and Access			X
Wastes, Hazardous or Solid			X
LAND RESOURCES			
Prime or Unique Farmlands	X		
Recreation			X
Special Designations (ACEC, SMAs, NCAs, etc.)			X
Wild and Scenic Rivers	X		
Wilderness	X		
Range Management			X
Wild Horse and Burros	X		
Land Tenure, ROW, Other Uses			X

The following elements, identified as not present or not affected, will not be brought forward for additional analysis:

- Geological Resources – No known unique geologic resources occur in the Project Area.
- Prime or Unique Farmlands – No prime or unique farmlands occur in the Project Area.
- Wild and Scenic Rivers – No wild and scenic rivers occur in or near the Project Area.
- Wilderness Areas – No wilderness, wilderness study areas, or lands with wilderness characteristics occur within the Project Area. The closest wilderness area is the Dominguez Canyon Wilderness Area which is approximately 5.8 miles from proposed Project disturbance and separated by U.S. Highway 50.

3.2 PHYSICAL RESOURCES

3.2.1 Air Quality and Climate

3.2.1.1 Current Conditions

Regional air quality is influenced by a combination of factors including climate, meteorology, the magnitude and spatial distribution of local and regional air pollution sources, and the chemical properties of emitted pollutants. Within the lower atmosphere, regional and local scale air masses interact with regional topography to influence atmospheric dispersion and transport of pollutants. The following sections summarize the climatic conditions and existing air quality within the Project Area and surrounding region.

The Project Area is located in a semiarid (dry and cold), mid-continental climate regime. The area is typified by dry, sunny days, clear nights, and large daily temperature changes. The climate and topography of the region are very conducive to the formation of temperature inversions. The nearest long-term meteorological measurements were collected at Palisade, Colorado (1911-present), located approximately 2 miles north of the Project Area at an elevation of 4,800 feet above mean sea level - amsl (Western Regional Climate Center - WRCC 2013).

The annual average total precipitation at Palisade is 9.88 inches, with annual totals ranging from 19.37 inches (1983) to 4.68 inches (1956). Precipitation is fairly consistent throughout the year with average monthly precipitation ranging from 0.54 inches (January) to 1.21 inches (September). An average of 14.0 inches of snow falls during the year (annual high 36.7 inches in 1983), with the majority of the snow distributed evenly between November and March.

The region has cool temperatures, with average temperature (in degrees Fahrenheit - ˚F) ranging between 17.6˚F and 39.3˚F in January to between 63.5˚F and 94.0˚F in July. Extreme temperatures have ranged from -23˚F (1913) to 111˚F (1937). The frost free period generally occurs from early May to mid-October. Table 3.2-1 shows the mean monthly temperature ranges and total precipitation amounts.

Table 3.2-1
Mean Monthly Temperature Ranges and Total Precipitation Amounts

Month	Average Temperature Range (˚F)	Total Precipitation (inches)
January	17.6 – 39.3	0.54
February	24.7 – 46.7	0.57
March	32.3 – 56.6	0.84
April	40.1 – 66.7	1.03
May	48.6 – 77.0	0.93
June	57.1 – 88.1	0.59
July	63.5 – 94.0	0.69
August	61.4 – 90.9	0.98
September	52.8 – 82.6	1.21
October	41.4 – 69.4	1.17
November	29.9 – 53.3	0.76
December	20.9 – 41.6	0.57
ANNUAL	52.8 (mean)	9.88 (mean)
WRCC, 2013.		

Comprehensive wind measurements are collected at Grand Junction located approximately 10 miles northwest of the Project Area. To describe the wind flow pattern for the region, a wind rose for the site, for years 2006 through 2010, is presented in Figure 3.2-1. From this information, it is evident that winds originate from the east to southeast over 40 percent of the time.

The frequency and strength of winds greatly affect the transport and dispersion of air pollutants (see Tables 3.2-2 and 3.2-3). The annual mean wind speed is 7.6 miles per hour (mph), and that relatively high average wind speed indicates the presence of good dispersion and mixing of any potential pollutant emissions resulting from Project sources for most hours over the year. Poor dispersion conditions do occur during periods with temperature inversions, which are common to the area.

Table 3.2-2
Wind Speed Distribution, Grand Junction, Colorado, 2006 - 2010

Wind Speed (mph)	Frequency (%)
0 – 4.0	23.6
4.0 – 7.5	34.3
7.5 – 12.1	26.6
12.1 – 19.0	12.9
19.0 – 24.7	2.0
Greater than 24.7	0.6

Table 3.2-3
Wind Direction Frequency Distribution
Grand Junction, Colorado, 2006 - 2010

Wind Direction	Frequency (%)
N	5.1
NNE	2.7
NE	3.7
ENE	6.4
E	10.9
ESE	16.8
SE	11.1
SSE	6.0
S	3.1
SSW	2.4
SW	2.1
WSW	2.9
W	5.5
WNW	8.1
NW	8.2
NNW	5.1

Air Pollution Concentrations. The U.S. Environmental Protection Agency (EPA) and the States set limits on permissible concentrations of air pollutants. The National Ambient Air Quality Standards (NAAQS) and Colorado Ambient Air Quality Standards (CAAQS) are health-based criteria for the maximum acceptable concentrations of air pollutants at all locations to which the public has access.

Monitoring of air pollutant concentrations has been conducted in the region. These monitoring sites are part of several monitoring networks overseen by state and federal agencies, including: CDPHE, Clean Air Status and Trends Network (CASTNET), Interagency Monitoring of Protected Visual Environments (IMPROVE), and National Acid Deposition Program (NADP) National Trends Network (NTN).

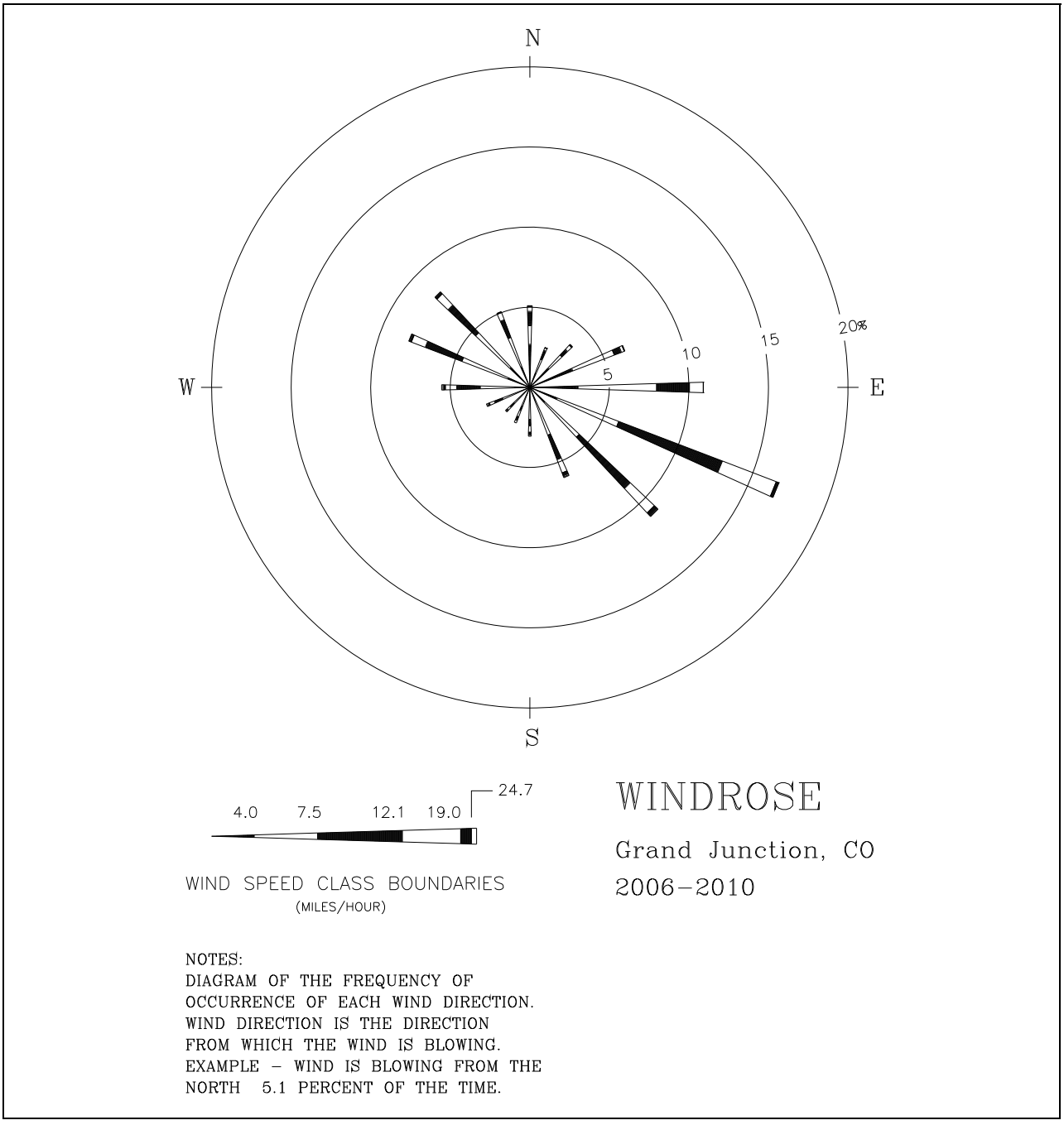


Figure 3.2-1
Grand Junction, Colorado Meteorological Data Wind Rose, 2006-2010

Air pollutants monitored in the region include carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), particulate matter less than 10 microns in effective diameter (PM_{10}), particulate matter less than 2.5 microns in effective diameter ($PM_{2.5}$), and sulfur dioxide (SO_2). Background concentrations of these pollutants define ambient air concentrations in the region and establish existing compliance with ambient air quality standards. The most representative monitored regional background concentrations available for criteria pollutants as identified by CDPHE are shown in Table 3.2-4.

Table 3.2-4
Background Ambient Air Quality Concentrations

Pollutant	Averaging Period	Measured Background Concentration $\mu g/m^3$
CO[1]	1-hour	1,145
	8-hour	1,145
NO_2[2]	1-hour	92.1
	Annual	9.4
PM_{10}[3]	24-hour	30
	Annual	10
$PM_{2.5}$[4]	24-hour	12
	Annual	5
Ozone[5]	8-hour	145
SO_2[6]	1-hour	31.4
	3-hour	23.5
	24-hour	13.1
	Annual	5.2

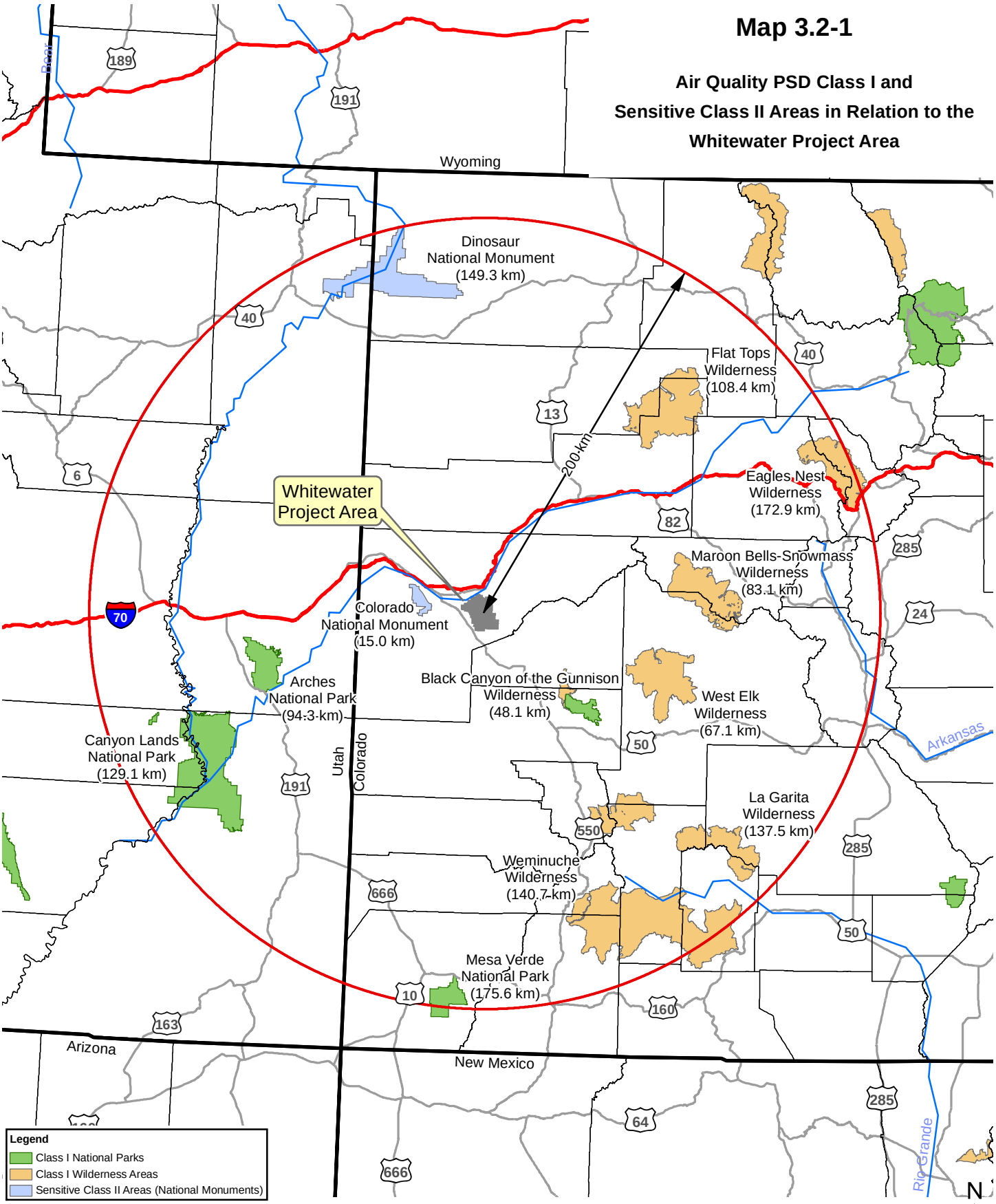
[1] American Soda, Parachute 2007-2009, CDPHE.
[2] Southern Ute, 1 mile NE of Ignacio, 2006-2008, CDPHE.
[3] Energy Fuels, 2008-2009, CDPHE.
[4] Based on S. Ute, 7571 Hwy 5505, 2009-2010, CDPHE.
[5] Based on CASTNET in Mesa Verde, Canyonlands, and Gothic.
[6] 1-hour concentration data from Holcim Portland, 2007-2009, other averaging period from Unocal 1983-84 (CDPHE, 2011a).

Air Quality Related Values. Air quality related values (AQRVs) such as visibility, atmospheric deposition, and the change in water chemistry associated with atmospheric deposition at acid sensitive lakes have been identified as a concern at several federal Class I and sensitive Class II areas in the region.

The Project Area is within 200 kilometers (km) of ten Class I areas and two sensitive Class II areas as shown on Map 3.2-1. Class I areas within 200 km of the Project Area include the Flat Tops Wilderness (108 km), Eagles Nest Wilderness (173 km), Maroon Bells – Snowmass Wilderness (83 km), West Elk Wilderness (67 km), Black Canyon of the Gunnison Wilderness (48 km), La Garita Wilderness (138 km), Weminuche Wilderness (141 km), Mesa Verde National Park (176 km), Canyon Lands National Park (129 km), and Arches National Park (94 km). Federal Class II areas within 200 km of the Project Area that are considered sensitive areas are Dinosaur National Monument (149 km) and Colorado National Monument (15 km). Dinosaur National Monument is regulated as a Class I area for SO_2 by the CDPHE.

Map 3.2-1

Air Quality PSD Class I and Sensitive Class II Areas in Relation to the Whitewater Project Area



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Visibility conditions can be measured as standard visual range (SVR). SVR is the farthest distance at which an observer can just see a black object viewed against the horizon sky; the larger the SVR, the cleaner the air. Visibility for the region is considered to be very good. Continuous visibility-related optical background data have been collected in the Class I areas Flat Tops Wilderness, Arches National Park and Weminuche Wilderness, as part of the IMPROVE program. The average SVR at each of the three sites is historically greater than 150 km and in the most recent reported years, average SVR has increased to greater than 200 km (Visibility Information Exchange Web System – VIEWS, 2012).

Atmospheric deposition refers to the processes by which air pollutants are removed from the atmosphere and deposited on terrestrial and aquatic ecosystems, and it is reported as the mass of material deposited on an area per year in kilograms per hectare per year (kg/ha-yr). Air pollutants are deposited by wet deposition (precipitation) and dry deposition (gravitational settling of pollutants). The chemical components of wet deposition include sulfate (SO_4), nitrate (NO_3), and ammonium (NH_4); the chemical components of dry deposition include SO_4, SO_2, nitrogen oxides (NO_X), NO_3, NH_4, and nitric acid (HNO_3).

The NADP and the NTN station monitors wet atmospheric deposition and the CASTNET station monitors dry atmospheric deposition at the Gothic site, located east of the Project Area. The total annual deposition (wet and dry) reported as total nitrogen (N) and total sulfur (S) deposition for year 2010 are shown in Table 3.2-5.

Table 3.2-5
Background N and S Deposition Values (kg/ha-yr)[1]

Site Location	Nitrogen Deposition			Sulfur Deposition			Year of Monitoring
	Wet	Dry	Total	Wet	Dry	Total	
Gothic	1.77	0.23	2.00	0.89	0.09	0.98	2010

[1]EPA, 2013a.

Table 3.2-6 presents a list of four lakes in the Flat Tops Wilderness Area that have been identified as acid sensitive lakes. Analyses for potential changes to lake acidity from atmospheric deposition are based on the acid neutralizing capacity (ANC) for the lake. The most recent lake chemistry background ANC data available from the Forest Service are shown in Table 3.2-6. The ANC values shown are the 10th percentile lowest ANC values which were calculated for each lake following procedures provided from the Forest Service. The years of monitoring data that were currently available, and the number of samples used in the calculation of the 10th percentile lowest ANC values, are provided.

Of the four lakes listed in Table 3.2-6, one lake (Upper Ned Wilson) is considered by the Forest Service as extremely sensitive to atmospheric deposition because the background ANC values are less than 25 microequivalents per liter (µeq/l).

Table 3.2-6
Background ANC Values for Acid Sensitive Lakes[1]

Wilderness Area	Lake	Latitude (Deg-Min-Sec)	Longitude (Deg-Min-Sec)	10th Percentile Lowest ANC Value (µeq/l)[2]	Number of Samples	Monitoring Period
Flat Tops WA	Ned Wilson Lake	39°57'41"	107°19'25"	39.4	195	1981-2007
Flat Tops WA	Upper Ned Wilson Lake	39°57'46"	107°19'25"	12.9	144	1983-2007
Flat Tops WA	Lower Packtrail Pothole	39°58'5"	107°19'24"	29.7	96	1987-2007
Flat Tops WA	Upper Packtrail Pothole	39°57'56"	107°19'23"	48.7	96	1987-2007

[1] Forest Service, 2010.
[2] 10th Percentile Lowest ANC Values reported.

Overview of Regulatory Environment. The CDPHE-Air Pollution Control Division (APCD) is the primary air quality regulatory agency responsible for determining potential impacts once detailed industrial development plans have been made, and those development plans are subject to applicable air quality laws, regulations, standards, control measures, and management practices. Therefore, the CDPHE-APCD has the ultimate responsibility for reviewing and permitting the Project prior to its operation. Unlike the conceptual 'reasonable, but conservative' engineering designs used in NEPA analyses, any CDPHE-APCD air quality preconstruction permitting demonstrations required would be based on very site-specific, detailed engineering values, which would be assessed in the permit application review. Any facility developed under the Proposed Action which meets the requirements set forth under Colorado regulations would be subject to CDPHE-APCD permitting and compliance processes.

Federal air quality regulations adopted and enforced by CDPHE-APCD limit incremental emission increases to specific levels defined by the classification of air quality in an area. The PSD program is designed to limit the incremental increase of specific air pollutant concentrations above a legally defined baseline level. Incremental increases in federal Class I areas are strictly limited, while increases allowed in Class II areas are less strict. Through the PSD program, Class I areas are protected by Federal Land Managers (FLMs) by management of AQRVs such as visibility, aquatic ecosystems, flora fauna, etc.

The 1977 Clean Air Act amendments established visibility as an AQRV that FLMs must consider. The 1990 Clean Air Act amendments contain a goal of improving visibility within PSD Class I areas. The Regional Haze Rule finalized in 1999 requires the states, in coordination with federal agencies and other interested parties, to develop and implement air quality protection plans to reduce the pollution that causes visibility impairment.

Regulations and standards which limit permissible levels of air pollutant concentrations and air emissions and are relevant to the Project air impact analysis include:

- NAAQS, CAAQS;
- PSD and
- New Source Performance Standards (NSPS).

Each of these regulations is further described in the following sections.

Ambient Air Quality Standards. The Clean Air Act requires the EPA to set NAAQS for pollutants considered to endanger public health and the environment. The NAAQS prescribe limits on ambient levels of these pollutants in order to protect public health, including the health of sensitive groups. The EPA has developed NAAQS for seven criteria pollutants: NO_2, CO, SO_2, PM_{10}, $PM_{2.5}$, O_3 and lead. Lead emissions from Project sources are negligible and therefore, the lead NAAQS is not addressed in this analysis. States typically adopt the NAAQS but may also develop state-specific ambient air quality standards for certain pollutants. The NAAQS and the CAAQS are summarized in Table 3.2-7. PSD Class I and Class II increments are also included in Table 3.2-7.

Table 3.2-7
Ambient Air Quality Standards and PSD Increments (µg/m^3)

Pollutant/Averaging Time	NAAQS	CAAQS	PSD Class I Increment[1]	PSD Class II Increment[1]
CO				
1-hour[2]	40,000	40,000	--[3]	--[3]
8-hour[2]	10,000	10,000	--[3]	--[3]
NO_2				
1-hour[4]	188	188	--[3]	--[3]
Annual[5]	100	100	2.5	25
O_3				
8-hour[6]	147	147	--[3]	--[3]
PM_{10}				
24-hour[2]	150	150	8	30
Annual[4]	--[7]	--[7]	4	17
$PM_{2.5}$				
24-hour[8]	35	35	2	9
Annual[4]	12	12	1	4
SO_2				
1-hour[9]	196	196	--[3]	--[3]
3-hour[2]	1,300	700	25	512
24-hour[2]	--[7]	-[7]	5	91
Annual[4]	--[7]	-[7]	2	20

[1] The PSD demonstrations serve information purposes only and do not constitute a regulatory PSD increment consumption analysis.
[2] No more than one exceedance per year.
[3] No PSD increments have been established.
[4] An area is in compliance with the standard if the 98th percentile of daily maximum 1-hour NO_2 concentrations in a year, averaged over 3 years, is less than or equal to the level of the standard.
[5] Annual arithmetic mean.
[6] An area is in compliance with the standard if the fourth-highest daily maximum 8-hour ozone concentrations in a year, averaged over 3 years, is less than or equal to the level of the standard.
[7] The NAAQS and CAAQS for this averaging time for this pollutant has been revoked by EPA and the CDPHE.
[8] An area is in compliance with the standard if the highest 24-hour $PM_{2.5}$ concentrations in a year, averaged over 3 years, is less than or equal to the level of the standard.
[9] An area is in compliance with the standard if the 99th percentile of daily maximum 1-hour SO_2 concentrations in a year, averaged over 3 years, is less than or equal to the level of the standard.

Hazardous Air Pollutants. HAPs are those pollutants that are known or suspected to cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental effects. No ambient air quality standards exist for HAPs, instead, emissions of these pollutants are regulated by a variety of regulations that target the specific source class and industrial sectors for stationary, mobile, and product use/formulations.

For the air quality analysis short-term (1-hour) HAP concentrations are compared to acute Reference Exposure Levels (RELs) (EPA, 2011) shown in Table 3.2-8. RELs are defined as concentrations at or below which no adverse health effects are expected. No RELs are available for ethyl benzene and n-hexane; instead, the available Immediately Dangerous to Life or Health divided by 10 (IDLH/10) values are used. These IDLH values were determined by the National Institute for Occupational Safety and Health (NIOSH) and were obtained from EPA's Air Toxics Database (EPA, 2011). These values are approximately comparable to mild effects levels for 1-hour exposures.

Long-term exposures to air toxics are compared to Reference Concentrations for Chronic Inhalation (RfCs). An RfC is defined by EPA as the daily inhalation concentration at which no long-term adverse health effects are expected. RfCs exist for both non-carcinogenic and carcinogenic effects on human health (EPA, 2012a). Annual modeled air toxics concentrations for all air toxics emitted are compared directly to the non-carcinogenic RfCs shown in Table 3.2-9.

Long-term exposures to emissions of suspected carcinogenic HAPs (benzene, ethyl benzene and formaldehyde) are also evaluated based on estimates of the increased latent cancer risk over a 70-year lifetime.

Table 3.2-8
Acute RELs (1-Hour Exposure)

Air Toxic	REL (µg/m^3)
Benzene	1,300[1]
Toluene	37,000[1]
Ethyl benzene	350,000[2]
Xylene	22,000[1]
n-Hexane	390,000[2]
Formaldehyde	55[1]

[1] EPA Air Toxics Database, Table 2 (EPA, 2011).
[2] No REL available for these air toxics. Values shown are from Immediately Dangerous to Life or Health (IDLH/10, EPA Air Toxics Database, Table 2 (EPA, 2011).

Table 3.2-9
Non-Carcinogenic Air Toxics RfCs (Annual Average)[1]

Air Toxic	Non-CarcinogenicRfC1 (µg/m^3)
Benzene	30
Toluene	5,000
Ethyl benzene	1,000
Xylene	100
n-Hexane	700
Formaldehyde	9.8

[1] EPA Air Toxics Database, Table 1 (EPA, 2012a).

Prevention of Significant Deterioration. The PSD Program is designed to limit the incremental increase of specific air pollutant concentrations above a legally defined baseline level. All areas of the country are assigned a classification which describes the degree of degradation to the existing air quality that is allowed to occur within the area under the PSD permitting rules. Federal Class I areas are areas of special national or regional natural, scenic, recreational, or historic value, and very little degradation in air quality is allowed by strictly limiting industrial growth. Class II areas allow for reasonable industrial/economic expansion. Certain national parks and wilderness areas are designated as Class I, and air quality in these areas is protected by allowing only slight incremental increases in pollutant concentrations. Class I areas within 200 km of the Project Area are shown on Map 3.2-1. All other areas not designated Class I are classified as Class II, where less stringent limits on increases in pollutant concentrations apply. Sensitive Class II areas are subject to PSD Class II Increments shown in Table 3.2-7.

Comparisons of Project impacts to the PSD Class I and II increments are for informational purposes only and are intended to evaluate a threshold of concern. They do not represent a regulatory PSD Increment Consumption Analysis, which would be completed as necessary during the New Source Review permitting process by the State of Colorado.

In addition to the PSD increments, Class I areas are protected by the FLMs through management of AQRVs such as visibility, aquatic ecosystems, flora, fauna, etc. Evaluations of potential impacts to AQRVs would also be performed during the New Source Review permitting process under the direction of the CDPHE-APCD in consultation with the FLMs.

AQRVs to be analyzed for the Proposed Action include visibility, atmospheric deposition and potential sensitive lake acidification. A discussion of the applicable background data and analysis thresholds are provided below.

Visibility. Change in atmospheric light extinction relative to background conditions is used to measure regional haze. Analysis thresholds for atmospheric light extinction are set forth in The Federal Land Managers' Air Quality Related Values Work Group (FLAG) Report (FLAG, 2010), with the results reported in percent change in light extinction and change in deciviews (dv). A 5 percent change in light extinction (approximately equal to a 0.5 change in dv) is the threshold recommended in FLAG (2010) and is considered to contribute to regional haze visibility impairment. A 10 percent change in light extinction (approximately equal to 1.0 dv) is considered to represent a noticeable change in visibility when compared to background conditions.

Estimated visibility degradation at the Class I areas and sensitive Class II areas of concern are presented in terms of the number of days that exceed a threshold percent change in extinction, or dv relative to background conditions. Although procedures and thresholds have not been established for sensitive Class II areas, the BLM is including these areas in its visibility analysis.

Atmospheric Deposition and Lake Chemistry. The effects of atmospheric deposition of nitrogen and sulfur compounds on terrestrial and aquatic ecosystems are well documented and have been shown to cause leaching of nutrients from soils, acidification of surface waters, injury to high elevation vegetation, and changes in nutrient cycling and species composition.

FLAG (2010) recommends that applicable sources assess impacts of nitrogen and sulfur deposition at Class I areas. This guidance recognizes the importance of establishing critical deposition loading values ("critical loads") for each specific Class I area as these critical loads are completely dependent on local atmospheric, aquatic and terrestrial conditions and chemistry. Critical load thresholds are essentially a level of atmospheric pollutant deposition below which negative ecosystem effects are not likely to occur. FLAG (2010) does not include

any critical load levels for specific Class I areas and refers to site-specific critical load information on FLM websites for each area of concern. This guidance does, however recommend the use of deposition analysis thresholds (DATs) developed by the National Park Service (NPS) and the FWS. The DATs represent screening level values for nitrogen and sulfur deposition from Project alone emission sources below which estimated impacts are considered negligible. The DAT established for both nitrogen and sulfur in western Class I areas is 0.005 kg/ha-yr.

The BLM has compiled currently available research data on critical load values for Class I areas in the vicinity of this Project. Critical load thresholds published by Fox et al. (1989) established pollutant loadings for total nitrogen of 3 to 5 kg/ha-yr and for total sulfur of 5 kg/ha-yr for the Bob Marshall Wilderness Area in Montana and the Bridger Wilderness Area in Wyoming. However, the NPS has recently stated that these pollutant loadings are not protective of sensitive resources and in its "Technical Guidance on Assessing Impacts to Air Quality in NEPA and Planning Documents", January 2011 suggests that critical load values above 3 kg/ha-yr may result in moderate impacts. Research conducted by Baron (2006) using hindcasting of diatom communities suggests 1.5 kg/ha-yr as a critical loading value for wet nitrogen deposition for high elevation lakes in Rocky Mountain National Park, Colorado. Recent research conducted by Saros, et al. (2010) using fossil diatom assemblages suggests that a critical load value of 1.4 kg/ha-yr for wet nitrogen is applicable to the eastern Sierra Nevada and Greater Yellowstone ecosystems. Project N and S deposition impacts are compared to the following critical load values: with 1.5 kg/ha-yr used as a surrogate for total N deposition and 3 kg/ha-yr used for total S deposition for Class I and Class II areas.

Analyses to assess the change in water chemistry associated with atmospheric deposition are performed following the procedures developed by the Forest Service Rocky Mountain Region (Forest Service, 2000). The analysis assesses the change in the ANC of four sensitive lakes (Table 3.2-6) in the region. Predicted changes in ANC are compared with the applicable threshold for each identified lake: 10 percent change in ANC for lakes with background ANC values greater than 25 µeq/l, and less than a 1 µeq/l change in ANC for lakes with background ANC values equal to or less than 25 µeq/l.

New Source Performance Standards. Well drilling/completion activities and the operation of production equipment may be subject to emission limits, control requirements, and recordkeeping and reporting requirements set forth in NSPS contained in 40 CFR § 63. Potentially applicable subparts include Subpart A, General Provisions, and Subpart OOOO, Standards of Performance for Crude Oil and Natural Gas Production. The final determination of applicability and compliance with these federal standards, as well as Colorado oil and gas industry standards, would be made during the State permitting process.

Greenhouse Gases. The U.S. Supreme Court ruled in 2007 that EPA has the authority to regulate greenhouse gases (GHGs) such as methane (CH_4) and CO_2 as air pollutants under the Clean Air Act; however, there are currently no ambient air quality standards for GHGs, nor are there currently any emissions limits on GHGs that would apply to sources developed under the Proposed Action.

The Mandatory Reporting of Greenhouse Gases, 40 CFR § 98, final rule (EPA, 2011) sets forth monitoring, recordkeeping and reporting requirements for certain emitters of GHGs. Subpart W of the rule is applicable to Petroleum and Natural Gas Systems and would include the Proposed Action. Subpart W does not require emission controls or establish emissions limits on GHG emissions for the Proposed Action.

EPA's Greenhouse Gas Tailoring Rule defines GHG emission levels at which an emitter would be subject to PSD permit requirements. The Tailoring Rule generally applies to new sources

emitting 100,000 tons per year or more of GHGs from a single facility. The wellsites to be developed as part of the Proposed Action would emit far less than the PSD applicability threshold established under this rule and as such, the Proposed Action would not be subject to PSD permitting under this rule.

As part of the development of the Project emission inventory, an inventory of CO_2, CH_4, and nitrous oxide (N_2O) was prepared. GHGs were not modeled, but the GHG inventory is presented for informational purposes.

3.2.1.2 Environmental Consequences

Proposed Action Alternative

An air quality modeling analysis was performed to assess the impacts on ambient air quality and AQRVs from potential air emissions due to the Proposed Action. Both near-field and far-field air quality analyses were performed. Potential ambient air quality impacts were quantified and compared to applicable state and federal ambient air quality standards, PSD increments and HAP thresholds. AQRV impacts (impacts on visibility, atmospheric deposition and potential increases in acidification to acid-sensitive lakes) were determined and compared to applicable thresholds.

Near-Field Modeling

A near-field ambient air quality impact assessment was performed to evaluate maximum pollutant impacts within and near the Project Area resulting from construction and operation. EPA's Guideline (EPA, 2005) model, AERMOD (version 12345), was used to assess these near-field impacts. The near-field modeling used one year of meteorological data collected during 2010 at the Grand Junction airport, located approximately 10 miles northwest of the Project Area.

The near-field criteria pollutant assessment was performed to estimate maximum potential impacts of CO, NO_2, SO_2, PM_{10} and $PM_{2.5}$ from well pad and road construction, well drilling/completion and production emissions sources. Near-field HAP (benzene, toluene, ethyl benzene, xylene, n-hexane and formaldehyde) emissions were evaluated for purposes of assessing impacts in the immediate vicinity of the Project Area for both short-term (acute) exposure assessment and for calculation of long-term human health risk.

The near-field analysis included an assessment of PM_{10} and $PM_{2.5}$ impacts from well pad and road construction. Fugitive dust and vehicle tailpipe particulate emissions from one representative well pad and road segment under construction were analyzed.

The near-field analysis also included a field-wide impact assessment for all criteria pollutants that utilized each of the 12 proposed well pad locations within the Project Area. This assessment included a maximum emissions scenario with drilling/completion and production occurring simultaneously throughout the Project Area, and another scenario with only production occurring. The combined scenario included modeling two well sites with well development activities, (one with a drilling rig and the other with a completion rig, both operating continuously over a year), along with the associated vehicle traffic emissions, combined with well production at each of the other ten well pad locations.

Both analyses utilized receptor grids that extended outward at least 1.5 km from the edge of any well pad. Discrete modeling receptors were defined on a 25-meter interval along boundaries, beginning 100 meters from the perimeter of each well pad and then defined on 100-meter intervals throughout the modeling domain. Where applicable, terrain elevations for each receptor were developed using the AERMAP processor along with available digital elevation model data.

Far-Field Modeling

A far-field ambient air quality impact assessment quantified potential air quality impacts to both ambient air concentrations and AQRVs from air pollutant emissions of NO_X, SO_2, PM_{10} and $PM_{2.5}$ expected to result from the Proposed Action. Ambient air quality impacts of NO_2, SO_2, PM_{10}, and $PM_{2.5}$ and AQRVs were analyzed at far-field federal Class I and sensitive Class II areas located within 100 km of the Project Area. The Class I areas located within 100 km of the Project Area include the Black Canyon of the Gunnison Wilderness, Flat Tops Wilderness, Maroon Bells-Snowmass Wilderness, West Elk Wilderness and Arches National Park. Federal Class II areas within 100 km of the Project Area that are considered sensitive areas include the Raggeds Wilderness Area and Colorado National Monument. Nine lakes that are designated as acid sensitive and are located within the Flat Tops Wilderness area (Ned Wilson Lake, Upper Ned Wilson Lake, Lower Packtrail Pothole, and Upper Packtrail Pothole), Maroon Bells-Snowmass Wilderness area (Avalanche Lake, Capitol Lake, and Moon Lake), Raggeds Wilderness area (Deep Creek Lake) and West Elk Wilderness area (South Golden Lake) were assessed for potential lake acidification from atmospheric deposition impacts. In addition PM_{10} and $PM_{2.5}$ impacts were modeled at nearby monitoring location sites operated by the CDPHE in Grand Junction, Clifton, and Delta.

The far-field analyses used the EPA-approved version of the CALPUFF modeling system (Version 5.8) along with a windfield developed for year 2008 using the Mesoscale Model Interface Program (MMIF) Version 2.1 (ENVIRON, 2012) and the 2008 Weather Research and Forecasting (WRF) meteorological model output that was produced as part of the Western Regional Air Partnership's (WRAP) West-wide Jump Start Air Quality Modeling Study (WestJumpAQMS) (ENVIRON et al., 2012).

The far-field assessment assumed a maximum field-wide emissions scenario with well development and production activities occurring simultaneously throughout the Project Area.

Impact Significance Criteria. Air quality impacts from pollutant emissions are limited by regulations, standards and implementation plans established under the Federal Clean Air Act, as administered by the CDPHE-APCD under authorization of the EPA. Under FLPMA and the Clean Air Act, the BLM cannot conduct or authorize any activity which does not conform to all applicable local, state, tribal or federal air quality laws, statutes, regulations, standards or implementation plans. As such, significant impacts to air quality from Project-related activities would result if it is demonstrated that:

- NAAQS or CAAQS would be exceeded; or
- AQRVs would be impacted beyond acceptable levels.

All NEPA analysis comparisons to the PSD Class I and II increments are intended to evaluate a threshold of concern, and do not represent a regulatory PSD Increment Consumption Analysis. The determination of PSD increment consumption is an air quality regulatory agency responsibility. Such an analysis would be conducted to determine minor source increment consumption or, for major sources, as part of the New Source Review process. The New Source Review process would also include an evaluation of potential impacts to AQRVs such as visibility, aquatic ecosystems, flora, fauna, etc. performed under the direction of federal land managers.

Emission Inventory Development. Air pollutant emissions would occur as part of construction and well production. Sources of emissions during construction include vehicle traffic, well pad and road construction, pipeline construction, and well drilling and completion. The primary pollutants emitted during construction would be PM_{10}, $PM_{2.5}$, NO_x, CO, SO_2, volatile organic compounds (VOCs), and HAPs including benzene, toluene, ethyl benzene, xylene, n-hexane

and formaldehyde. These activities would temporarily elevate pollutant levels, but impacts would be localized and would occur only for the short-term duration of the activities. Fugitive dust emissions (PM_{10} and $PM_{2.5}$) would result from work crews commuting to and from the work site and from the transportation and operation of equipment during construction. Wind-blown fugitive dust emissions would also occur from open and disturbed land during construction.

Emissions from construction were quantified using accepted methodologies, including manufacturer's emission factors, EPA emission factors and standards, and engineering estimates. Drill rig and completion engines would be Tier 2 emissions compliant. Maximum annual field-wide criteria pollutant and HAPs emissions resulting from well pad construction and drilling/completion are shown in Table 3.2-10. The emissions assume that a maximum of 12 well pads would be constructed in one year, and that a maximum of 25 wells would be drilled and completed in one year. The total HAPs emissions include benzene, toluene, ethyl benzene, xylene, n-hexane and formaldehyde emissions of 0.005, 0.011, 0.002, 0.014, 0.746, and 0.238 tons per year (tpy), respectively.

Table 3.2-10
Construction Emissions

Activity	Tons Per Year						
	PM_{10}	**$PM_{2.5}$**	**NO_x**	**CO**	**SO_2**	**VOC**	**HAPs**
Well Pad and Road Construction	2.18	0.23	0.56	0.36	0.015	0.04	--
Pipeline Construction	10.15	1.00	0.75	0.61	0.019	0.07	--
Drill Rig Engines	0.82	0.82	24.69	14.26	0.045	1.65	--
Drilling and Rig Move Traffic	10.52	1.09	0.93	1.32	0.004	0.13	--
Completion Engines	0.63	0.63	18.75	10.83	0.049	1.25	--
Completion Traffic	3.44	0.36	0.34	0.44	0.001	0.05	--
Completion Venting/Flaring	--	--	0.46	2.51	--	3.66	1.02
Maximum Annual Emissions	27.74	4.13	46.48	30.33	0.13	6.85	1.02

During field production, each of 12 well pads could contain up to nine producing wells. Emissions during this phase would occur from vehicle traffic on roads during routine field operations and maintenance, up to two separator heaters and a thermal oxidizer at each well pad and an estimated two work-overs each year. It is assumed that any natural gas collected in the field would be used to power the separator heaters and any excess gas would be combusted in high efficiency, smokeless thermal oxidizers located at each well pad. The primary pollutants emitted would be PM_{10}, $PM_{2.5}$, NO_x, CO, SO_2, VOCs and HAPs (formaldehyde). These emissions would impact air quality in the Project Area over the life of the Project. Production equipment is subject to current and future CDHPE Best Available Control Technology (BACT) and Reasonably Achievable Control Technology (RACT) guidance and applicable portions of 40 CFR Part 63 Subpart OOOO, Standards of Performance for Crude Oil and Natural Gas Production. Maximum annual emissions calculated for production are summarized in Table 3.2-11.

Table 3.2-11
Annual Production Emissions

Activity	Tons/Year						
	PM_{10}	$PM_{2.5}$	NO_x	CO	SO_2	VOC	HAPs
Work-over Rig Engines	0.006	0.006	0.18	0.10	0.02	0.01	--
Production Traffic	49.99	5.25	5.43	6.35	0.02	0.68	--
Separator Heaters	--	--	1.91	0.95	--	0.60	--
Thermal Oxidizers	--	--	52.82	16.00	--	1.05	0.42
Total Production Emissions	50.00	5.26	60.34	23.40	0.04	2.34	0.42

Greenhouse Gases

As part of the development of the Project emission inventory, an inventory of CO_2, CH_4, and N_2O emissions from field development and production activities was prepared. GHGs were not modeled in either the near-field or far-field impact analyses, but the GHG inventory is presented here for informational purposes and is compared to other U.S. GHG emission inventories in order to provide context for the Project GHG emissions.

In the Proposed Action emission inventory, emissions of the greenhouse gases CO_2, CH_4, and N_2O from new and existing sources are quantified in terms of CO_2 equivalents (CO_2e). Measuring emissions in terms of CO_2e allows for the comparison of emissions from different greenhouse gases based on their Global Warming Potential (GWP). GWP is defined as the cumulative radiative forcing of a gas over a specified time horizon relative to a reference gas resulting from the emission of a unit mass of gas. The reference gas is taken to be CO_2. The CO_2e emissions for a greenhouse gas are derived by multiplying the emissions of the gas by the associated GWP. The GWPs for the inventoried greenhouse gases are CO_2:1, CH_4:21, N_2O:310 (EPA, 2011). CO_2e emissions for construction and production are shown in Table 3.2-12.

Table 3.2-12
GHG Emissions (metric tons per year)

Pollutant	Construction	Production
CO_2e	2,276.2	63,949.1

Modeling Results.

Near-Field Modeling

Air pollutant dispersion modeling was performed to quantify maximum potential PM_{10}, $PM_{2.5}$, NO_x, CO, SO_2 and HAP impacts from construction and production. AERMOD was used to model the maximum potential emissions of PM_{10}, $PM_{2.5}$, NO_x, CO and SO_2 that could occur from the Proposed Action well pad/road construction, drilling/completion and production sources. Table 3.2-13 presents the maximum modeled air pollutant concentrations that could occur for any of these activities. When maximum modeled concentrations from the modeled scenarios are added to representative background concentrations, it is demonstrated that the total ambient air concentrations are less than the applicable NAAQS and CAAQS. In addition, direct modeled concentrations are below the applicable PSD Class II increments. Ozone impacts from this Project will be predicted as part of a regional air modeling study entitled the Colorado Air Resources Management Modeling Study (CARMMS), discussed further in Section 4.4.1. A discussion of the potential contribution from Project source emissions to regional ozone formation is presented later in this section.

Modeling was performed to estimate the maximum impacts that could occur from HAP emissions generated by construction and production sources. Potential maximum acute (short-term; 1-hour) HAP concentrations are shown in Table 3.2-14 compared with the acute RELs (EPA, 2011). RELs are defined as concentrations at or below which no adverse health effects are expected. No RELs are available for ethyl benzene and n-hexane; instead, the available IDLH/10 values are used. These IDLH values are determined by NIOSH and were obtained from EPA's Air Toxics Database (EPA, 2011). As shown in Table 3.2-14, the maximum predicted acute HAP concentrations are below the threshold levels.

Table 3.2-13
Maximum Modeled Pollutant Concentration Impacts (µg/m^3)

Pollutant	Averaging Period	Direct Modeled	PSD Class II Increment[1]	Background	Total Predicted	NAAQS	CAAQS
CO	1-hour	193.6	--	1,144.5	1338.1	40,000	40,000
	8-hour	92.6	--	1,144.5	1237.1	10,000	10,000
NO_2	1-hour	57.6	--	92.1	149.7	188	188
	Annual	17.5	25	9.4	26.9	100	100
SO_2	1-hour	0.9	--	31.4	32.3	196	196
	3-hour	0.5	512	23.5	24.0	1,300	700
	24-hour	0.2	91	--	--	--	--
	Annual	0.1	20	--	--	--	--
PM_{10}	24-hour	80.2	30	30.0	110.2	150	150
	Annual	9.9	17	--	--	--	--
$PM_{2.5}$	24-hour	10.8	9	12.0	22.8	35	35
	Annual	1.5	4	5.0	6.5	12	12

[1] The PSD demonstrations serve informational purposes only and do not constitute a regulatory PSD increment consumption analysis.

Table 3.2-14
Maximum Modeled 1-Hour HAP Concentration Impacts (µg/m^3)

Air Toxics	Direct Modeled	REL
Benzene	2.3	1,300
Toluene	5.2	37,000
Ethyl benzene	1.2	350,000[1]
Xylene	7.0	22,000
n-Hexane	369.3	390,000[1]
Formaldehyde	4.3	94

[1] No REL available for these air toxics. Values shown are from Immediately Dangerous to Life or Health (IDLH/10), EPA Air Toxics Database, Table 2 (EPA, 2011).

An analysis for long-term (annual) HAP concentrations was performed for formaldehyde emission resulting from the proposed thermal oxidizer emissions. Annual HAP analyses were not performed for the other HAPs evaluated in this study (benzene, toluene, ethyl benzene and n-hexane) given that these emissions are likely to occur short-term, well completion activities and the emissions would not contribute substantially to long-term impacts.

The potential annual formaldehyde concentrations are shown in Table 3.2-15 compared to non-carcinogenic RfCs (EPA, 2012a). An RfC is defined by EPA as the daily inhalation concentration at which no long-term adverse health effects are expected. As shown in Table 3.2-15 the maximum modeled annual formaldehyde impacts are below the RfC levels.

Table 3.2-15
Maximum Modeled Annual HAP Concentration Impacts (µg/m^3)

Air Toxic	Proposed Action	RfC
Formaldehyde	0.07	9.8

Modeling estimated the potential cancer risk resulting from thermal oxidizer formaldehyde emissions. Formaldehyde impacts were evaluated based on estimates of the increased latent cancer risk over a 70-year lifetime. This analysis presents the potential incremental risk from formaldehyde and does not represent a total risk analysis. The cancer risks were calculated using the maximum predicted annual concentrations and EPA's chronic inhalation unit risk factors (URF) for carcinogenic constituents (EPA, 2012b). Two estimates of cancer risk are presented: 1) a most likely exposure (MLE) scenario; and 2) a maximum exposed individual (MEI) scenario. The estimated cancer risks are adjusted to account for duration of exposure and time spent at home.

The adjustment for the MLE scenario is assumed to be 9 years, which corresponds to the mean duration that a family remains at a residence (EPA, 1993). This duration corresponds to an adjustment factor of 9/70 = 0.13. The duration of exposure for the MEI scenario is assumed to be 20 years (i.e., the life of the Project), corresponding to an adjustment factor of 20/70 = 0.286. A second adjustment is made for time spent at home versus time spent elsewhere. For the MLE scenario, the at-home time fraction is 0.64 (EPA, 1993) and it is assumed that during the rest of the day the individual would remain in an area where annual air toxics concentrations would be one-quarter as large as the maximum annual average concentration. Therefore, the final MLE adjustment factor is (0.13) x [(0.64 x 1.0) + (0.36 x 0.25)] = 0.094. The MEI scenario assumes that the individual is at home 100 percent of the time, for a final MEI adjustment factor of (0.286 x 1.0) = 0.268.

The modeled long-term risk from formaldehyde emissions are shown in Table 3.2-16. Under both the MLE and MEI scenarios, the estimated cancer risk associated with long-term exposure to formaldehyde is less than one-in-one-million.

Table 3.2-16
Long-term Modeled MLE and MEI Cancer Risk Analyses

Analysis	Air Toxic	Modeled Concentration (µg/m^3)	Unit Risk Factor 1/(µg/m^3)	Exposure Adjustment Factor	Cancer Risk
MLE	Formaldehyde	0.07	1.3×10^{-5}	0.094	8.1×10^{-8}
MEI	Formaldehyde	0.07	1.3×10^{-5}	0.286	2.5×10^{-7}

Far-Field Modeling

Far-field modeling at Class I and sensitive Class II areas within 100 km of the Project Area was performed using the CALPUFF model to quantify potential air quality impacts to both ambient air concentrations and AQRVs from air pollutant emissions of NO_x, SO_2, PM_{10} and $PM_{2.5}$ expected to result from the Proposed Action. The far-field analysis also included an assessment of maximum Project PM_{10} and $PM_{2.5}$ impacts at nearby monitoring location sites operated by the CDPHE. These include the Grand Junction PM_{10} and $PM_{2.5}$ monitoring site, the Clifton PM_{10} site and the Delta PM_{10} monitoring location. For each of these monitoring site locations both PM_{10} and $PM_{2.5}$ concentrations were modeled.

The Class I and sensitive Class II areas analyzed include the Class I Arches National Park, Black Canyon of the Gunnison Wilderness, Flat Tops Wilderness, Maroon Bells-Snowmass Wilderness, and West Elk Wilderness, and the Class II Raggeds Wilderness Area and Colorado National Monument.

The far-field assessment assumed a field-wide maximum emissions scenario with well drilling/completion and production activities occurring simultaneously throughout the Project Area. The field-wide scenario included two well pads with development activities (one drilling rig at one pad, and one completion rig at the other well pad, both operating continuously over the year) along with well production at each of the other ten well site locations. Emissions associated with well drilling/completion and production traffic were included in the analysis. The modeled field-wide emissions included 109.2 tpy of PM_{10}, 13.2 tpy of $PM_{2.5}$, 182.4 tpy of NO_X, and 3.0 tpy of SO_2.

Monitoring Site PM_{10} and $PM_{2.5}$ Impacts. Table 3.2-17 presents the maximum modeled PM_{10}, and $PM_{2.5}$ concentrations at the nearby CDPHE monitoring sites in Grand Junction, Clifton and Delta. As shown in Table 3.2-17, at these locations, the predicted PM_{10} and $PM_{2.5}$ impacts from field-wide Project sources are minimal. When maximum modeled concentrations are added to representative background concentrations, it is demonstrated that the total ambient air concentrations are well below the applicable NAAQS and CAAQS. In addition, direct modeled concentrations are below the applicable PSD Class II increments.

Table 3.2-17
Maximum Modeled PM_{10} and $PM_{2.5}$ Pollutant Concentration Impacts ($\mu g/m^3$) at Monitoring Site Locations

Site	Pollutant	Averaging Period	Direct Modeled	PSD Class II Increment[1]	Background	Total Predicted	NAAQS	CAAQS
Grand Junction	PM_{10}	24-hour	0.15	30	30.0	30.15	150	150
		Annual	0.02	17	--	--	--	--
	$PM_{2.5}$	24-hour	0.08	9	12.0	12.08	35	35
		Annual	0.01	4	5.0	5.01	12	12
Clifton	PM_{10}	24-hour	0.23	30	30.0	30.23	150	150
		Annual	0.04	17	--	--	--	--
	$PM_{2.5}$	24-hour	0.13	9	12.0	12.13	35	35
		Annual	0.01	4	5.0	5.01	12	12
Delta	PM_{10}	24-hour	0.22	30	30.0	30.22	150	150
		Annual	0.02	17	--	--	--	--
	$PM_{2.5}$	24-hour	0.12	9	12.0	12.12	35	35
		Annual	0.01	4	5.0	5.01	12	12

[1] The PSD demonstrations serve informational purposes only and do not constitute a regulatory PSD increment consumption analysis.

Class I and Sensitive Class II Areas.

PSD Increment Comparison. The direct modeled concentrations of NO_2, SO_2, PM_{10}, and $PM_{2.5}$ at Class I and sensitive Class II areas are provided in Table 3.2-18 for comparison to applicable PSD Class I and Class II increments. As shown in Table 3.2-18, these values are well below the PSD Class I and Class II increments.

Table 3.2-18
Maximum Modeled Pollutant Concentrations at PSD Class I and Sensitive Class II Areas (µg/m^3)

Location	Pollutant	Averaging Time	Direct Modeled	PSD Increment
Arches National Park	NO_2	Annual	0.001	2.5
	SO_2	3-hour	0.002	25
		24-hour	0.0007	5
		Annual	0.00003	2
	PM_{10}	24-hour	0.083	8
		Annual	0.003	4
	$PM_{2.5}$	24-hour	0.042	2
		Annual	0.001	1
Black Canyon of the Gunnison Wilderness Area	NO_2	Annual	0.004	2.5
	SO_2	3-hour	0.003	25
		24-hour	0.001	5
		Annual	0.0001	2
	PM_{10}	24-hour	0.080	8
		Annual	0.010	4
	$PM_{2.5}$	24-hour	0.037	2
		Annual	0.004	1
Flat Tops Wilderness Area	NO_2	Annual	0.0003	2.5
	SO_2	3-hour	0.0004	25
		24-hour	0.0002	5
		Annual	0.00002	2
	PM_{10}	24-hour	0.032	8
		Annual	0.003	4
	$PM_{2.5}$	24-hour	0.016	2
		Annual	0.001	1
Maroon Bells/Snowmass Wilderness Area	NO_2	Annual	0.0004	2.5
	SO_2	3-hour	0.0005	25
		24-hour	0.0002	5
		Annual	0.00003	2
	PM_{10}	24-hour	0.036	8
		Annual	0.003	4
	$PM_{2.5}$	24-hour	0.016	2
		Annual	0.001	1
West Elk Wilderness Area	NO_2	Annual	0.0008	2.5
	SO_2	3-hour	0.002	25
		24-hour	0.0004	
		Annual	0.00004	2
	PM_{10}	24-hour	0.037	8
		Annual	0.005	4
	$PM_{2.5}$	24-hour	0.019	2
		Annual	0.002	1
Raggeds Wilderness Area	NO_2	Annual	0.0004	25
	SO_2	3-hour	0.0007	512
		24-hour	0.0002	91
		Annual	0.00003	20
	PM_{10}	24-hour	0.029	30
		Annual	0.004	17
	$PM_{2.5}$	24-hour	0.014	9
		Annual	0.001	4
Colorado National Monument	NO_2	Annual	0.015	25
	SO_2	3-hour	0.010	512
		24-hour	0.003	91
		Annual	0.0004	20
	PM_{10}	24-hour	0.196	30
		Annual	0.031	17
	$PM_{2.5}$	24-hour	0.071	9
		Annual	0.008	4

AQRV Impacts.

Visibility Impacts. Visibility impacts were calculated following FLAG 2010 (FLAG, 2010), at Class I and sensitive Class II areas and the results are shown in Table 3.2-19. The visibility analysis indicated that there are zero days predicted above the 0.5 delta-deciviews (Δdv) threshold at any of the Class I and sensitive Class II areas. A maximum predicted visibility impact was 0.26 Δdv, occurring at Colorado National Monument.

Table 3.2-19
Maximum Visibility Impacts at Class I and Sensitive Class II Areas

Location	Maximum Impact (Δdv)
Arches National Park	0.18
Black Canyon of the Gunnison Wilderness Area	0.14
Flat Tops Wilderness Area	0.07
Maroon Bells/Snowmass Wilderness Area	0.06
West Elk Wilderness Area	0.08
Raggeds Wilderness Area	0.06
Colorado National Monument	0.26

Deposition Impacts. Potential direct atmospheric deposition impacts within Class I and sensitive Class II areas were also calculated for Proposed Action sources. At all Class I and sensitive Class II areas, the maximum direct total (wet and dry) N and S deposition are predicted to be well below the BLM thresholds of 3 kg/ha-yr for S and 1.5 kg/ha-yr for N. The predicted deposition values at each sensitive area are also well below the DAT of 0.005 kg/ha-yr. The maximum predicted deposition impacts occurred at Colorado National Monument and are 0.0035 kg/ha-yr (N) and 0.0002 kg/ha-yr (S).

In addition, potential changes in ANC, resulting from potential N and S deposition from Proposed Action source emissions, were calculated for nine sensitive lakes within the Flat Tops, Maroon Bells-Snowmass, Raggeds and West Elk Wilderness areas. For all lakes the estimated changes in ANC are all predicted to be less than the significance thresholds (Forest Service, 2000). The estimated change in ANC was 0.002 percent at Avalanche Lake, 0.002 percent at Capitol Lake, 0.010 percent at Moon Lake, 0.018 percent at Deep Creek Lake, 0.012 percent at Lower Packtrail Pothole, 0.007 percent at Upper Packtrail Pothole, 0.009 percent at Ned Wilson Lake and 0.004 percent at South Golden Lake (compared to the 10 percent threshold), and a 0.004 µeq/l change at the more sensitive Upper Ned Wilson Lake (compared to a 1.0 µeq/l threshold for sensitive lakes).

Potential Ozone Formation

As discussed earlier, potential ozone formation resulting from Project source and regional emissions will be predicted as part of the CARMMS analysis. However, for purposes of presenting an analysis for the potential of Project sources to contribute to regional ozone formation, a comparison of the most recent five years of oil and gas drilling and completion activity data within the GJFO Planning Area paired with maximum ozone concentrations measured at the monitoring site at Palisade, Colorado is presented in Table 3.2-20.

Table 3.2-20
Oil and Gas Drilling and Completions within the GJFO Planning Area and Maximum Ozone Concentrations at Palisade, Colorado

Year	Number of Oil and Gas Wells[1]	4th Highest Daily Maximum Ozone Concentrations (ppb)[2]
2008	436	70
2009	76	64
2010	113	68
2011	137	66
2012	14	71

[1] Data provided from BLM, 2013.
[2] Data from EPA, 2013b.

As is shown in Table 3.2-20, the maximum ozone concentrations in the region over the past five years range from 64 to 71 parts per billion, and that these maximum concentrations do not appear to be significantly influenced by oil and gas drilling activities that have occurred within the GJFO planning area. For example, during 2008, the maximum ozone concentration was 70 ppb and 436 wells were drilled, and during 2012 14 wells were drilled and the maximum ozone concentration was 71 ppb. These data suggest that the emissions resulting from Fram drilling operations (25 wells per year) would not contribute to an increase in regional ozone formation. An additional analysis comparing field-wide Project emissions and regional emissions is presented in Section 4.4.1 to further demonstrate that Project sources would have a minimal contribution to regional ozone formation.

Greenhouse Gas Emissions

According to the U.S. Global Change Research Program (2009), global warming is unequivocal, and the global warming that has occurred over the past 50 years is primarily human-caused. Standardized protocols designed to measure factors that may contribute to climate change, and to quantify climatic impacts, are presently unavailable. As a consequence, impact assessment of specific impacts related to anthropogenic activities on global climate change cannot be accurately estimated. Moreover, specific levels of significance have not yet been established by regulatory agencies. Therefore, climate change analysis for the purpose of this analysis is limited to accounting for GHG emissions changes that would contribute incrementally to climate change.

The maximum GHG emissions resulting from the Proposed Action are estimated at 63,949 metric tons per year [0.06 terragrams (tg)/yr] of CO_2e. To place the Project GHG emissions in context, the GHG emissions from the top five emitting coal-fired power plants in Colorado range from 3.5 to 9.8 tg/year (EPA, 2012c). In addition, 0.06 tg/yr is approximately equivalent to 0.0009 percent of total 2011 U.S. CO_2e emissions. Predicting the degree of impact any single emitter of GHGs may have on global climate change, or on the changes to biotic and abiotic systems that accompany climate change, is not possible at this time. As such, the controversy is to what extent GHG emissions resulting from continued oil and gas development may contribute to global climate change, as well as the accompanying changes to natural systems cannot be quantified or predicted. The degree to which any observable changes can, or would, be attributable to the Proposed Action cannot be reasonably predicted at this time.

Protective/Mitigation Measures
In addition to the Project Design Features listed in Chapter 2 and the BLM GJFO Standard COAs in Appendix G, the BLM would require the following measures to further reduce impacts to air quality:

- No venting of natural gas should occur.
- Speeds on unpaved access roads and disturbed areas should not exceed 10 to 15 miles per hour, and Fram should enforce with Project personnel.

Single Access Alternative
Under the Single Access Alternative, direct and indirect impacts to air quality would be similar to those described above for the Proposed Action.

B Road Alternative
Under the B Road Alternative, direct and indirect impacts to air quality would be similar to those described above for the Proposed Action. Temporary construction impacts associated with construction of an additional 2.74 miles of road would occur under this alternative and would not result in any measurable differences from the Proposed Action Alternative.

No Action Alternative
Under the No Action Alternative, construction and production of wells would not occur and no impacts to air quality would occur from any of the action alternatives described above.

3.2.2 Minerals

3.2.2.1 Current Conditions

Mineral resources in the Project Area consist of oil and gas leases and sand and gravel operations (BLM, 2012a). The entire Project Area is within the Whitewater Oil and Gas Unit operated by Fram. Table 3.2-21 lists the oil and gas leases and sand and gravel operations.

Table 3.2-21
Mineral Resources in the Project Area

Case Number	Grant Holder	Type
COC061636	BLM Grand Junction	Sand and Gravel Pit T1S R1E Section 35
COC065721	United Companies	Sand and Gravel Pit T1S R1E Section 35
COC069884	Upland Gravel	Sand and Gravel Pit T1S R1E Section 35
COC061360	BLM Grand Junction	Sand and Gravel Pit T1S R2E Section 30
COC064746	Clements Capital LLC, Fram Americas LLC	Oil and Gas Lease
COC064949	Clements Capital LLC, Fram Americas LLC	Oil and Gas Lease
COC064950	Clements Capital LLC, Fram Americas LLC	Oil and Gas Lease
COC064952	Clements Capital LLC, Fram Americas LLC, South Oil Inc.	Oil and Gas Lease
COC061847	Clements Capital LLC, Fram Americas LLC	Oil and Gas Lease
COC063975	Clements Capital LLC, Fram Americas LLC	Oil and Gas Lease
COC064953	Clements Capital LLC, Fram Americas LLC	Oil and Gas Lease
COC064954	Clements Capital LLC, Fram Americas LLC	Oil and Gas Lease
COC064955	Clements Capital LLC, Fram Americas LLC	Oil and Gas Lease
COC065097	Clements Capital LLC, Fram Americas LLC	Oil and Gas Lease
COC071344	Clements Capital LLC, Fram Americas LLC,	Oil and Gas Lease

Case Number	Grant Holder	Type
	Retamco Oper. Inc.	
COC071345	Clements Capital LLC, Fram Americas LLC, Retamco Oper. Inc.	Oil and Gas Lease
COC073038X	BLM CO State Office, Fram Operating LLC	Oil and Gas Exploratory Unit
COC01370A	Adelante O&G LLC, Maralex Resources Inc, Sleeping Bonanza LLC	Oil and Gas Lease
COC061718	Clements Capital LLC, Fram Americas LLC Fram Operating Inc., South Oil Inc.	Oil and Gas Lease
COC062814	Clements Capital LLC, Fram Americas LLC	Oil and Gas Lease
COC013710	Adelante O&G LLC, Maralex Resources Inc, Sleeping Bonanza LLC, Jetta Prod. Co. Inc., JPC Inc, Maralex Resources Inc. Providance Energy Corp.	Oil and Gas Lease
COC062810	Clements Capital LLC, Fram Americas LLC	Oil and Gas Lease
COC063929	Clements Capital LLC, Fram Americas LLC	Oil and Gas Lease
COC063930	Clements Capital LLC, Fram Americas LLC	Oil and Gas Lease
COC068809	Genesis Gas & Oil Co. LLC	Oil and Gas Lease
COC069660	Clements Capital LLC, Fram Americas LLC	Oil and Gas Lease
COC073038A	BLM CO State Office, Fram Operating LLC	Oil and Gas Participating Area
COC073038X	BLM CO State Office, Fram Operating LLC	Oil and Gas Exploratory Unit
COC063033	Clements Capital LLC, Fram Americas LLC	Oil and Gas Lease
COC062811	Clements Capital LLC, Fram Americas LLC	Oil and Gas Lease
COC063027	Clements Capital LLC, Fram Americas LLC	Oil and Gas Lease
COC063028	Clements Capital LLC, Fram Americas LLC	Oil and Gas Lease
COC063271	Clements Capital LLC, Fram Americas LLC	Oil and Gas Lease
BLM, 2012a.		

3.2.2.2 Environmental Consequences

Proposed Action Alternative

Oil and gas leases would be affected by the Proposed Action to the extent that they were drilled and produced by Fram. Existing sand and gravel operations would not be affected.

Protective/Mitigation Measures

In addition to the Project Design Features listed in Chapter 2, the BLM GJFO Standard COAs in Appendix C, and the Federal Onshore Oil and Gas Orders, the BLM has not identified any additional measures to further reduce impacts to minerals.

At the time of APD approval, the BLM would identify and require as Downhole Conditions of Approval, additional measures to further protect mineral resources under the Proposed Action Alternative.

Single Access Alternative

Under the Single Access Alternative, direct and indirect impacts to mineral resources would be the same as those described above for the Proposed Action Alternative.

B Road Alternative

Under the B Road Alternative, direct and indirect impacts to mineral resources would be the same as those described above for the Proposed Action Alternative.

No Action Alternative

No impact to Mineral Resources would occur under the No Action Alternative.

3.2.3 Soils (includes a finding on Standard 1)

3.2.3.1 Current Conditions

Soils within the Project Area were identified and characterized using the NRCS soil survey of Mesa County Area, Colorado, (NRCS, 1970). Information in this survey was supplemented with the NRCS Soil Survey Geographic (SSURGO) Database Descriptions which include both spatial and tabular data (NRCS, 2012a).

The five principal factors of soil formation include parent material, climate, relief, living organisms or biological activity and time. In the Project Area, soil differences primarily result from the relative importance or dominant influence of the various soil formation factors. The main climatic characteristics affecting soil formation are precipitation and temperature. Elevations in the Project Area range from between 4,700 and 8,500 feet amsl, annual precipitation at Palisade is 9.88 inches with average monthly precipitation ranging from 0.54 inches (January) to 1.21 inches (September) (see Section 3.2.1.1). Most precipitation occurs as snow from October through April. Average temperature ranges between 17.6˚F and 39.3˚F in January to between 63.5˚F and 94.0˚F in July (see Section 3.2.1.1). Soils in the Project Area formed in materials weathered from basalt and sandstone, or sediments from mixed rocks and in moderately steep or steep stony land (NRCS, 1970). Some soils are saline or sodic such as the Utaline, Uffens, Deaver, Kilpack and Persayo soils. The only hydric soil in the Project Area is the Ustifluvents soil (mapping unit 12) found along the floodplain of Kannah Creek.

Topographic conditions such as slope gradient, configuration (concaved or convex) and aspect also affect soil development. These features influence the amount of water that reaches the soil, the amount of water retained by the soil and the amount of water that runs off the soil. Topographic conditions also influence soil development by the amount of colluvial deposition that occurs onto some soils. Geologic or accelerated erosion, soil temperature and wind movement are also affected by topographic relief. Steep terrain within the Project Area is located where soils were formed from colluviums derived from basalt over residuum weathered from clayey shale, sandstone and siltstone and/or residuum weathered from sandstone and shale, or till derived from basalt. In steep or extremely steep areas, rapid runoff rates limits soil formation through erosional processes and limits soil development through the process of water infiltration and weathering of parent material (residuum) contributing less to soil profile development. Steep soils in the Project Area commonly are shallow (0 to 40 inches to a restrictive layer or paralithic bedrock).

The soils that occur within the Project Area and that would be affected by the Proposed Action are described below, grouped by landform position. Table 3.2-22 provides a listing of these soils with their dominant limiting characteristics.

Alluvial Soils on Floodplains, Stream Terraces and Narrow Valleys. The Ustifluvents soil (mapping unit 121) is found on the valley floor along Kannah Creek. The parent material consists of alluvium derived from basalt. It is deep, well-drained and has an effective rooting depth of 60 inches or more. The soil is occasionally flooded and has a seasonal zone of water saturation at 18 inches from April to August. Compaction and rutting hazard is severe.

Table 3.2-22
Soil Mapping Units Affected within the Project Area and Their Limiting Soil Characteristics

Map Unit Number	Mapping Unit Name[1]	Water Erosion[2]	Wind Erosion[3]	Steep Slopes[4]	Large Stones[5]	Restrictive Layer[6]	Reclamation Sensitivity[7]	Saline/Sodic[8]	Compaction[9]	Hydric Soils[10]	Prime Farmland[11]	Flooding Hazard Frequency[13]	Water Table[12]
Soils on Flood Plains, Stream Terraces and Narrow Valleys													
121	Ustifluvents, 0 to 3 percent slopes	Low	Moderate	No	No	No	No	No	Yes	Yes	No	Brief Occasional	Yes
Alluvial Soils on Fans and Toe Slopes													
119	Ildefonso-Scholle complex, 6 to 30 percent slopes, extremely stony	Moderate/High	Low/Moderate	No	Yes	No	Yes	No	Yes	No	No	No	No
120	Scholle loam, 3 to 15 percent slopes, extremely stony	Moderate	Moderate	No	Yes	No	No	No	Yes	No	No	No	No
Soils on Structural Benches, Plateaus and Mesas													
47	Utaline, sodic-Uffens complex, 3 to 12 percent slopes, very stony	Moderate/High	Low/Moderate	No	Yes	No	Yes	Yes	No	No	No	No	No
47D	Utaline, sodic-Uffens complex, 12 to 25 percent slopes, very stony	Moderate/High	Low/Moderate	No	Yes	No	Yes	Yes	No	No	No	No	No
52	Badlands-Deaver-Chipeta complex, 25 to 99 percent slopes, extremely stony	High	Low/Moderate	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No
118	Leebench, warm-Avalon-Blackston complex, 1 to 12 percent slopes, stony	High	Moderate/Low	No	Yes	No	No	No	No	No	No	No	No
253	Clapper-Agua Fria complex, 5 to 25 percent slopes, extremely stony	Moderate	Moderate	No	Yes	Yes	Yes	No	Yes	No	No	No	No
254	Clapper-Agua Fria complex, 25 to 65 percent slopes, extremely stony	Moderate/High	Moderate	Yes	Yes	Yes	Yes	No	Yes	No	No	No	No
Soils on Upland Hills, Knolls, Ridges, High Terraces													
68	Killpack-Badlands-Persayo complex, 3 to 25 percent slopes, saline	High	Moderate	No	No	Yes	Yes	Yes	Yes	No	No	No	No
210	Torrirthents, cool-rock outcrop, 35 to 90 percent slopes	High	Moderate	Yes	No	Yes	Yes	No	Yes	No	No	No	No

[1] Soil group ratings are based on the dominant soil type for the soil map unit. Inclusions of sensitive soil types may be found within soil map units that do not receive sensitive ratings.
[2] Water Erosion – soils sensitive to water erosion have an NRCS rating of high or severe.
[3] Wind Erosion – soils sensitive to wind erosion are in the NRCS wind erodibility groups 1 and 2. [4] Steep Slopes – sensitive soils occur in soil map units when slopes are greater than 30 percent.
[5] Large Stones – soils with greater than 25 percent cobbles and/or stones in the soil profile can present problems with surface reclamation. Soil with large quantities of large stones hold less available water for plant growth and generally require broadcast seeding methods.
[6] Restrictive Soils – soils that have a lithic, paralithic, or other restrictive soil layer within 60 inches of the soil surface. These soils have shallow profiles and hold less available water for plant growth.
[7] Reclamation Sensitivity – soils having reclamation sensitivity is a combined rating for soils with high or severe erosion potential, steep slopes, large stones, shallow soils and saline or sodic conditions and clayey soils (greater than 40 percent). This also includes soil map units with dominant amounts of rock outcrop. BMPs are generally required to reduce erosion and sedimentation potential in these soils. Restoration of these soils in most cases requires adaptive seed mixtures and implementation of revegetation practices (i.e., scarification, fertilization, proper seeding techniques, mulching, monitoring, etc.) to enhanced revegetation success. Revegetation of areas with extensive rock outcrop may not be possible.
[8] Saline/Sodic Soils – includes soils with an electrical conductivity of 8 mmhos/cm or greater and/or a Sodium Adsorption Ratio (SAR) of 13 or greater. Saline/sodic soils may require special handling of materials and/or special seed mixes.
[9] Soil Compaction – sensitive soils include those with an NRCS rating of high or severe. Ratings are based on depth to a water table, rock fragments on or below the surface, the Unified classification, depth to a restrictive layer and slope.
[10] Hydric Soils – at least one major named map unit soil is included on the county hydric soil list.
[11] Prime Farmland – dominant map unit soil is included on either the state or county list of farmland of importance.
[12] High Water Table – NRCS ratings of soils which have a saturated zone in the soil profile within 60 inches of the surface in most years. A saturated zone that lasts for less than a month is not considered a water table.
[13] Flooding Hazard - temporary inundation of an area caused by overflowing streams or runoff from adjacent slopes.

Alluvial Soils on Fans and Toe Slopes. Two soils are found on alluvial fans along the base of the Grand Mesa in the Project Area, Ildefonso-Scholle complex (mapping unit 119) and the Scholle loam (mapping unit 120). These soils were formed from alluvium derived from sandstone and shale and/or basalt. They are deep, well-drained soils and have an effective rooting depth of 60 inches or more. Available water capacity is low. These soils are slightly to moderately alkaline throughout the profile and may contain up to 25-45 percent coarse fragments from the surface down to 36 inches and up to 85 percent between 36 and 60 inches in their profile.

Soils on Structural Benches, Plateaus and Mesas. More than 50 percent of the soils in the Project Area are found on mesas. The soils in this group range from deep to shallow and are gently sloping to very steep. The Badlands-Deaver-Chipeta complex (mapping unit 52) formed from colluvium derived from basalt over residuum weathered from clayey shale. The steepest slopes within the Project Area are associated with this complex and range from 25 to 99 percent where they are located in this landscape on erosional remnants on the flanks of mesas, plateaus and structural benches. The Clapper-Agua Fria complex (mapping units 253 and 254) formed from till derived from basalt. Both soil complexes typically have a restrictive layer of bedrock below 40 inches that is soft or can be excavated. The hazard of water erosion is high. The Utaline, sodic-Uffens complex (mapping unit 47 and 47D) and the Leebench, warm-Avalon-Blackston complex (mapping unit 118) are deep, well-drained, gently sloping soils, formed in colluvium derived from basalt and alluvium derived from sandstone and shale over residuum weathered from clayey shale. Three soils mapping units within this group are considered moderately saline (47, 47D and 52) with mapping units 47 and 47D also being moderately to strongly sodic. All of the soils in this landscape contain more than 50 percent coarse fragments.

Soils on Slopes of Mountains, Hills Ridges and Canyonlands. The soils in this group are characterized by gently sloping to steep eroding slopes and rock outcrops in the Project Area. The Killpack-Badlands-Persayo complex (mapping unit 68) are gently sloping, shallow, well-drained, clayey soils, and are moderately saline. The Torriorthents soils (mapping unit 210) are well-drained, have up to 15 percent coarse fragments, have a restrictive layer of hard or soft bedrock and are slightly saline. The hazard of water erosion and compaction for all the soils in this group is severe. The rock outcrops consist of barren escarpments, ridge caps and rock points of sandstone.

Public Land Health Standard 1 (Upland Soils)

Standard 1: Upland soils exhibit infiltration and permeability rates that are appropriate to soil type, climate, land form and geologic processes.

The condition of upland soils within the Kannah Creek Common, the Whitewater Common and North Fork Kannah Creek allotments were evaluated in 2008 for meeting Public Land Health Standard 1. Of the 116 range sites sampled within the combined Whitewater Common-North Fork Kannah Creek allotments, 91 percent were found to be meeting the Standard while conditions on 9 percent of sampled sites were not meeting the Standard, primarily due to active soil erosion.

Sixty-one percent of the area within the Kannah Creek Common Allotment was found to be meeting Public Land Health Standard 1. Sites within the allotment that were not meeting Standard 1 had poor native vegetative cover and evidence of active erosion, gully formation and overland flows. However, 74 percent of the range sites in the Kannah Creek Common Allotment that coincide with the Project Area are meeting Public Land Health Standard 1.

3.2.3.2 Environmental Consequences

Proposed Action Alternative

The soil series data (i.e., soil mapping unit) from the county soil survey reports and SSURGO databases were used to conduct a detailed analysis of the potential impacts to soils resulting from the Proposed Action. Typically, these sources map soils (mapping units) at a scale of 1:24,000, which provides the best or most detailed soil information available. A database was developed incorporating the soil series characteristics listed in Table 3.2-22. Spatial analysis using Geographic Information System (GIS) was completed to determine the number of acres within each soil series (mapping unit) that would be affected by the proposed well pads, roads and gathering pipelines so that potential impacts could be accurately quantified within each soil mapping unit.

Table 3.2-23 provides a listing of soils by landform group and indicates acres and percent of disturbance under the Proposed Action within each group. As indicated in Table 3.2-23, the Proposed Action would disturb a total of 162.99 acres of soils. Table 2.2-3 in Chapter 2 notes that 72.84 acres or 45 percent of this soil disturbance would be in the long-term, while the remaining 90.15 acres (55 percent) of the soil disturbance would be restored in the short-term.

Table 3.2-23
Proposed Surface Disturbance by Soil Mapping Unit

Soil Mapping Unit Number	Soil Mapping Unit Number	Acres (percent)
Alluvial Soils on Floodplains, Stream Terraces and Narrow Valleys		
121	Ustifluvents, 0 to 3 percent slopes	1.96 (1.2)
	Total	**1.96 (1.2)**
Alluvial Soils on Fans and Toe slopes		
119	Ildefonso-Scholle complex, 6 to 30 percent slopes, extremely stony	33.58 (20.5)
120	Scholle loam, 3 to 15 percent slopes, extremely stony	1.71 (1.1)
	Total	**35.29 (21.7)**
Soils on Structural Benches, Plateaus and Mesas		
47	Utaline, sodic-Uffens complex, 3 to 12 percent slopes, very stony	37.59 (23.1)
47D	Utaline, sodic-Uffens complex, 12 to 25 percent slopes, very stony	6.80 (4.2)
52	Badlands-Deaver-Chipeta complex, 25 to 99 percent slopes, extremely stony	8.52 (5.2)
118	Leebench, warm-Avalon-Blackston complex, 1 to 12 percent slopes, stony	23.65 (14.5)
253	Clapper-Agua Fria complex, 5 to 25 percent slopes, extremely stony	16.77 (10.3)
254	Clapper-Agua Fria complex, 25 to 65 percent slopes, extremely stony	0.01 (<0.01)
	Total	**93.33 (57.3)**
Soils on Upland Hills, Knolls, Ridges, High Terraces		
68	Killpack-Badlands-Persayo complex, 3 to 25 percent slopes, saline	21.97 (13.5)
210	Torriorthents, cool-rock outcrop, 35 to 90 percent slopes	10.44 (6.4)
	Total	**32.41 (19.9)**
	Grand Total	**162.99**

Surface disturbance associated with the Proposed Action has the potential to adversely affect natural soil characteristics and, consequently, soil productivity and restoration potential, during clearing and grading, trenching and clean-up. Potential soil impacts include:

- soil erosion/sediment transport due to water, wind, loss of vegetation (including biologic soils crusts) and mass wasting,
- soil compaction and damage to soil structure resulting from the movement of heavy construction equipment,
- soil mixing or displacement from grading/excavation and reclamation,
- rutting from equipment or vehicle traffic,
- structural damage to wet or frozen soils and soils with poor drainage and
- introduction of large stones or blast rock into the topsoil as a result of construction.

Table 3.2-24 provides a summary of the acres of disturbance that would occur to each of the sensitive soil characteristic groups that would be affected by the Proposed Action. Based on the soil mapping unit characteristics, many of the soils affected occur within multiple sensitive soil groups, as shown in Table 3.2-22. Most of the soil mapping units that would be affected by the Proposed Action are soil complexes, composed of more than one soil series because the soils are so intermingled that they cannot be mapped separately at the scale of the survey maps. For this analysis, the dominant soil series in the mapping unit was used to assess the sensitive soil characteristics or groups affected by the Proposed Action, although many of the soil series in these soil complexes have similar characteristics. Because NRCS soil survey data for the various soil parameters are typically reported as ranges (i.e., slopes: 12 to 45 percent), the soil mapping unit was considered to be within a sensitive soil group if the specific soil parameter range exceeded the sensitive soil threshold, such as 30 percent for steep slopes. Therefore, this analysis makes the 'worst-case' assumption that all areas of disturbance would occur within the areas of the soil mapping unit that exceed the sensitive soil threshold criteria.

Table 3.2-24
Proposed Surface Disturbance in Sensitive Soils

Sensitive Soil Characteristic	Total (acres)	Percent of Total Disturbance
Water Erosion Hazard[2]	118.90	72.95
Wind Erosion Hazard[3]	0.00	0.0
Steep Slopes[4]	18.96	11.6
Large Stones[5]	128.62	78.9
Restrictive Layer[6]	57.69	35.4
Reclamation Sensitivity[7]	102.09	62.6
Saline/Sodic[8]	74.88	45.9
Compaction Potential[9]	132.53	81.3
Hydric Soils[10]	1.96	1.2
Prime Farmlands[11 & 12]	0.00	0.0
Flooding Hazard[13]	1.96	1.2
High Water Table[14]	1.96	1.2
Footnotes refer to notes in Table 3.2-20.		

Soil disturbance could be difficult to reclaim due to sensitive soil characteristics (e.g., low available water content, steep slopes, shallow profiles and high content of rock fragments). As shown in Table 3.2-22, construction could affect soils that are easily eroded and compacted, are on steep slopes, are shallow to a restrictive layer, have a high content of coarse fragments and are potentially saline. Any of these characteristics can make soils difficult to reclaim. The invasion of noxious weeds into disturbed areas could occur on all soil types, but the potential for weed invasion is typically greater on soils that are difficult to reclaim due to their sensitive or droughty characteristics. Based on the NRCS soil survey data (NRCS, 1970 and 2012a), the wind erosion hazard of undisturbed soil indicates that these soils are generally not susceptible to blowing. Soil disturbance such as grading/blading would increase the wind erosion hazard of soil in the short-term until soils have crusted, settled, been revegetated or been compacted.

Water Erosion. The Proposed Action would affect a total of about 119 acres of soils (73 percent of total soils affected) that have a high or severe erosion potential, as indicated in the NRCS soil surveys. However, implementation of the state-required SWMP would reduce erosion and the potential increase in sediment transport. The SWMP would include site-specific adaptive BMPs designed to minimize potential erosion and sediment transport from disturbed areas. Storm water regulations also require monitoring and reporting protocols to ensure that soil conditions and BMPs are maintained in good functioning condition. BMPs may include run-on/run-off controls, such as swales, ditches or berms, sediment catchments, anchored barriers such as erosion blankets or straw wattles, or other erosion and sediment control methods where appropriate based on site specific conditions. Implementing appropriate revegetation practices (see Reclamation Sensitivity) to stabilize disturbed areas would help ensure that disturbed areas were stabilized in the short-term.

Steep Slopes. Based on the slope ranges of NRCS soil mapping units (NRCS, 1970 and 2012a), construction would affect a total of about 19 acres of soil mapping units (12 percent of the total soils affected) with slope ranges exceeding 35 percent. Soils on steep slopes (exceeding 40 percent) are particularly susceptible to accelerated erosion when deep road cuts or other surface-disturbing activities take place. Many of the soils with lower slope gradients are also highly susceptible to erosion and management would be designed to reduce erosion and sediment yield (BLM, 1985), including application of appropriate BMPs, as specified in the SWMP. Project components would be sited based on civil surveys, on-site inspections and routine monitoring, to avoid/minimize disturbance to steep slopes.

Surface disturbance on BLM-administered lands would be consistent with guidelines outlined in *Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development*, (BLM and Forest Service, 2007), generally known as *The Gold Book*. Typical BMPs proposed by Fram to minimize potential impacts on steep slopes would be provided in their SWMP. Implementation of storm water BMPs such as diversion ditches, topsoil/slash berms, run-on/run-off protections, anchored wattles and straw bales, as well as outfall protection like angular rock armor are important in steep areas where linear flow tends to erode soils. Reclamation BMPs on steep slopes would typically include topsoil salvage and replacement, site-specific seedbed preparation including soil roughening techniques such as soil pitting/pocking and application of crimped straw or hydro mulch, or anchored erosion control fabric. These measures could also be implemented on slopes of less than 30 percent. Such BMPs would help minimize erosion and sediment transport, maximizing the potential for successful reclamation.

Large Stones. Soils likely to be composed of more than 25 percent rock fragments are included as sensitive soils. Soils with large volumes of cobbles or stones can present problems with reclamation because they hold less available water for plant growth and may require broadcast rather than drill seeding methods when large rocks on the surface prevent drill seeding

methods. As indicated in Table 3.2-24, 129 acres (79 percent of total soils affected) of the soils in the Project Area that would be affected by the Proposed Action contain 25 percent or more large stones.

Restrictive Layer. Soils that are rated as having a restrictive layer are shallow soils that have a lithic, paralithic, or other restrictive soil layer within 60 inches below the soil surface. These soils have thin profiles, restrictive root zones and hold less available water for plant growth. Shallow soils and hard bedrock can also restrict construction or trenching operations and may require special equipment (rock hammers/saws) or blasting to efficiently excavate well pads or trenches to required design depths. Soils in this group are also included as soils that have reclamation sensitivity. As indicated in Table 3.2-24, construction would affect a total of about 58 acres of soils that have a restrictive layer (35 percent of the total soils affected).

Reclamation Sensitivity. As shown in Table 3.2-24, construction would affect a total of about 102 acres of soils rated as having reclamation sensitivity (63 percent of the total soils affected within the Project Area). Soils in this group may have high or severe erosion potential, steep slopes, shallow soils, are saline and/or sodic, or have coarse soil textures or large rock fragments that minimize the soil's available water content. Reclamation and stabilization of these soils typically require site-specific recontouring, special seedbed preparation, appropriate seeding techniques and seed mixtures, as well as mulch, monitoring and weed control. Site-specific conditions may recommend techniques such as pitting or pocking the soil or the use of mulch to conserve moisture. Topsoil availability may be limited, so the shredding of woody vegetation to be salvaged with topsoil and then redistributed during reclamation may enhance organic matter content and water-holding capabilities of sensitive soils. Soils that are difficult to revegetate also tend to be more susceptible to noxious weed infestations.

This soil group also includes 29 acres of soil map units dominated by rock outcrops where revegetation might not be possible. Specific climatic conditions in the Project Area, such as low precipitation and high temperature, also affect soil reclamation potential, especially when soils have characteristics such as shallow depths or have a high content of rock fragments which limits their water holding capabilities. Implementation of the revegetation measures outlined in the BLM GJFO's Standard Conditions that require shredding large woody vegetation, topsoil salvaging and appropriate reclamation BMPs such as scarification, seedbed preparation, appropriate seed mixtures and seeding methods would minimize the potential impact to soils productivity.

Saline/sodic soils. Sensitive soils in this group include soils that have an electrical conductivity of 8 micromhos per centimeter (mmhos/cm) or greater and/or a SAR of 13 or greater. Saline and sodic soils can be difficult to revegetate and generally require specially adapted seed mixes. Construction would affect about 75 acres of saline and sodic soils in this group (46 percent of the total soils affected).

Compaction. Soil compaction results when internal pore space is reduced due to physical pressure exerted on the surface. Compaction can result in soil conditions that reduce infiltration, permeability and gaseous and nutrient exchange rates within the soil. These processes are critical to viability of vegetative species. Physical resistance to root growth can occur when soils are compacted. Unmitigated soil compaction can result in long-term reductions in soil productivity and increased erosion due to increased runoff. Soils in the group sensitive to compaction were determined based on the NRCS rating of High or Severe for the category 'Haul Roads, Log Landings and Soil Rutting.' Soil ratings in this group are based on unified soil texture classification, rock fragments on or below the surface depth to a restrictive layer, depth to a water table and on slope. As indicated in Table 3.2-24, soils susceptible to compaction

comprise the largest sensitive soil group that would be disturbance, a total of about 133 acres of disturbance or 81 percent of the total soils affected.

Flooding Hazard and High Water Table. Soils with a high water table are rated based on NRCS criteria that require a saturated zone in the soil profile within 60 inches of the surface in most years. A saturated zone lasting less than a month is not considered a water table. As indicated in Table 3.2-24, 1.96 acres (mapping unit 121) is characterized as having a high water table and brief/occasional flooding from April to August. Areas of this mapping unit that are affected by the Proposed Action are associated with short segments of road improvements and pipeline installations that traverse this mapping unit.

With implementation of protective measures, it is expected that the 72.84 acres of soil disturbance that would be reclaimed would occur in the short-term with the reclaimed soil being adequately stabilized and successfully revegetated within 5 years.

Protective/Mitigation Measures
In addition to the Project Design Features listed in Chapter 2 and the BLM GJFO Standard COAs in Appendix C, the BLM would require the following measures to further reduce impacts to soils:

- Proposed well pad locations Federal 13-98-12-2 and Federal 1-2-33-1 should be evaluated during an on-site inspection for slopes greater than 30 percent and may require relocation or specific mitigation measures to minimize disturbance to steep slopes.
- Site specific interim reclamation plans should be prepared, outlining procedures to minimize erosion and sedimentation and ensure that disturbed areas are successfully reclaimed in the short-term. In particular, seedbed preparation and rapid seeding of disturbances would support interim and final reclamation and help reestablish native forbs, shrubs and grasses. The plans should address vegetation removal, topsoil salvaging and storage, recontouring of disturbed areas, contour grading for vegetated visual barriers where needed, restoration of natural landforms and drainage patterns, scarification/seedbed preparation, installation of temporary and permanent erosion control measures, seeding methods, seed mixtures, reseeding schedule/timing, mulching, monitoring to ensure success and weed control. Planning should include measures to limit/control vehicle and/or livestock use of reclaimed areas.

Single Access Alternative
Potential impacts under the Single Access Alternative would be similar to those described above for the Proposed Action Alternative. Surface disturbance and interim reclamation would occur over a longer time period under this alternative because construction would be spread over more years.

B Road Alternative
Potential impacts under the B Road Alternative would be similar to those described above for the Proposed Action; however, an additional 2.74 miles of new road construction would occur. Under this alternative, an additional 3.35 acres of acres would be disturbed in mapping unit 21, 1.49 acres in mapping unit 118, and 3.07 acres in mapping unit 52.

No Action Alternative
Under this alternative, no Project-related impacts would occur to soils on BLM-administered lands from construction and operation of any of the action alternatives described above.

Finding on the Public Land Health Standard 1 (Upland Soils)

With the implementation of the proposed mitigation measures identified within this EA and by managing noxious weeds within the Project Area, it is anticipated that impacts would not unduly affect the soils' existing capacity to meet Standard 1. No changes in Land Health Standard 1 are anticipated under the Proposed Action if the Project Design Features and mitigation measures are properly implemented.

Similar to the Proposed Action, with the implementation of mitigation measures identified within this EA and managing noxious weeds within the Project Area, it is anticipated that Standard 1 would not be affected by the Single Access Alternative or B Road Alternative.

Under the No Action Alternative, effects from existing and new surface disturbances (unrelated to any of the action alternatives) would continue and could affect Public Land Health Standard 1.

3.2.4 Water (Surface and Groundwater) (includes a finding on Standard 5)

3.2.4.1 Current Conditions

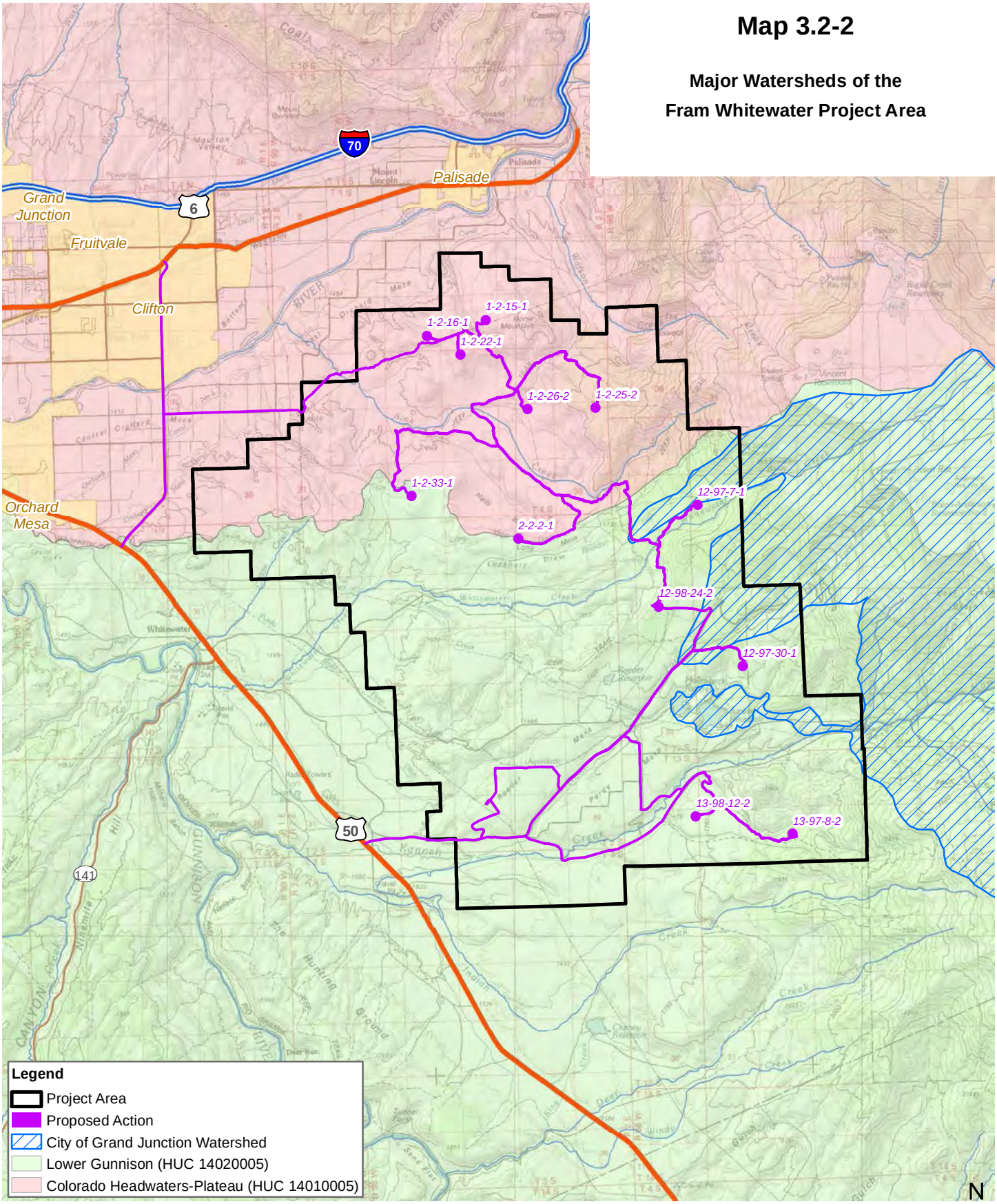
Surface Water Hydrology. The Project Area is located in the Colorado Plateau Physiographic Province, where basins and the broad valleys of the middle Colorado River and its tributaries form an irregular intermontane topography (Robson and Banta, 1995). The uplift of the Colorado Plateaus steepened stream gradients and accelerated the down cutting of the Colorado River and its principal tributaries. The major drainage basins are the Lower Gunnison (HUC 14020005) and Colorado Headwaters – Plateau (HUC 14010005) sub-basins (NRCS, 2012b) (Map 3.2-2).

The climate of the Project Area is discussed in Section 3.2.1.1 but is characterized as semi-arid with average total precipitation of 9.88 inches at Palisade with average monthly precipitation ranging from 0.54 inches (January) to 1.21 inches (September). Thus, perennial surface water flow is limited to larger streams and streams with sources at high elevations to the east of the Project Area on Grand Mesa, which receives more than 30 inches of annual precipitation. Flows in intermittent and ephemeral drainages within the Project Area occur in response to spring snowmelt and large summer and early autumn thunderstorms.

The City of Grand Junction adopted a Watershed Protection Ordinance in September 2006 (City of Grand Junction, 2006) and supporting Watershed Protections Regulations in July 2007 (City of Grand Junction, 2007). The purpose of the Watershed Protection Ordinance is to protect the City's water supply and waterworks from pollution. A portion of the Project Area coincides with the Grand Junction protected watershed (Map 3.2-2).

Map 3.2-2

Major Watersheds of the
Fram Whitewater Project Area



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Subwatersheds within the Project Area (Map 3.2-3) include Watson Creek-Colorado River (HUC 140100051502), Sink Creek (HUC 140100051501) and Indian Wash-Colorado River (HUC 140100051503) which drain into the Colorado River. The Callow Creek-Gunnison River (HUC 140200050803), Whitewater Creek (HUC 140200050706) and Outlet Kannah Creek (HUC 140200050705) subwatersheds drain into the Gunnison River. North Fork Kannah Creek (HUC 140200050703) and a small portion of the Indian Creek subwatershed (HUC 140200050704) are located inside the Project Area and drain into Kannah Creek which then drains into the Gunnison River (NRCS, 2012b). The headwaters of Kannah Creek is outside of the Project Area, and the source of the perennial flow in Kannah Creek. Characteristics of the subwatersheds in the Project Area are summarized in Table 3.2-25.

Table 3.2-25
Characteristics of Subwatersheds in the Project Area

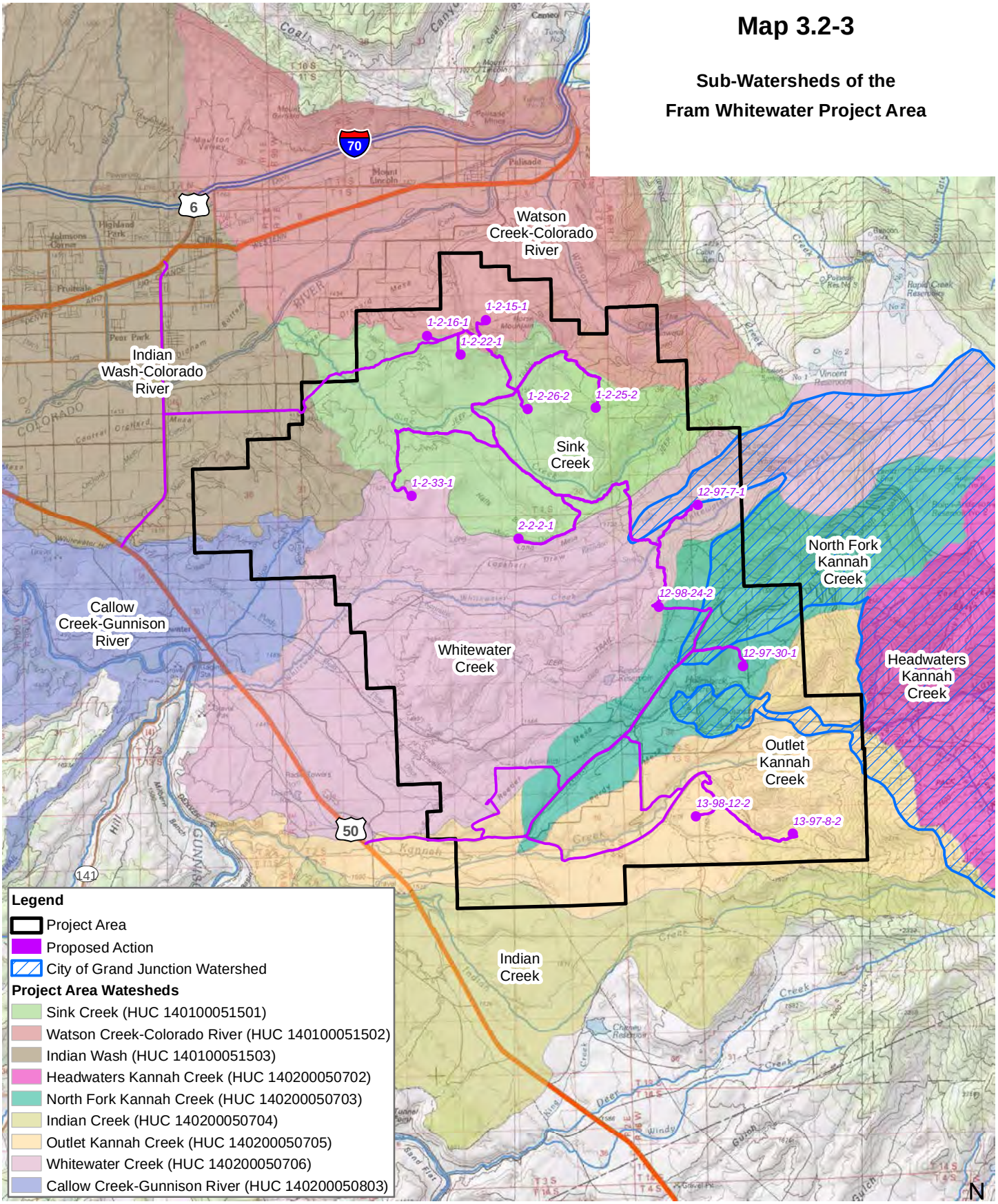
Subwatershed Name	HUC 12 Number	Main Drainage Length (Feet)	Main Drainage Max Elev. (Feet amsl)	Main Drainage Min Elev. (Feet amsl)	Main Drainage Average Gradient (%)	Sub-watershed Area (Acres)	Drainage Subbasin
Watson Creek-Colorado River	140100051502	36,384	9,140	4,720	12.1	24,383	Colorado Headwaters Plateau
Sink Creek	140100051501	63,405	9,800	4,640	8.1	12,562	Colorado Headwaters Plateau
Indian Wash-Colorado River	140100051503	20,664	5,200	4,690	2.5	36,236	Colorado Headwaters Plateau
Callow Creek-Gunnison River	140200050803	17,767	5,150	4,644	2.8	25,460	Lower Gunnison
Whitewater Creek	140200050706	105,391	10,290	4,630	5.4	30,688	Lower Gunnison
North Fork Kannah Creek	140200050703	75,746	10,290	5,240	6.7	11,822	Lower Gunnison
Outlet Kannah Creek	140200050705	71,460	6,110	4,670	2.0	16,229	Lower Gunnison
Indian Creek	140200050704	93,976	10,092	4,750	5.7	19,978	Lower Gunnison

Note: Drainage characteristics are for the entire subwatershed; distances and elevations estimated from USGS maps
HUC – Hydrologic Unit Code (NRCS, 2012b).

The Watson Creek-Colorado River subwatershed drains the northernmost part of the Project Area. Watson Creek is an intermittent stream, originating in the higher elevation areas of Grand Mesa to the east of the Project Area and draining into the Colorado River more than 3 miles downstream from the Project Area. Two additional unnamed intermittent tributaries to the Colorado River, flowing west and parallel to Watson Creek, are part of the subwatershed and drain the northern part of the Project Area. The shortest distance from the Project Area boundary to the Colorado River is approximately 1 mile, along an unnamed tributary in the Watson Creek-Colorado River subwatershed.

Map 3.2-3

Sub-Watersheds of the
Fram Whitewater Project Area



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The Sink Creek subwatershed is located just south of the Watson Creek subwatershed. Sink Creek is intermittent and flows first southwesterly from Grand Mesa, then northwesterly to its confluence with the Colorado River southeast of Clifton, Colorado. All of the tributaries to Sink Creek are ephemeral and unnamed, but provide flow to Sink Creek during storm events. Sink Creek is crossed by the Orchard Mesa Canal Number 2 just outside of the Project Area.

Three intermittent and unnamed streams within the Indian Wash-Colorado River subwatershed drain the northwest corner of the Project Area. Instantaneous flows of the eastern-most stream (U.S. Geological Survey - USGS station 390322108253401 drain) between Orchard Mesa Canal Number 2 and Orchard Mesa Canal Number 1 and outside the Project Area boundary ranged from 30 to 400 gallons per minute (gpm) based on five measurements recorded between 1991 and 1998 (USGS, 2012). Flows in the second unnamed stream (USGS 390322108263001 drain) downstream of Orchard Mesa Canal Number 1 ranged from 300 to 4,000 gpm based on four measurements recorded between 1991 and 1992 (USGS, 2012). The locations of the USGS monitoring stations are shown on Map 3.2-4.

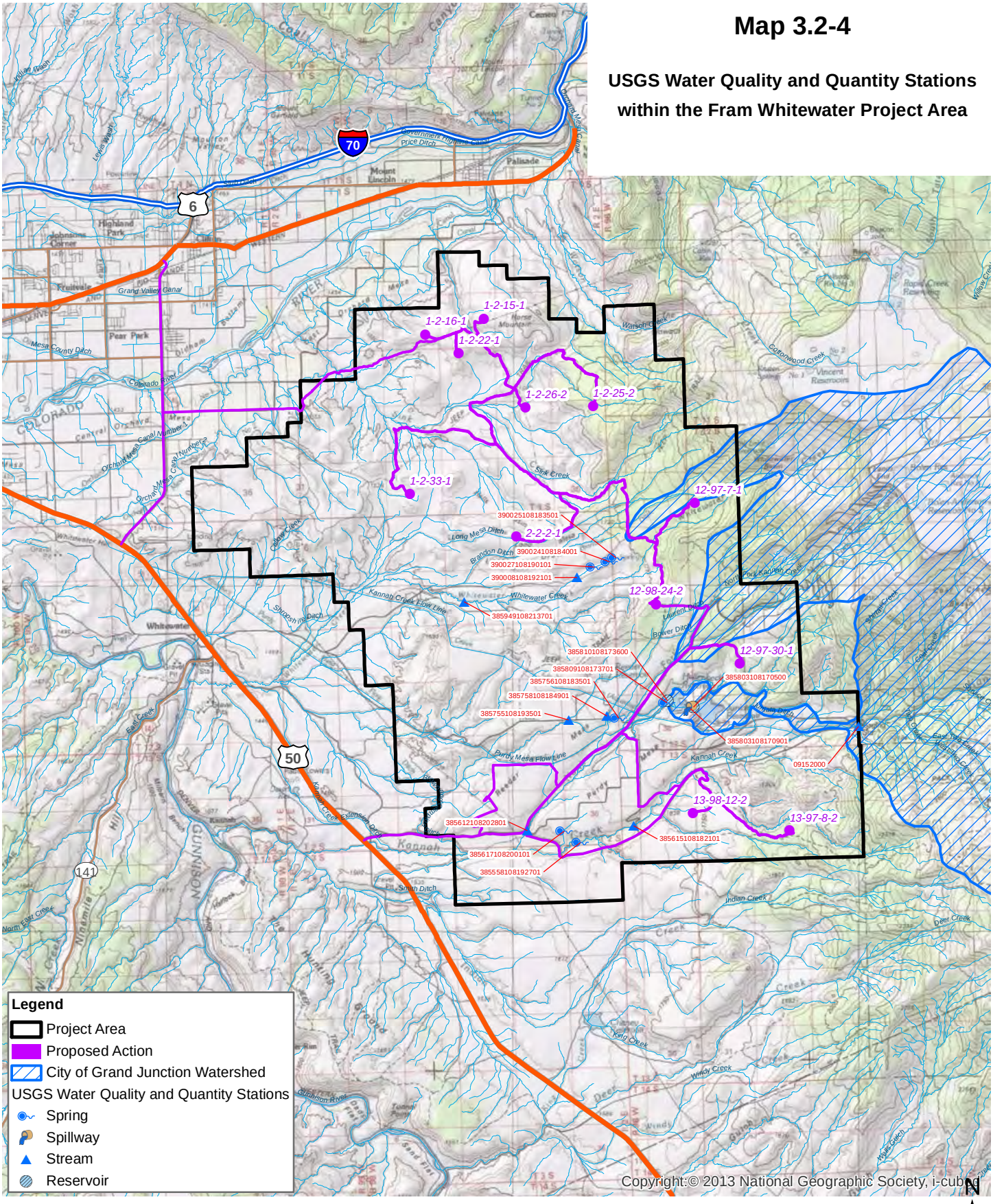
Callow Creek drains a small portion of the Project Area along the western Project Area boundary and flows into the Gunnison River. The Callow Creek-Gunnison River watershed outside the Project Area contains the Kannah Creek Extension Ditch, Kannah Creek Flow Line pipeline and Purdy Mesa Flow Line pipeline. Average daily flows in Callow Creek downstream from the Kannah Creek Extension Ditch outside of the Project Area, as measured from 2000 to 2003, ranged from dry in December through February to 130 gpm in November (USGS, 2012).

Whitewater Creek and its tributaries drain the largest portion of the Project Area. Whitewater Creek originates in the higher elevation areas of Grand Mesa to the east of the Project Area and flows into the Gunnison River. Within the Project Area, only some reaches of lower Whitewater Creek have perennial flow. Whitewater Creek is ephemeral and intermittent below the city's point of diversion for the Brandon Ditch and Orchard Mesa Ditch and only flowing during runoff events or storms, because all of its base flows (up to 25 cubic feet per second - cfs) are diverted into Grand Junction municipal ditches east of the Project Area. These municipal ditches include Brandon Ditch, Lockhart Ditch and Long Mesa Ditch (Map 3.2-4). Brandon Ditch diverts water from Whitewater Creek at a point about ½ mile to the east and upstream of the Project Area boundary. An average of about 2,300 acre-feet are diverted annually for municipal (Grand Junction), irrigation and stock watering purposes (CDWR, 2012a). Brandon Ditch flows perennially, but the majority of diversion occurs from April through October (CDWR, 2012a). Drinking water for the City of Grand Junction is diverted from Brandon Ditch and piped in a 12 to 20 inch pipe along Whitewater Road to Grand Junction. Lockhart Ditch diverts water from Whitewater Creek via the Brandon Ditch and is also perennial. Water in the ditch is used for irrigation and stock watering. Long Mesa Ditch diverts water from the lower slopes of the Grand Mesa in the area to the north of Brandon Ditch and can also divert water from Brandon Ditch. Long Mesa ditch flows intermittently and is primarily used for stock watering. The City of Grand Junction's "protected watershed area" extends along the eastern part of Brandon Ditch into the Project Area (Map 3.2-4).

The Kannah Creek Flow Line pipeline and Purdy Mesa Flow Line pipeline traverse the Whitewater Creek drainage in the Project Area. All surface water flow and water quality measurements inside the Project Area within the Whitewater Creek subwatershed are summarized in Table 3.2-26 and the USGS monitoring station locations are shown on Map 3.2-4.

Map 3.2-4

USGS Water Quality and Quantity Stations within the Fram Whitewater Project Area



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North Fork Kannah Creek originates in the higher elevation areas of Grand Mesa to the east of the Project Area and flows into Kannah Creek. North Fork Kannah Creek is perennial in its upper reaches, but intermittent below the points of diversion for Laurent Ditch and Bower Ditch (Map 3.2-4). Lander Extension Ditch starts in the Kannah Creek subwatershed and traverses the North Fork Kannah Creek drainage just upstream of Juniata and Hallenbeck reservoirs. The eastern part of the North Fork of Kannah Creek and Juniata and Hallenbeck reservoirs are part of the City of Grand Junction protected watershed area. All of the USGS (2012) surface water flow and water quality data collected to date inside the Project Area and within the North Fork Kannah Creek subwatershed are summarized in Table 3.2-26 and the USGS monitoring station locations are shown on Map 3.2-4.

Kannah Creek originates in the higher elevation areas of Grand Mesa to the east of the Project Area and flows into the Gunnison River. Kannah Creek is perennial upstream from the Project Area, but flows can be substantially reduced inside the Project Area with upstream diversions and during periods of drought. All of its tributaries are intermittent or ephemeral within the Project Area. There is one named tributary to Kannah Creek within the Project Area, North Fork Kannah Creek. Downstream of the Project Area, Indian Creek flows into Kannah Creek. Several water diversion ditches or pipelines originate in the Kannah Creek subwatershed: Kannah Creek Highline Ditch, Juniata Ditch, Kannah Creek Flow Line, Smith Ditch and Brown and Campion Ditch (Map 3.2-4).

A USGS gaging station is located on Kannah Creek at the eastern Project Area boundary (USGS 09152000 Kannah Creek near Whitewater, Colorado). The period of record for this station is 1917 through 1982. Average monthly flow rates range from 4 cfs in January to 147 cfs in May (USGS, 2012). Peak flows generally occur during periods of snow melt in May or June. Peak flows can reach up to 1,560 cfs, as measured in June 1921, but average around 580 cfs over the period of record (USGS, 2012). Additional surface water flow and water quality measurements inside the Project Area within the Kannah Creek subwatershed are summarized in Table 3.2-26 and the USGS monitoring station locations are shown on Map 3.2-4.

Only about 650 acres of the Indian Creek subwatershed are inside the Project Area. Indian Creek is a perennial stream above Cheney Reservoir. One unnamed ephemeral drainage drains this part of the Project Area into Indian Creek. The drainage leaves the Project Area, then crosses Smith Ditch before draining into Indian Creek. Indian Creek drains into Kannah Creek about 2 miles upstream from the confluence of Kannah Creek with the Gunnison River outside the Project Area.

Several roads exist within the Project Area. Road surfaces on the access roads vary from four-wheel drive unimproved to two-wheel drive paved. Existing roads currently cross streams and ditches with low water crossings as well as culverts.

Surface Water Quality. Surface water quality depends on natural and anthropogenic factors including geology, precipitation, vegetation cover and land use. The geology within a watershed is a key determinant of its surface water quality. In areas of sandstone, basalt, or granite, the surface water tends to be of good quality. Where the Mancos Formation is exposed, water quality tends to be poorer, with high total dissolved solids (TDS) and/or selenium concentrations. Precipitation pattern also influences water quality. Most rainfall in the Project Area occurs in the form of isolated, short-duration and intense summer thunderstorms, creating localized flood flows that have the power to erode, mobilize and transport sediment downstream. This sediment is then transported to streams and can increase salinity and selenium concentrations in surface water (BLM, 2009a).

Table 3.2-26
USGS Water Quality and Flow Data for Surface Water Stations inside the Project Area

USGS Monitoring Station ID	Site Type	Site Description	Subwatershed	Date	Instantaneous Discharge (ft^3/sec)	Temperature (degree C)	Specific Conductance (unfiltered, field) (µS/cm)	pH (unfiltered, field) (standard units)	Selenium (µg/L)
385810108173600	Lake	PURDY MESA RESERVOIR	N Fork Kannah Creek	9/14/1973		17	226	9.2	
385803108170500	Lake	JUNIATA RESERVOIR	N Fork Kannah Creek	9/14/1973		19.5	352	8.7	
385803108170901	Lake	SPILLWAY BELOW JUNIATA RESERVOIR NR WHITEWATER, CO	N Fork Kannah Creek	11/5/2003	0 (estimate)	7	818		
385612108202801	Stream	N. FORK KANNAH CR ABV CONFLUENCE NR WHITEWATER, CO	N Fork Kannah Creek	10/17/2003	0.15 (estimate)	8.9	3860	8.2	75.9
385758108184901	Stream	UNNAMED SF WHITEWATER CK TRIB-2 @ READER MESA RD	N Fork Kannah Creek	11/5/2003	0.25 (estimate)	9.8	660		
385756108183501	Stream	UNNAMED SF WHITEWATER CK TRIB-3 @ REEDER MESA RD	N Fork Kannah Creek	11/5/2003	0.12(estimate)	10.3	773		
385615108182101	Stream	KANNAH CK @ DIVIDE RD NR WHITEWATER, CO	Outlet Kannah Creek	10/17/2003	2.2	13.3	480		
385949108213701	Stream	WHITEWATER CK S OF WHITEWATER CK RD NR WHITEWATER	Whitewater Creek	10/16/2003	0.06	12.5	1240		
385755108193501	Stream	UNNAMED SF WHITEWATER CK TRIB-1 @ READER MESA RD	Whitewater Creek	11/5/2003	0.04 (estimate)	11.3	2420		
390008108192101	Stream	WHITEWATER CK @ WHITEWATER CK RD NR LOCKHART DRAW	Whitewater Creek	10/17/2003	0.25 (estimate)	13.3	556		
385809108173701	Spring	SEEP COLLECTOR PIPE BLW DAM @ HALLENBECK RESERVOIR	N Fork Kannah Creek	11/5/2003	0 (estimate)	13	2630		
385617108200101	Spring	UD00200235DBD1	Outlet Kannah Creek	6/19/1981		12	2920		
385558108192701	Seep	UD00200236CCD1 (SEEP ALONG KANNAH CR.)	Outlet Kannah Creek	4/14/2000		13.3	2710	7.5	2.9
390024108184001	Spring	UD00200201DDD1	Whitewater Creek	9/8/1977		13.2	320	7	
				7/28/1977		13.3	400		
				8/20/1981		13.5	430		
390025108183501	Spring	SC01209814DBA1	Whitewater Creek	7/28/1977		13	440		
				9/8/1977		12.5	480	7	
				7/14/1980		12.5	480		
390027108190101	Spring	UD00200201DCA1	Whitewater Creek	8/1/1980		20	2580		

USGS, 2012.

Vegetation helps prevent the detrimental effects that precipitation has on surface water quality. A diverse and abundant vegetation cover is better able to stabilize the soil, minimizing soil erosion, sediment transport and deposition in nearby streams. Vegetation reduces soil loss by minimizing raindrop impact, slowing runoff velocities and allowing more percolation of rainwater and saturating the soil to further enhance vegetative growth in a positive feedback cycle (BLM, 2009a).

Sink Creek, Whitewater Creek, Kannah Creek and North Fork Kannah Creek originate in the Grand Mesa area east of the Project Area at higher elevations. All other streams start inside the Project Area, where the dominant bedrock formation is Mancos Shale. The headwaters of streams originating in higher elevation outside the Project Area generally have good water quality, meeting or exceeding water quality standards established by the State of Colorado for the beneficial uses on the streams (BLM, 2009a). However, many stream segments in lower elevation areas have water quality concerns, with the primary pollutants being salinity, sediment and/or selenium. Salinity and selenium are typically associated with sediment, as the ions tend to be bound to soil particles. Elevated pollutant levels commonly originate from eroding saline soils developed from the Mancos Formation (BLM, 2009a). These saline soils associated with the Mancos Shale (Km in Map 3.2-5) exist in areas east of the Gunnison River below the Grand Mesa.

Salinity represents the presence of elevated levels of soluble salts in soils or waters. These salts are generally sodium chloride, magnesium and calcium sulfates and bicarbonates. Salinity is one of the greatest water quality concerns within the Colorado River Basin and is subject to the Colorado River Basin Salinity Control Act (PL 98-569) (BLM, 2009a). Specific conductance can be used to estimate salinity. The highest sediment loads occur during periods of high flow during spring snowmelt on the larger streams and high flows during intense summer storms on the smaller tributaries. In general, high flows tend to dilute pollutant concentrations but increase pollutant loading within a stream. Low or base flows occur in late fall and winter, correlating with high specific conductance caused by high dissolved salt concentrations (BLM, 2009a).

The Water Quality Control Commission - WQCC (CDPHE, 2013a and 2013b) classifies stream segments according to river basin and specific water segments. All surface waters within Colorado are organized by basin and labeled by stream segment. For each stream segment, the State has set water quality standards for physical, chemical and biological parameters based on the existing or potential beneficial uses for water supply, aquatic life, recreation and agriculture.

Watson Creek, Sink Creek and their unnamed tributaries plus unnamed direct tributaries to the Colorado River upgradient of Orchard Mesa Canal No. 2 are within the state-designated Lower Colorado River segment 13a (Table 3.2-27). Whitewater Creek and Kannah Creek within the Project Area boundary are within the state-designated Lower Gunnison River Basin, stream segments 4a and 4b, respectively (Table 3.2-27). Water quality standards and guidance for drainages within the Gunnison and Lower Colorado basins are included in the CDPHE WQCC Regulation Nos. 35 and 37 respectively (CDPHE, 2013a and 2013b). A brief description of the classifications is provided in Table 3.2-27. Table Value Standards for selenium for tributaries to the Gunnison River in the Project Area according to CDPHE WQCC (2013a) are 18.4 micrograms per liter (µg/L) for acute toxicity and 4.6 µg/L for chronic toxicity. A temporary modification for selenium is currently in effect, with an expiration date of 12/31/2017, setting the standard to existing ambient water quality. A complete listing of numeric standards for physical, biological, inorganic and metal parameters for these segments can be found in CDPHE (2013a and 2013b).

Map 3.2-5

Geology of the
Fram Whitewater Project Area

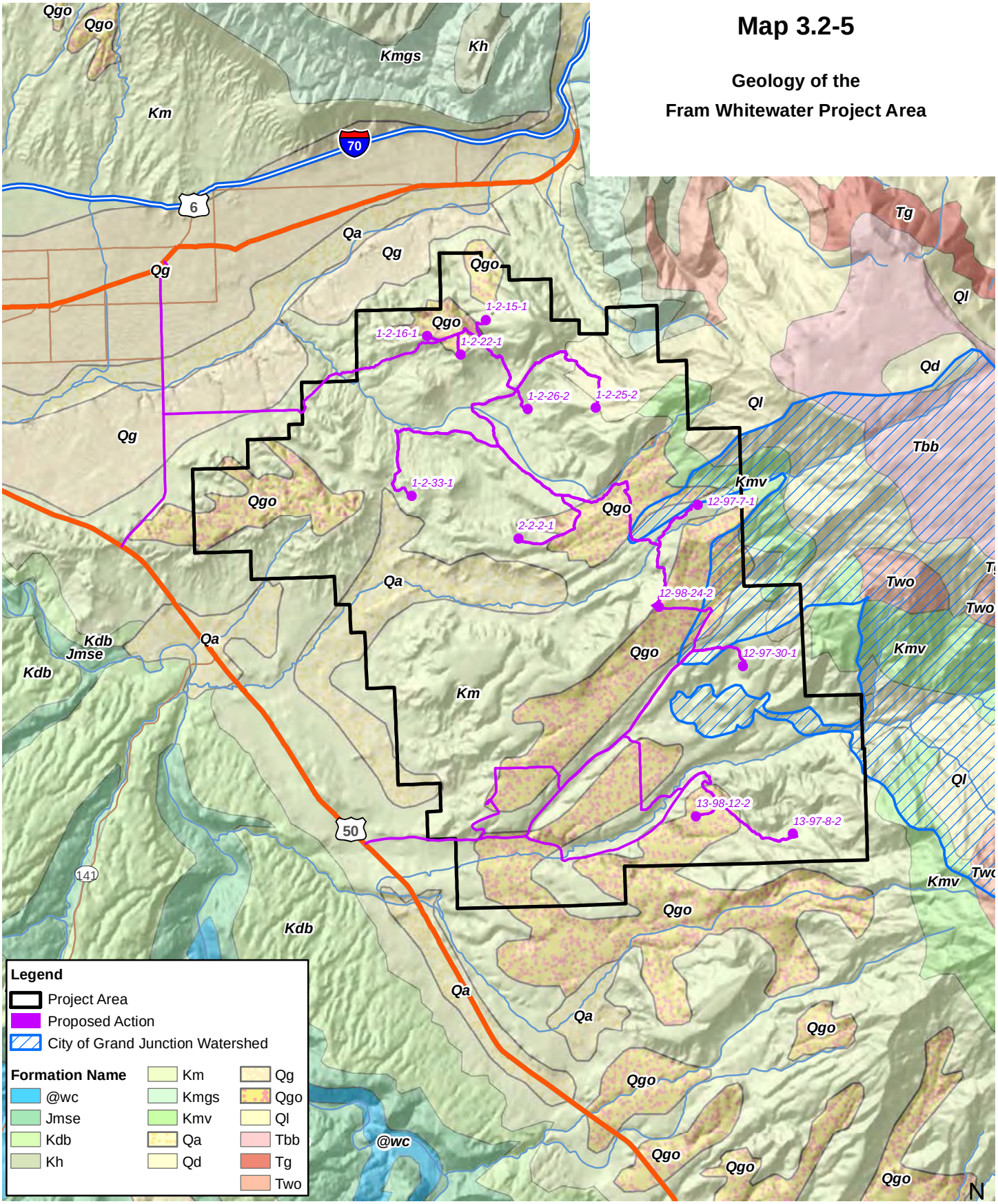

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Table 3.2-27
Beneficial Use Classifications for Potentially Affected Streams

Stream Segment Description	Classifications*
BASIN: LOWER COLORADO RIVER	
2b. Main stem of the Colorado River from a point immediately above the confluence with Rapid Creek to immediately above the confluence of the Gunnison River.	Aquatic Life Warm 1 Recreation E Water Supply Agriculture
13a. All tributaries to the Colorado River including wetlands, from a point immediately below the confluence of Roan Creek to the Colorado/Utah border except for the specific listings in Segments 13b through 19.	Aquatic Life Warm 2 Recreation P Agriculture
BASIN: LOWER GUNNISON RIVER	
2. Main stem of the Gunnison River from a point immediately above the confluence with the Uncompahgre River to the confluence with the Colorado River.	Aquatic Life Warm 1 Recreation E Water Supply Agriculture
4a. All tributaries to the Gunnison River, including all wetlands which are not on national forest lands, from the outlet of Crystal Reservoir to the confluence with the Colorado River, except for specific listings in the North Fork and Uncompahgre River subbasins and in Segments 3, 4b, 4c, 5 through 10, 12 and 13.	Aquatic Life Warm 2 Recreation N Water Supply Agriculture
4b. All tributaries to the Gunnison River, including all wetlands which are not on national forest lands, from the outlet of Crystal Reservoir to the confluence with the Colorado River, except for specific listings in the North Fork and Uncompahgre River subbasins and in Segments 3, 4b, 4c, 5 through 10, 12 and 13.	Aquatic Life Warm 2 Recreation E Water Supply Agriculture

* **Class 1** - Warm Water Aquatic Life. These are waters that (1) currently are capable of sustaining a wide variety of warm water biota, including sensitive species, or (2) could sustain such biota but for correctable water quality conditions. Waters shall be considered capable of sustaining such biota where physical habitat, water flows or levels, and water quality conditions result in no substantial impairment of the abundance and diversity of specifies.
* **Class 2** – Cold and Warm Water Aquatic Life. These are waters that are not capable of sustaining a wide variety of cold or warm water biota, including sensitive species, due to physical habitat, water flows or levels, or uncorrectable water quality conditions that result in substantial impairment of the abundance and diversity of species.
* **Recreation Class P** - Potential Primary Contact Use. These surface waters have the potential to be used for primary contact recreation. This classification shall be assigned to water segments for which no use attainability analysis has been performed demonstrating that a recreation class N classification is appropriate, if a reasonable level of inquiry has failed to identify any existing primary contact uses of the water segment, or where the conclusion of a UAA is that primary contact uses may potentially occur in the segment, but there are no existing primary contact uses.
* **Recreation Class N** - Not Primary Contact Use. These surface waters are not suitable or intended to become suitable for primary contact recreation uses. This classification shall be applied only where a use attainability analysis demonstrates that there is not a reasonable likelihood that primary contact uses would occur in the water segment(s) in question within the next 20-year period.
* **Class E** - Existing Primary Contact Use. These surface waters are used for primary contact recreation or have been used for such activities since November 28, 1975.
* **Domestic Water Supply**. These surface waters are suitable or intended to become suitable for potable water supplies. After receiving standard treatment (defined as coagulation, flocculation, sedimentation, filtration, and disinfection with chlorine or its equivalent), these waters will meet Colorado drinking water regulations and any revisions, amendments, or supplements thereto.
* **Agriculture.** These surface waters are suitable or intended to become suitable for irrigation of crops usually grown in Colorado and which are not hazardous as drinking water for livestock.

CDPHE, 2012a and 2012b.

The Clean Water Act (EPA, 1972) requires states to compile a list of water bodies, known as the 303(d) list, that do not fully support their designated uses. CDPHE-WQCC Regulation 93, Colorado's Section 303(d) list of impaired waters, indicates that sediment and selenium are the primary water quality impairments in the Colorado and Gunnison River drainages (CDPHE, 2012). Downstream of the Project Area, the mainstem of the Colorado River is identified as segment COLCLC02b under Colorado's Monitoring and Evaluation List for sediment (CDPHE, 2012). The Gunnison River is identified as segment COGULG02 and is listed under Colorado's Monitoring and Evaluation List for sediment and as impaired for E. coli (CDPHE, 2012c). Whitewater Creek downstream of Brandon Ditch within the Project Area is currently listed as impaired under Colorado's Section 303(d) list of impaired waters for sulfate and manganese. Lakes and reservoirs within the Kannah Creek subwatershed are under Colorado's Monitoring and Evaluation List for sulfate (CDPHE, 2012). The ambient dissolved selenium concentration in Whitewater Creek and Lower Kannah Creek is 59.2 and 30.8 µg/L as measured between 1999 and 2005 (CDPHE, 2011), and thus both creeks do not attain the chronic aquatic life use standard of 4.6 µg/L, or the standard for acute aquatic life use of 18.4 g/L for dissolved selenium. In order to attain the aquatic water quality standards, selenium load in Whitewater Creek and North Fork Kannah Creek would have to be reduced by over 90 percent, and load in Kannah Creek would have to be reduced by over 60 percent (CDPHE, 2011). For these creeks, there are no point source discharges; therefore load reductions would have to come from reductions in non-point source loads (CDPHE, 2011). CDPHE (2011) states that "the magnitude of selenium concentrations and loads in surface-water features are directly related to the application of irrigation water."

The USGS collected water quality data at several sites within the Project Area (USGS, 2012). Surface water quality in the Project Area is influenced by minerals in the Mancos Shale, the uppermost bedrock formation. The most important minerals are calcite, dolomite and gypsum. Dissolution of these minerals can produce waters locally dominated by calcium, magnesium, sodium, bicarbonate, sulfate and chloride. The surface water in the Project Area is generally characterized as calcium bicarbonate or calcium sulfate type, with moderate alkalinity. Specific conductance is typically below 1,000 microseimens per centimeter (µS/cm), although several surface water samples had higher values ranging up to 3,860 µS/cm. The sample with the highest specific conductance was a sodium sulfate type, measured in North Fork Kannah Creek.

Water quality data indicate very good to excellent quality waters in Kannah Creek upstream from the Project Area (USGS, 2012). The excellent vegetative cover, geology consisting of basalt, glacial tills, terrace and pediment gravels and colluvium in upper Kannah Creek provide for minimal sediment and low TDS concentrations (<100 milligrams per liter - mg/L). As streams flow over Mancos Shale and alluvial deposits in the lower elevations, the concentrations of TDS (salinity), sulfate, sodium, phosphate, alkalinity, magnesium and sediment increase (BLM, 2009a). Limited historical surface water flow, temperature, pH, specific conductance and selenium and other parameter data are available for the USGS monitoring stations in the Project Area. The headwaters of Kannah Creek as measured at USGS Station 09152000 at the upstream Project Area boundary (Map 3.2-4) had selenium levels below detection limits (<0.3 µg/L) for most measurements for the period of record from 1999 through 2003 (USGS 2012). North Fork Kannah Creek (USGS 385612108202801) just above the confluence with Kannah Creek had selenium levels of 76 µg/L, as measured in 2003 (Table 3.2-26). A summary of available water quality data is presented in Table 3.2-26. The locations of the USGS monitoring stations are shown on Map 3.2-4.

Groundwater Hydrology. The major regional aquifer system in the Project Area is the Colorado Plateau aquifer system which stretches across northern Arizona, western Colorado, northwestern New Mexico and eastern Utah. The Colorado Plateau aquifers are contained in a thick sequence of poorly to well-consolidated conglomerate, sandstone, siltstone and shale. Other formations consisting of volcanic rock, carbonate rock and evaporite deposits in the area also can yield water to wells. Structural deformation, faulting and lateral changes in the lithology of the rocks have produced a complex sequence of water-yielding strata (Robson and Banta, 1995).

The Project Area is situated south of the Colorado River within the southern portion of the Piceance Basin. Both bedrock and alluvial aquifers are present within the Project Area; however, only alluvial sources of groundwater have been developed. The principal bedrock aquifer system in the planning area is the Dakota-Glen Canyon aquifer (part of the regional Colorado Plateau aquifer system) which is comprised of four permeable zones referred to as the Dakota aquifer (Dakota Sandstone), Morrison aquifer (sandstone portions of the Morrison Formation), Entrada aquifer (associated with the Entrada Sandstone), and Glen Canyon aquifer (associated with the Kayenta and Wingate Sandstone). The Dakota-Glen Canyon aquifer system is overlain by the Mancos Shale, which forms an overlying confining unit. This aquifer system is bounded at the bottom by the underlying Chinle-Moenkopi confining unit. In general, both confining units are thick, low-permeability zones that severely restrict vertical flow between the Dakota-Glen Canyon aquifer system and overlying and underlying aquifers. Flow in the Dakota-Glen Canyon aquifer system is generally towards the major discharge areas along the Colorado and Gunnison rivers. However, in the Project Area, the Dakota Formation is at a depth of 4,500 to 5,000 feet below ground surface and dips to the northeast towards the center of the Piceance Basin and does not discharge groundwater to the Gunnison or Colorado Rivers as is the case to the south and southwest of the Project Area (outside of the Piceance structural basin). No known groundwater wells in the Project Area utilize water from this aquifer because it is too deep (4,500-5,000 feet below ground surface) to be useful for domestic or small-scale irrigation purposes (Robson and Banta, 1995). It is important to note that the target formation for production of hydrocarbons is the Dakota sandstone which is a primary water bearing unit in the bedrock aquifer system.

In the Project Area, alluvial aquifers suitable for beneficial use are found along Whitewater Creek, North Fork Kannah Creek and Kannah Creek. The alluvial aquifers include unconsolidated alluvium as well as near-surface weathered and fractured Mancos Shale on top of the consolidated Mancos Shale. The consolidated Mancos Shale acts as a confining unit between the alluvial aquifer and the underlying Dakota-Glen Canyon aquifer (Robson and Banta, 1995). Shallow domestic and stock wells with depths ranging from16 feet to 445 feet are completed in these aquifers. Groundwater in the shallow aquifer is presumed to flow along the topographic gradient.

Groundwater Quality. In locations where the Glen Canyon aquifer is less than 2,000 feet below land surface, the dissolved-solids concentration of water in the aquifer is less than 1,000 mg/L. However, in large areas where the aquifer is deeply buried, such as in parts of the Piceance Basin, the TDS concentration exceeds 35,000 mg/L (Robson and Banta, 1995). Due to the depth of the Dakota-Glen Canyon aquifer of over 4,000 feet in the Project Area, the TDS concentration in the aquifer is assumed to be elevated and not suitable for domestic or stock uses. The Dakota sandstone is the target formation for oil and gas production in the Project Area and has not been utilized for development of groundwater resources.

Springs and seeps sampled by the USGS (2012) are assumed to be representative of the water quality for the alluvial aquifers. Laboratory water quality was determined for three of the sampled springs/seeps: USGS 385558108192701 (seep along Kannah Creek) and USGS 390024108184001 and USGS 390025108183501 springs located near Whitewater Creek (Table 3.2-26, Map 3.2-4). The seep along Kannah Creek is of calcium-sulfate type, while both springs near Whitewater Creek are of calcium bicarbonate type. All springs in the Outlet Kannah Creek and North Kannah Creek subwatersheds have high specific conductance values above 2,500 µS/cm, while the springs in the Whitewater Creek subwatershed (with one exception) have a specific conductance below 500 µS/cm (Table 3.2-26).

Water Rights. Currently, 115 water rights on record at the Colorado Division of Water Resources (CDWR) within the Project Area boundary (CDWR, 2012b). Table 1 in Appendix H presents the points of diversion classified as diversions, wells, reservoirs and trans-basin structures. Diversions include ditches, springs and pump stations. Ninety diversions are located within the Project Area and they are concentrated along Kannah Creek and the North Fork of Kannah Creek. Eleven well water rights occur within the Project Area, which are also concentrated along Kannah Creek and the North Fork of Kannah Creek, as well as Whitewater Creek. The 12 reservoir points of diversion include Juniata, Hallenbeck and Reader reservoirs and other smaller bodies of water. The two trans-basin diversion structures are located at Juniata and Hallenbeck reservoirs. The Project Area points of diversion are summarized in Table 1 in Appendix H and are shown on Map 3.2-6.

Currently, the CDWR lists 64 well permits within the Project Area boundary including 49 permitted for domestic and/or stock water, 3 permitted for geothermal use and 12 permitted as monitoring wells. Well permit details are summarized in Table 2 in Appendix H. Total depth, depth to water and well yield are provided where available. The existing well permit locations are shown on Map 3.2-7.

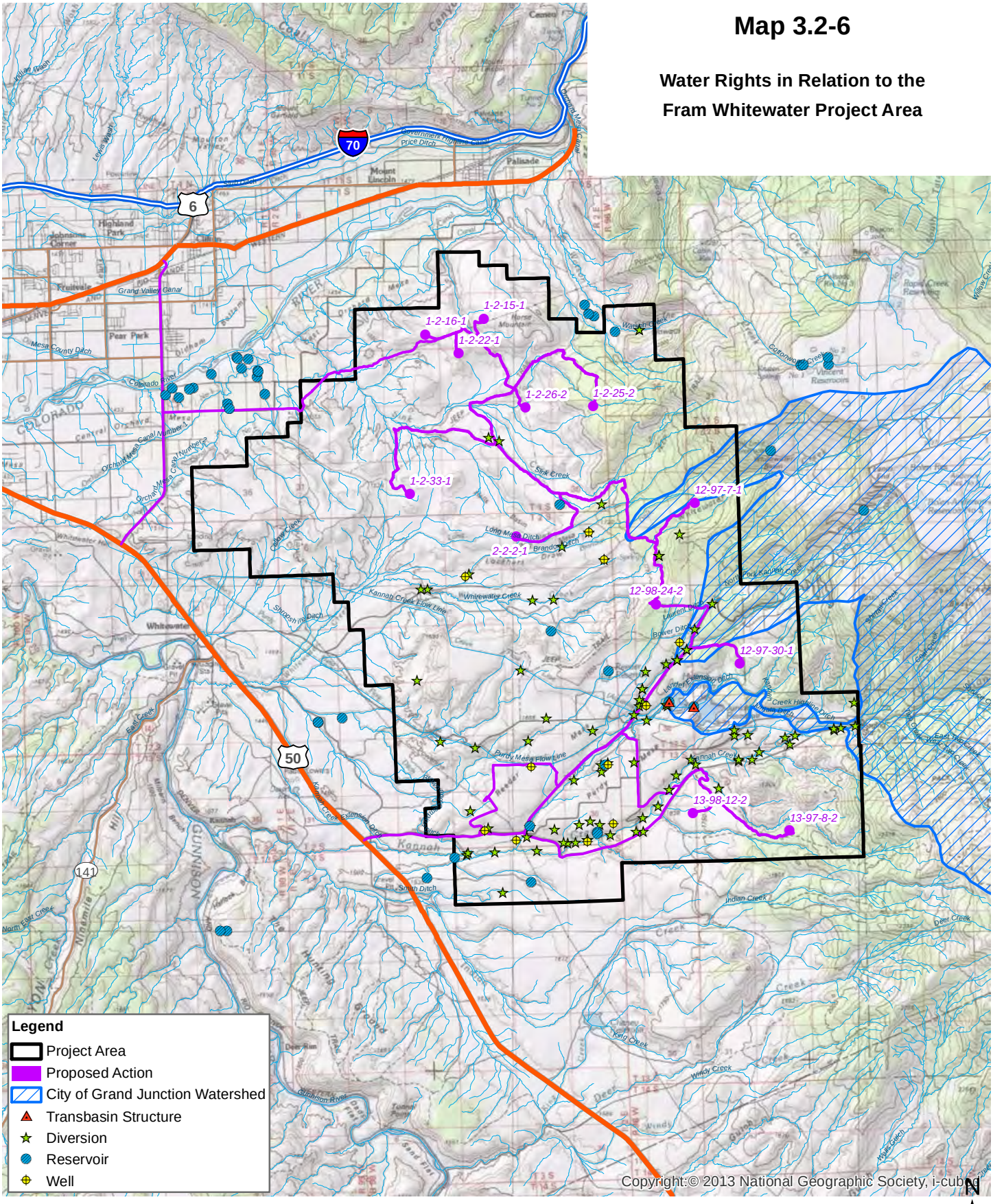
Public Land Health Standard 5 (Water Quality)

Standard 5: The water quality of all water bodies, including ground water where applicable, located on or influenced by BLM lands, will achieve or exceed the Water Quality Standards established by the State of Colorado.

Whitewater Creek downstream of Brandon Ditch within the Project Area is currently listed as impaired for sulfate and manganese. Lakes and reservoirs within the Kannah Creek subwatershed are under Colorado's Monitoring and Evaluation Parameters List for sulfate and the lower Gunnison River is on the monitoring list for sediment (CDPHE, 2012c). The land health standard for water quality is not currently being met.

Map 3.2-6

Water Rights in Relation to the Fram Whitewater Project Area



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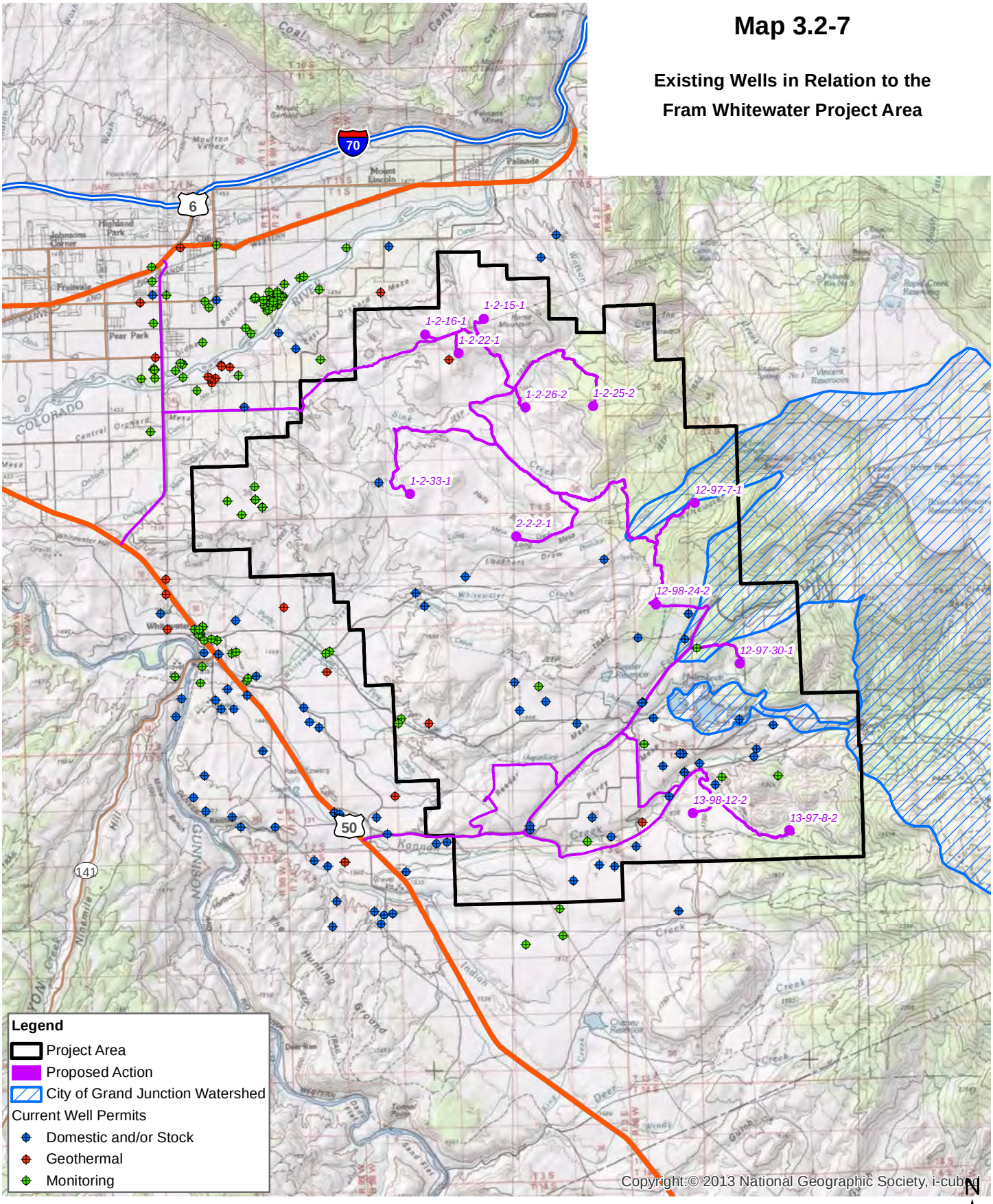
Map 3.2-7

Existing Wells in Relation to the Fram Whitewater Project Area



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3.2.4.2 Environmental Consequences

Proposed Action Alternative

Surface Water. Construction and operation of well pads, pipelines and roads has the potential to cause erosion and impact surface water resources. Construction of culverts for roads crossing perennial streams and municipal ditches would cause short-term impacts to surface water resources, but prevent long-term impacts. Construction and operations would be conducted to minimize impacts. Drill pads would be designed as zero discharge areas and no sediment transport to surface water would occur at these sites. Access roads would be upgraded and maintained as necessary to prevent soil erosion and accommodate year-round traffic. All construction (well pads, pipelines, roads) would be covered by Fram's General Construction Permit for storm water discharges from the CDPHE. The permit number for the Whitewater Unit is COR-03B947 and Fram has a SWMP currently in place which would be updated as necessary to include all new construction. BMPs, as required by the permits and plans, would be in place before, during and after construction until the location has reached final stabilization. All other requirements of the permits would be followed, such as the bi-weekly inspections and post-precipitation event inspections. Fram would follow BLM GJFO's Standard COAs as they apply to construction. However, there could be potential temporary short-term impacts to surface water quality in the form of elevated sediment delivery associated with the Proposed Action at road crossings of streams and municipal ditches even with BMPs in place.

Of special concern are potential impacts to the City of Grand Junction watershed (Map 3.2-2). Rule 317B, Public Water System Protection (COGCC, 2012), defines three buffer zones for classified water supply segments: an internal buffer from 0 – 300 feet, an intermediate buffer from 301 – 500 feet, and an external buffer from 501 - 2,640 feet. No proposed well pads are located within the internal or intermediate buffer zones. All well pads would be constructed outside of and/or down-gradient from the City of Grand Junction municipal watershed and would not impact the watershed. Proposed Federal 12-97-7-1 well pad would be located just outside the City of Grand Junction's watershed boundary and would be located to drain toward the Whitewater Creek drainage and not towards Brandon Ditch, which is part of the City of Grand Junction municipal water supply. Proposed Well Pad Federal 12-97-30-1 would be located outside of the watershed boundary, but upslope of Juniata Reservoir which is a major storage facility for the City of Grand Junction water. Well pad Federal 12-97-30-1 is proposed in the external buffer zone adjacent to an unnamed ephemeral stream flowing towards Juniata Reservoir. Lander Extension Ditch is located between proposed Well Pad Federal 12-97-30-1 and Juniata Reservoir and thus would prevent potential effects to Juniata Reservoir. The lease associated with this well pad contains a NSO stipulation due to the Grand Junction watershed. Fram would need to obtain an exception to the lease stipulation to build this well pad in its current proposed location. Fram proposes to drill a water monitoring well near this well pad to the depth of Juniata Reservoir for the City of Grand Junction. The requirements stated in Rule 317B (COGCC, 2012) for new oil and gas locations within the external buffer zone will be followed for well pad Federal 12-97-30-1. This includes pitless drilling systems or containment of all drilling flowback and stimulation fluids pursuant to Rule 904, and the notification of potentially impacted Public Water Systems 15 miles downstream, in this case the City of Grand Junction.

Access road and pipeline construction would cross Sink Creek, Whitewater Creek, North Fork Kannah Creek and Kannah Creek, along with several unnamed washes and tributaries with intermittent flows, ditches and flow lines. There is a potential for increased sedimentation to surface water during construction at stream crossings and during increased vehicular traffic during drilling and well completion, which would be on-going for 4 years. Sediment transport from disturbed areas near streams could also be actuated during high precipitation and flow events and could enter adjacent drainages or ditch areas, until disturbed areas are completely

stabilized by reclamation. Possible effects could include increased erosion and stream sedimentation due to changes in channel morphology associated with clearing and grading of stream banks, placement of fill for access roads in stream channels, installation of culverts and armored road crossings, in-stream trenching for gathering line placement and trench backfilling. In addition, near-surface soil compaction caused by construction equipment activity could reduce the soil's ability to absorb water and could increase surface runoff and the potential for ponding.

Although surface waters would be most susceptible to sedimentation over the short term, access roads would remain in place over the life of the wells (i.e., 20 years) and could channel runoff during periods of precipitation. The greatest sediment load would occur immediately downstream of stream and ditch crossings and suspended sediment concentration would progressively decrease downstream as the sediment settles in the stream channel. If the near stream disturbed areas include the Mancos Shale there is the possibility that selenium concentrations could increase near the area of disturbed shale. Destabilization of upland watershed and the network of surface water drainages would contribute towards increased sedimentation, salinity, and salt loading to receiving surface waters. Quantification of these impacts may be difficult to decipher from impacts resulting from other land uses in the area. Distance to receiving waters (Colorado and Gunnison Rivers) would have a natural attenuating effect on the degree of impacts. No sediment induced impacts are expected at the Gunnison River or the Colorado River because confluences of Project Area perennial drainages are over 10 miles downstream from any proposed Project disturbance.

Several existing roads within the Project Area would be used to access the proposed well pads. Pipelines for oil, gas and produced water would be constructed along access roads. Proposed disturbances for new pipeline construction would cross streambeds, drainages, ditches, or flow lines at 42 sites in the Project Area and may change existing erosion patterns. Access road water crossings would be improved for several of the proposed water crossings. Improvements to road crossings could decrease erosion. Two new resource roads are proposed, one with a low water crossing of an ephemeral stream in the Outlet Kannah Creek subwatershed. The proposed new buried pipelines would cross ephemeral or intermittent creeks or streams in 35 locations; ditches in five locations, and flow lines in four locations (Table 3.2-28).

Access roads would cross municipal ditches, but are not expected to impact the City of Grand Junction municipal water supply. Five ditches would be crossed: Brandon Ditch, Long Mesa Ditch, Lockhart Ditch, Lander Extension Ditch and one unnamed ditch would be crossed by pipelines and access roads which would be upgraded.

All City of Grand Junction municipal water is delivered via three underground pipelines: a pipeline starting at the Brandon Ditch diversion, Purdy Mesa Flow Line and Kannah Creek Flow Line. The Brandon Ditch diversion is upstream of the road crossing. Water in Brandon, Long Mesa and Lockhart ditches located downstream of the road crossing is used for irrigation and stock watering and not for the municipal water supply. The Kannah Creek Flow Line and Purdy Mesa Flow Line are buried concrete municipal water aqueducts that are crossed by the existing access road (Lands End Road) and no impacts are expected at this site.

Road construction for proposed Federal 12-97-30-1 well pad near North Kannah Creek is the only road construction that would occur within the City of Grand Junction watershed boundary. Along with road construction, pipeline construction would also occur. Additional disturbance for pipeline construction through the City of Grand Junction watershed would occur near Brandon Ditch, to connect the northern area wells to the Sink Creek Facility. On private lands owned by the City of Grand Junction, Fram would be required to obtain a City of Grand Junction watershed permit before excavating, grading, filling or surfacing 100 cubic yards or more.

Table 3.2-28
Water Crossings

Crossing ID	Surface Water Site	Stream Type	Road Name[1]	Current Description[1]	Road Upgrades Proposed	UTM X (NAD 83)	UTM Y (NAD 83)	Distance to Colorado or Gunnison River (miles)
Streams								
x1	Unnamed Stream	Intermittent	BLM 7265	Bladed 4WD Road	yes	728281	4328802	2.01
x2	Unnamed Stream	Intermittent	BLM 7265	Bladed 4WD Road	yes	728290	4328681	2.08
x3	Unnamed Stream	Intermittent	BLM 7265	Bladed 4WD Road	yes	728305	4328609	2.13
x4	Unnamed Stream	Intermittent	BLM 7265	Bladed 4WD Road	yes	728326	4328561	2.16
x5	Unnamed Stream	Intermittent	BLM 7265	Bladed 4WD Road	yes	728365	4328308	2.32
x6	Unnamed Stream	Intermittent	BLM 7265	Bladed 4WD Road	yes	728509	4327974	2.57
x7	Unnamed Stream	Intermittent	BLM 7265	Bladed 4WD Road	yes	728614	4327894	2.66
x8	Unnamed Stream	Intermittent	BLM 7265	Bladed 4WD Road	yes	728629	4327784	2.73
x9	Unnamed Stream	Intermittent	BLM 7265	Bladed 4WD Road	yes	728707	4327659	2.82
x10	Unnamed Stream	Intermittent	unnamed	Unimproved 4WD Road	yes	728858	4327442	2.99
x11	Unnamed Stream	Intermittent	BLM 7265	Bladed 4WD Road	yes	731104	4326945	7.17
x12	Unnamed Stream	Intermittent	BLM 7265	Bladed 4WD Road	yes	730532	4326663	6.73
x13	Unnamed Stream	Intermittent	BLM 7265	Bladed 4WD Road	yes	729816	4326235	5.73
x14	Unnamed Stream	Intermittent	---	Proposed Road	New Road	732338	4325492	8.16
x15	Unnamed Stream	Intermittent	unnamed	Bladed 4WD Road	yes	730152	4325458	5.66
x16	Unnamed Stream	Intermittent	BLM 7265I	Bladed 4WD Road	yes	728723	4325423	4.85
x17	Sink Creek	Intermittent	BLM 7265I	Bladed 4WD Road	yes	728724	4325413	4.86
x18	Unnamed Stream	Intermittent	unnamed	Unimproved 4WD Road	yes	726752	4324790	3.43
x19	Unnamed	Intermittent	unnamed	Unimproved 4WD	yes	726549	4323514	4.15

Crossing ID	Surface Water Site	Stream Type	Road Name[1]	Current Description[1]	Road Upgrades Proposed	UTM X (NAD 83)	UTM Y (NAD 83)	Distance to Colorado or Gunnison River (miles)
	Stream			Road				
x20	Unnamed Stream	Intermittent	BLM 7265I	Bladed 4WD Road	yes	730653	4323281	6.77
x21	Unnamed Stream	Intermittent	BLM 7269	Bladed 2WD	yes	731346	4322744	7.43
x25	Whitewater Creek	Intermittent	unnamed	Bladed 4WD Road	yes	734235	4321763	11.82
x26	Whitewater Creek	Intermittent	BLM 7265	Bladed 4WD Road	no	734002	4321495	11.58
x27	Unnamed Stream	Intermittent	BLM 7265	Bladed 4WD Road	no	734237	4320801	11.45
x31	North Fork Kannah Creek	Intermittent	Lands End Road	2WD Gravel 2 lane County Road	no	733139	4316012	9.74
x32	North Fork Kannah Creek	Intermittent	Divide Road	2WD Gravel 2 lane County Road	no	733147	4315937	9.70
x34	Unnamed Stream	Intermittent	Lands End Road	2WD Gravel 2 lane County Road	no	732321	4315407	8.99
x37	Unnamed Stream	Intermittent	---	Existing Pipeline Corridor	no	731113	4314967	8.41
x38	Unnamed Stream	Intermittent	Kannah Creek Road	2WD Paved 2 lane County Road	no	735404	4314916	11.05
x39	Unnamed Stream	Intermittent	Kannah Creek Road	2WD Paved 2 lane County Road	no	735156	4314811	10.89
x40	Unnamed Stream	Intermittent	BLM 7254	2WD Road	yes	735481	4314376	11.24
x41	Unnamed Stream	Intermittent	---	Existing Pipeline Corridor	no	734440	4314227	10.22
x42	Kannah Creek	Intermittent	---	Existing Pipeline Corridor	no	734373	4314210	10.16
x43	Unnamed Stream	Intermittent	BLM 7254	2WD Road	yes	735696	4314196	11.42
x44	Unnamed Stream	Intermittent	---	Proposed Road	yes	735575	4313741	11.07
Ditches								
x22	Long Mesa	Intermittent	BLM 7265	Bladed 4WD Road	no	733280	4322626	10.36

Crossing ID	Surface Water Site	Stream Type	Road Name[1]	Current Description[1]	Road Upgrades Proposed	UTM X (NAD 83)	UTM Y (NAD 83)	Distance to Colorado or Gunnison River (miles)
	Ditch							
x23	Lockhart Ditch	Perennial	BLM 7265	Bladed 4WD Road	no	733267	4322453	10.54
x24	Brandon Ditch	Perennial	BLM 7265	Bladed 4WD Road	no	733277	4322032	10.39
x29	Lander Extension Ditch		Lands End Road	2WD Gravel 2 lane County Road	no	733518	4316517	10.35
x33	Unnamed Ditch		Divide Road	2WD Gravel 2 lane County Road	no	733263	4315852	9.66
Flow Lines								
x28	Kannah Creek Flow Line	Perennial	Lands End Road	2WD Gravel 2 lane County Road	no	733523	4316525	10.36
x30	Purdy Mesa Flow Line	Perennial	Lands End Road	2WD Gravel 2 lane County Road	no	733292	4316168	9.88
x35	Purdy Mesa Flow Line	Perennial	---	Existing Pipeline Corridor	no	730489	4315056	8.89
x36	Purdy Mesa Flow Line	Perennial	---	Existing Pipeline Corridor	no	731052	4315048	8.54

[1] BLM, 2012b.
4WD - Requires four-wheel drive or high clearance vehicle.
2WD - Suitable for two-wheel drive vehicles.

In addition to the potential effects of sedimentation, there would also be a potential risk of contamination of surface water during accidental releases of drilling fluids, produced water, condensate, lubricants and fuels and other chemicals that could into flow into streams or ditches during transport. Well pads would be designed as zero discharge areas and any accidental releases at these sites would be contained. Fram has prepared and would follow an SPCC Plan.

Fram would also follow all applicable rules and regulations stipulated by COGCC (2012) including:

- Maintain MSDS for any chemical products brought to a well site for use down hole during drilling, completion and work-over operations (Rule 205b).
- Maintain a chemical inventory by well site for each chemical product used downhole during drilling, completion and work-over operations, in an amount exceeding five hundred (500) pounds during any quarterly reporting period. Fram would also maintain a chemical inventory by well site for fuel stored at the well site during drilling, completion and work-over operations in an amount exceeding five hundred (500) pounds during any quarterly reporting period (Rule 205c).
- Complete and maintain a compliance checklist (Rule 206b).
- Submit APDs (Rule 303).
- State Groundwater Baseline Sampling and Monitoring (New Rule 609).

All installed production facilities (storage tanks, load-outs, separators, treating units, etc.) with the potential to leak or spill oil, condensate, produced water, glycol, or other fluid which may be a hazard to public health or safety would be placed within an appropriate impervious secondary containment structure that would hold 110 percent of the capacity of the largest single container within it for 72 hours.

Chemical containers would be clearly labeled, maintained in good condition and placed within secondary containment. They would not be stored on bare ground, nor exposed to sun and moisture. Produced water of approximately 3 to 5 barrels per day per well would be transferred by a water gathering line to the compressor sites or other yet to be determined central location. Produced water would be trucked off-site to an approved commercial disposal facility.

Fresh water would be used for drilling. This water would be hauled by truck over designated travel routes. The volume of water used in drilling operations is dependent on the depth of the well and any losses that might occur during drilling. The water would be purchased from the City of Grand Junction. All potential water pumping locations are on North Fork Kannah Creek or tributaries to North Fork Kannah Creek. Potential impacts to surface water would be further minimized if the trucks using the load-out are dedicated to freshwater transports and if they are equipped with check valves that prevent backflow into the water source.

Preventive measures, proper site management and spill response procedures during construction, drilling and well completion along with interim reclamation following construction would reduce the effects of erosion and sedimentation as well as prevent contamination from accidental releases of petroleum products and other chemicals. The preventive measures that would be implemented would follow recommendations outlined in the Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development, “Gold Book”, (BLM and Forest Service, 2007), BMPs and other preventive measures that would be required by the State’s site specific Storm Water Discharge Permit and SWMP and where applicable, recommendations from the Watershed Plan for the Town of Palisade and the City of Grand Junction (Town of Palisade and the City of Grand Junction et al., 2007).

Groundwater. The proposed wells would be located on top of the Mancos Shale or quaternary gravel and alluvial deposits and penetrate the groundwater zone of the Dakota Formation which also is the target formation for oil and gas production. Drilling would target production zones at approximate depths of 4,500-5,000 feet. In the Project Area, bedrock aquifers are not developed for groundwater uses due to poor water quality and depth to producing formations as outlined in Section 3.2.4.1, above. Therefore, the principal groundwater resource that could be impacted from the Proposed Action is represented by shallow alluvial aquifers located within tributary drainages to both the Gunnison and Colorado rivers.

Impacts to groundwater resources in alluvial aquifers include potential contamination from accidental surface releases of drilling fluids, produced water and fluid minerals, lubricants, fuels and other harmful chemicals. Hydrocarbons could also migrate from gas producing strata penetrated by the wellbore during drilling, during initial production, and following well completion if the well had a faulty annular seal. If these impacts were to occur, designated use types for usable groundwater would be degraded and potentially be rendered unusable. However, compliance with all applicable COGCC regulations, Project Design Features outlined in section 2.2.2.11 and BLM COAs (listed below) to protect groundwater (and surface-water) resources would effectively reduce potential for contamination and effectively mitigate impacts if an undesirable event were to occur.

Specifically, groundwater contamination in shallow gravel and alluvial aquifers from accidental spills could occur where well pads or access roads are located on gravel and alluvium with local aquifers. Well pad 13-98-12-2 is located in a zone of quaternary glacial outwash (Map 3.2-5). Containment methods (see Section 2.2.2.11) designed to protect surface water would also serve to prevent any spills from reaching groundwater areas of shallow alluvial aquifers. The low permeable nature of the Mancos Shale would be expected to prevent any contamination from reaching the Dakota aquifer although the Dakota aquifer does not produce usable groundwater in the area and is the hydrocarbon producing formation. The bedrock formation below the well pad upstream of City of Grand Junction watershed (Federal 12-97-30-1) is Mancos Shale, which would prevent subsurface flow from contaminating alluvial groundwater. Project Design Features of the Proposed Action outlined in section 2.2.2.11 to protect both surface and groundwater would serve to protect groundwater in alluvial deposits between the proposed well pad and Juanita Reservoir. No direct, indirect, or cumulative impacts to groundwater quality or quantity are anticipated with implementation of the Proposed Action.

Dry or non-producing wells would be plugged, abandoned, and reclaimed within 90 days of well completion, weather permitting. Upon abandonment, each borehole would be plugged, capped, and its related surface equipment removed. Subsurface pipelines would be plugged at specific intervals. A Sundry Notice would be submitted to the BLM that describes the engineering, technical, and/or environmental aspects of final plugging and abandonment. This notice would describe final reclamation procedures and mitigation measures associated with the final reclamation. The BLM and the COGCC standards (COGCC, 2012) for plugging would be followed. A configuration diagram, a summary of plugging procedures and a job summary with techniques used to plug the wellbore (e.g., cementation) would be included in the Sundry Notice.

Water Rights. All planned operations have been designed to minimize impacts on surface and groundwater resources. No impacts to ground or surface water quality or quantity regarding water rights are expected.

Fram would purchase water for drilling, completion, dust control and hydrostatic testing from the City of Grand Junction. Because water from existing water rights would be used, no new impacts on water rights beyond those already permitted would occur.

Protective/Mitigation Measures
In addition to the Project Design Features listed in Chapter 2 and the BLM GJFO Standard COAs in Appendix C, the BLM would require the following measures to further reduce impacts to hydrology and water quality:

- Water supply trucks carrying fresh water should be dedicated to freshwater transport only. Transports that previously carried produced water, exploration and production waste, or other liquid or solid waste would not be used to transport fresh water. Dedicated freshwater trucks should be clearly labelled, so that they may be identified in the field.
- Freshwater transports should be equipped with check valves to prevent backflow into the water source.
- If hydrostatic test water or trench dewatering water is discharged, it should be discharged to an upland area at least 150 feet from WoUS and wetlands, in a manner so that it infiltrates into the ground without causing erosion. BLM approval of the discharge location and proposed BMPs should be obtained before discharging hydrostatic test water to an upland area. All discharges of hydrostatic test water should be in compliance with State permits and requirements.
- Any construction activities at perennial, intermittent and ephemeral drainage crossings (e.g. burying pipelines, installing culverts) should occur when no flowing water is present.
- Engineered culverts or bridges should be required at crossings of all ditches and perennial or intermittent stream channels, rather than low water crossings. Engineered plans should be provided to the BLM for approval with APDs or before crossing construction.
- A copy of the authorization from the State of Colorado to construct the monitoring well near well pad Federal 12-97-30-1 should be provided to the BLM.
- Copies of data collected by the City of Grand Junction from the monitoring well near well pad Federal 12-97-30-1 should be provided to the BLM prior to construction.
- Pipelines that cross perennial, intermittent and ephemeral stream channels should be constructed to withstand floods of extreme magnitude to prevent rupture and accidental contamination of runoff during high flow events. Methods and analysis outlined in BLM technical note 423-Hydraulic Considerations for Pipelines Crossing Stream Channels (DOI, 2007) should be closely followed to prevent undesirable events.
- A copy of the SPCC Plan should be provided to the BLM with the APD submittal, including locations of stored/staged emergency spill response equipment.
- Staging, refueling and storage areas should be located further than 300 feet from any reservoir, lake, wetland, or natural perennial or seasonally flowing stream or river.
- Emergency spill response equipment should be stored and staged at strategic locations along perennial water courses so that it is available to expedite effective spill response.
- All vehicles should be fueled within secondary containment structures.

Single Access Alternative
Under the Single Access Alternative, potential impacts to surface water and groundwater would be similar to those described above for the Proposed Action. Upgrading and use of the northern access route would not occur and associated impacts would also not occur.

B Road Alternative
WestWater Engineering (2013) identified five potential WoUS crossings along the alternate northern access route that could fall under the jurisdiction of the COE; no associated wetlands

were observed. Table 3.2-29 summarizes the additional WoUS that would be affected if B Road Alternative is selected (data from WestWater Engineering, 2013). Road improvements adjacent to identified WoUS and improvements to channel crossings would be necessary along this proposed route. If this alternate is selected, consultation with the COE would be appropriate to determine jurisdictional status and permitting requirements for the WoUS demonstrating any ordinary high water mark (OHWM; Table 3.2-29). Under the B Road Alternative, potential impacts to surface water and groundwater would be similar to those described above for the Proposed Action.

Table 3.2-29
Potential WoUS Crossed by B Road Alternative

Crossing ID	Surface Water Site	Stream Type	UTM X (NAD 83)	UTM Y (NAD 83)	Comments	Distance to Colorado and Gunnison River (miles)
Potential WoUS						
WOUS-1	Unnamed Tributary to Colorado River	Intermittent	724048	4323945	OHWM not very evident; ~ 4 feet wide X 5 inches deep. Vegetation below OHWM.	1.7 to 8.7
WOUS-2	Unnamed Tributary to Sink Creek	Intermittent	725559	4324586	OHWM ~ 1.5 feet wide X 4 inches deep.	3.1 to 12.4
WOUS-3	Unnamed Tributary to Sink Creek	Intermittent	725145	4324849	OHWM ~ 3 feet wide X 4 inches deep.	3.2 to 12.5
WOUS-4	Unnamed Tributary to Sink Creek	Intermittent	725424	4324572	OHWM ~ 2 feet wide X 3 inches deep.	3.2 to 12.5
WOUS-5	Unnamed Tributary to Sink Creek	Intermittent	726315	4324765	OHWM ~ 3 feet wide X 6 inches deep; dry wash joins this drainage.	3.3 to 12.6

[1] Source: WestWater Engineering, 2013.

No Action Alternative

Under this alternative, no Project-related impacts to water quality would occur on BLM-administered land from construction and operation of any of the action alternatives described above.

Finding on the Public Land Health Standard 5

Selenium, manganese and sulfate are associated with sediment runoff in water, which is caused by erosion. While erosion rates are naturally high in many local areas, erosion tends to be accelerated by land uses. Land use disturbances of marine-derived shale enhance the introduction of dissolved materials into the river systems. Increased recreational uses, energy development and surface-disturbing activities such as pipelines and roads, can increase erosion and sediment transport. With implementation of BMPs and the use of the proposed protective measures, the Proposed Action Alternative would not likely cause further deterioration of water quality in these streams. No changes in Land Health Standard 5 are anticipated under the Proposed Action if the Project Design Features and mitigation measures are properly implemented.

Similar to the Proposed Action Alternative, with implementation of BMPs and the use of proposed protective measures, the Single Access Alternative and B Road Alternative would not likely cause further deterioration of water quality in these streams and no changes in Land Health Standard 5 are anticipated.

Under the No Action Alternative, effects from existing and new surface disturbances (unrelated to the Proposed Action) would continue and could affect Public Land Health Standard 5.

3.2.5 Noise

3.2.5.1 Current Conditions

Noise measurements are not available for the Project Area. Local conditions such as traffic, topography and high winds characteristic of the region can alter background noise conditions. In general, sound levels (decibels – dB) at outdoor rural residential locations are about 40 dB, averaged for day and night periods (see for example, EPA, 1974). With existing levels of vehicular traffic, natural resource development and ranching activities average ambient noise levels are expected to be in the range of 35 to 45 dB and probably near an average of 40 dB for day and night conditions.

U.S. Highway 50 is 0.5 to 2.2 miles away from the western Project Area boundary. In 2011, an average 11,235 vehicles per day (including 847 trucks per day) utilized 6.5 miles of U.S. Highway 50 between SH 141 and Kannah Creek Road (weighted averages from Table 3.4-1). Noise produced by traffic, with volume of 500 vehicles per hour, traveling at speeds of 65 mph, is estimated at 69.7 dBA 50 feet away from the highway (Table 7-3 in Washington State Department of Transportation - WSDOT, 2011a). Noise from vehicular traffic on U.S. Highway 50 would attenuate, or gradually decrease, to background levels between 0.8 and 7.7 miles away, depending on topography and ground conditions. Vehicle noise on local roads would generally be limited to sound generated by individual vehicles such as a pickup truck or flatbed truck.

3.2.5.2 Environmental Consequences

Proposed Action Alternative

The Proposed Action would be most likely to increase local noise levels during the most active phases of field development, construction, well drilling and completion. Elevated noise levels during production and operation would likely be lower. Noise levels 50 feet away from typical construction equipment used to construct well pads, pipelines, and roads, including upgrading existing roads, are provided in Table 3.2-30. Included are distances for noise to attenuate to background ambient levels under hard site surface conditions (including bare ground, rock, pavement) and soft site conditions (roughened ground, vegetated surfaces).

Assuming that noise due to construction and operation would be classified as point sources, the standard reduction for point source noise is 6 dB per doubling of distance (under hard surface conditions such as bare ground, rock, pavement) from the source (WSDOT, 2011a). Ground conditions (such as roughened ground and vegetated surfaces) may further diminish noise from a point source by an additional reduction of 1.5 dB per doubling of distance (under soft site conditions, including roughened ground or vegetated surfaces) from the source so that noise reduction could be 7.5 dB per doubling of distance, rather than 6 dB, the standard reduction point. Distances at which noise from construction equipment would attenuate to 40 dBA under hard site and soft site conditions are included in Table 3.2-30. The estimates assume no intervening tree cover or topographic features, which if present, would provide additional noise attenuation.

Table 3.2-30
Average Maximum Noise (Lmax) at 50 feet from Construction Equipment and Estimated Distance to Attenuate to Background [1]

Construction Activity	Equipment	Noise dBA (L_{max} measured at 50 feet) [2]	Distance (feet) to Attenuate to Assumed Ambient Noise Level of 40 dBA [1]	
			Soft Site Reduction at 7.5 dBA per double of distance	Hard Site Reduction at 6 dBA per double of distance
Clearing and Grading	Grader	85	3,200	9,051
	Scraper	84	2,917	8.063
	Warning Horn	83	2,660	7,184
	Dozer	82	2,425	6,400
	Excavator	81	2,211	5,702
	Backhoe	78	1,676	4,032
	Pickup Truck	75	1,270	2,851
	Flatbed Truck	74	1,158	2,540
Stationary Equipment	Pneumatic Tools	85	3,200	9,051
	Generator	81	2,211	5,702
	Air Compressor	78	1,676	4,032
	Welder Torch	74	1,158	2,540

[1] WSDOT, 2011a.
[2] Federal Highway Administration, 2006.

Drilling a well would require 10 days; completions would take 5 days (Chapter 2). Because proposed well pads are relatively small (360 feet by 300 feet), construction is expected to require a few days. Noise from typical construction machinery ranges from 74 to 85 dBA. Drilling noise levels would depend on types of rigs and applied horsepower. On natural gas well pads, drilling rig noise ranges from 85 dBA to peak break noise levels of 105 dBA at 10 feet (71 to 91 dBA at 50 feet) (Behrens and Associates, 2006). During production, each well pad would have wellheads and separator units that could produce noise but at lower levels than construction equipment and drill rigs.

The Noise Control Act of 1972, as amended by the Quiet Communities Act of 1978 (42 USC 4901 et seq.), delegates the authority to regulate noise to the states and directs government agencies to comply with local noise regulations. Colorado has a regulation specifying quantitative limits on noise (CRS 25-12-103). Table 3.2-31 lists the noise limits in Colorado's Noise Abatement Law. COGCC Amended Rules (800 Series–Aesthetic and Noise Control Regulations) include section 802-Noise Abatement requirements for oil and gas operations at well sites, production facilities, or gas facilities. These requirements apply the noise limits of the state's Noise Abatement Law. The law and COGCC rules require oil and gas operations at any well site, production facility, or gas facility to comply with the maximum permissible noise levels in Table 3.2-31. COGCC rules allow operations involving pipeline or gas facility installation or maintenance, the use of a drilling rig, completion rig, work-over rig, or stimulation to be subject to the maximum permissible noise levels for industrial zones.

Table 3.2-31
Colorado Limits on Maximum Permissible Noise Levels[1]

Land Use Zone	Maximum Permissible Noise Level[2]	
	7:00 am to next 7:00 pm[3]	7:00 pm to next 7:00 am
Residential/Agricultural/Rural	55 dBA	50 dBA
Commercial	60 dBA	55 dBA
Light industrial	70 dBA	65 dBA
Industrial	80 dBA	75 dBA

[1] Source: CRS 25-12-101 et seq.
[2] Noise levels from oil and gas facilities located on surface property owned, leased or otherwise controlled by the operator shall be measured at three hundred and fifty (350) feet or at the property line, whichever is greater.
[3] In the hours between 7:00 a.m. and the next 7:00 p.m. the noise levels permitted may be increased 10 dBA for a period not to exceed 15 minutes in any one hour period. The allowable noise level for periodic, impulsive or shrill noises is reduced by 5 dBA from the levels shown.

The type of land use in the surrounding area is determined by the COGCC in consultation with the local governmental designee taking into consideration applicable zoning or other local land use designations. Private land parcels along Kannah Creek have been mapped as Residential and Agricultural by Mesa County.

Proposed Project activities include well pad construction, well drilling (and completions operations, assumed to be equivalent to noise produced by drilling), construction of new roads, upgrading existing roads and traffic (single vehicle) once operational, pipeline construction. Maximum noise has been estimated based on multiple equipment operating simultaneously at a single site (for example, a grader and shovel during well pad clearing and grading) and based on standard rules for decibel addition (WSDOT, 2011a). The closest residence to a proposed well pad is nearest residence to a proposed well pad is 0.6 mile north of Well Pad 1-2-16-1. In no instance would noise at any residence or property exceed the COGCC rule allowing noise from a drilling rig, completion rig, or work-over rig is subject to the maximum permissible noise levels for industrial zones (80 dBA day, 75 dBA night). If peak drilling noises are 71 to 91 dBA at 50 feet away, they would attenuate to 75 dBA between 220 and 317 feet away from the drilling equipment. Noise from construction equipment would attenuate to 55 dBA (construction would not occur at night) between 1,100 feet and 2,260 feet away from the edges of well pads and would not exceed the maximum permissible noise levels at residences. Noise produced during production would be near ambient levels at residences.

Protective/Mitigation Measures

In addition to the Project Design Features listed in Chapter 2 and the BLM GJFO Standard COAs in Appendix C, the BLM would require the following measures to further reduce impacts resulting from noise:

- Fram should minimize noise to reduce potential impacts to birds, wildlife and public.
- Construction should occur during daylight hours, when there is less sensitivity to sound.
- All equipment should have sound control devices no less effective than those provided by the manufacturer. All equipment should have muffled exhausts.
- Consistent with COGCC 800-series rules for noise abatement, oil and gas operations at any well site, production facility, or gas facility should comply with the COGCC maximum permissible noise levels. Where noise reduction is shown to be necessary, moveable

paneled noise shields, barriers, or enclosures should be installed adjacent to or around noisy equipment, where required to meet the Project noise limits.

- Generator(s) serving drilling rigs should be installed and operated at the site in a manner that at least meets the COGCC's Noise Abatement regulation (No. 802) for Residential/Agricultural/Rural Zones. This regulation requires that the noise level not exceed 50 dbA.

Single Access Alternative

Noise impacts under the Single Access Alternative would be similar to those described above for the Proposed Action Alternative; however, construction noise would not occur during the winter months in the northern portion of the Project Area without the northern access route.

B Road Alternative

Noise impacts under the B Road Alternative would be similar to those described above for the Proposed Action. Additional temporary noise would occur from construction of 2.74 miles of new road under this alternative.

No Action Alternative

Under the No Action Alternative, no impacts resulting from noise from any of the action alternatives described above would occur.

3.3 BIOLOGICAL RESOURCES

3.3.1 Invasive, Non-native Species

3.3.1.1 Current Conditions

Several lists of noxious weeds have been identified under the Colorado Noxious Weed Act (Title 35, Article 5.5). The "A" list includes species in Colorado that the Department of Agriculture Commissioner designated for eradication. Alternatively, "B" listed species are those designated by the Commissioner (in consultation with the state noxious weed advisory committee, local governments and other interested parties) for inclusion in state noxious weed management plans designed to stop the continued spread of these species. "C" listed species are also designated for state noxious weed management plans to support control and weed management on private and public lands by local governments with the goal of providing additional education, research and biological control resources to jurisdictions that choose to require management of List C species (Colorado Department of Agriculture, 2012).

No A-listed species were found within the Project Area; however, B- and C-listed species were observed (Table 3.3-1). Five B-listed species occur within the Project Area; the most common is whitetop (hoary cress). Four C-listed species are present. The Mesa County Noxious Weed Management Plan has designated 19 species as noxious weeds (Mesa County Division of Pest Management, 2009), all of which occur on the Colorado State noxious weed A or B list. Four noxious weed species included in the Mesa County Noxious Weed Management Plan have been documented within the Project Area. Eight additional non-native plant species, some with weedy characteristics, were observed during botanical surveys and have been included in Table 3.3-1.

Table 3.3-1
Noxious Weeds and Non-Native Plant Species Observed in the Project Area

Common Name Scientific Name	Mesa County Noxious Weed List [2]	Observation [4]
Colorado State B List [1]		
Russian Knapweed *Acroptilon (Centaurea) repens*	X	Present in dense patches on Purdy Mesa, Reeder Mesa, in Lockhart Draw, along Whitewater Creek and Sink Creek; in a drainage bottom on Horse Mountain.
Hoary Cress (Whitetop) *Cardaria draba*	X	Present throughout Project Area, especially in irrigated pastures and irrigation ditches along Kannah Creek.
Musk Thistle *Carduus nutans*	X	Present, scattered along irrigation ditches to Juniata Reservoir, along North Fork and in altered Pinyon-Juniper woodland.
Russian Olive *Elaeagnus angustifolia*		Present along irrigated pastures on Purdy and Reeder mesas and along North Fork.
Tamarisk (Saltcedar) *Tamarix ramosissima*	X	Present along irrigated pastures on Purdy and Reeder mesas, especially along North Fork and along Sink Creek.
Colorado State C List		
Downy Brome (Cheatgrass) *Bromus tectorum*		Present in dense infestations throughout mesa tops and dry drainages; along roadsides in previously disturbed areas.
Field Bindweed *Convolvulus arvensis*		Common in disturbed areas; bottom of drainage on Horse Mountain.
Halogeton *Halogeton glomeratus*		Common along roadsides and along dry mesas near Horse Mountain; along roadsides in previously disturbed areas.
Common Mullein *Verbascum Thapsus*		Present in burned Pinyon-Juniper vegetation along Whitewater Creek.
Other Non-Native, Non-listed Species [3]		
Crested Wheatgrass *Agropyron desertorum*		Present.
Lambsquarter *Chenopodium album*		Present.
Blue Mustard *Chorispora tenella*		Present.
Chicory *Cichorium intybus*		Present in southwestern Reeder Mesa.
Annual Wheatgrass *Eremopyrum triticeum*		Present.
Clasping Pepperweed *Lepedium perfoliatum*		Present.
Russian Thistle (Tumbleweed) *Salsola australis*		Present.
Tumbling Mustard *Sisymbrium altissimum*		Present.

Sources:
[1] Colorado Department of Agriculture, 2012.
[2] Mesa County Division of Pest Management, 2009.
[3] Whitson et al., 1996.
[4] WestWater Engineering, 2010, 2011, 2012a and 2012b.

3.3.1.2 Environmental Consequences

Proposed Action Alternative

The Proposed Action could affect abundance and diversity of noxious weeds through one or more of the following pathways:

1. Clearing native vegetation, disturbing, and exposing bare ground surfaces to allow establishment and growth of weed species;
2. Transporting weeds from established infestations by mud on vehicles and construction equipment; and
3. Reducing vigor and reproduction of native plants through dust deposition, interference with photosynthesis and impacts to pollinators of native plant species can allow weeds to invade and increase in affected locations.

Surface disturbance, increased vehicle traffic, equipment placement and operation, foot traffic and other activities associated with the Proposed Action could increase the distributions of established weed species (see Table 3.3-1) and/or could introduce new invasive species into areas that are not currently infested. Clearing native vegetation, disturbing and exposing bare ground surfaces, especially within closed canopy big sagebrush shrub communities, allows invasive species, particularly annuals, to become established at the expense of perennial bunchgrasses (West, 1988).

Surface disturbance that was revegetated as soon as possible after construction would be less likely to be infested by weeds than if it were left as exposed soil for longer periods. If revegetation efforts were not successful, the likelihood of weed infestation would be much higher and would require controlling and monitoring invasive non-native plants and noxious weeds as necessary components of reclamation (BLM and Forest Service, 2007). Fram plans to revegetate/reclaim disturbance resulting from pipeline installation and road construction at the time of installation, which would minimize the potential for the disturbed areas to be infested with invasive and noxious weeds.

As mandated by the Colorado Noxious Weed Act and the Colorado Oil and Gas Conservation Act and in conformance with the Weed Management and Invasive Species Program (also see BLM, 2007a), oil and gas operators would control noxious weeds on lands they disturb during oil and gas exploration and development, including well pads, facilities, pipelines, roads and any other disturbed areas on BLM-administered lands and private property. Controlling listed weeds would become more difficult to achieve on disturbed surfaces following implementation of the Proposed Action.

Protective/Mitigation Measures

In addition to the Project Design Features listed in Chapter 2 and the BLM GJFO Standard COAs in Appendix C, the BLM would require the following measures to further reduce impacts resulting from invasive, non-native species:

- In areas with sensitive plant species, weed treatments should be limited to spot treatments and require site-specific pre-approval by the BLM.

Single Access Alternative

The abundance and diversity of noxious weeds could be affected through the same pathways that were described above for the Proposed Action. C Road and its extension into the Project Area would not be used for the Single Access Alternative. Under this alternative, there would be less chance to spread field bindweed, halogeton, Russian knapweed, or tamarisk from infestations documented along C Road (WestWater, 2012b) and its extension into the Project Area. However, other infestations of these and other noxious weeds (see Table 3.3-1) could be spread by actions under this alternative.

B Road Alternative

In November 2013, surveys for noxious weeds were conducted within 20 meters from the edge of the alternate northern access route, where surveys were permitted (WestWater Engineering, 2013). Non-native halogeton dominates portions of the alternate northern access route, especially in high disturbance areas. Other noxious weed species present include cheatgrass, redstem filaree, and Russian thistle. Cheatgrass is scattered throughout the area west of the shooting range; redstem filaree is scattered throughout the area east of the shooting area; and Russian thistle is present in high densities west of Wilson Road (WestWater Engineering, 2013). Whitetop may also infest the area, but is an early spring weed, unlikely to have been identified by a November survey. Under this alternative, the abundance and diversity of noxious weeds could be affected through the same pathways as those described above for the Proposed Action.

No Action Alternative

Under the No Action Alternative, none of the direct and indirect effects that are discussed under the action alternatives above would occur. State-listed noxious weeds and other non-native, non-listed species, described above, however, would continue to affect native, unaltered vegetation and existing disturbed shrub vegetation in the Project Area.

3.3.2 Vegetation (includes a finding on Standard 3)

3.3.2.1 Current Conditions

The Project Area supports pinyon pine and/or juniper woodlands, shrublands, grasslands, wetland and riparian vegetation and naturally occurring barren lands, as well as vegetation types that have been altered by humans. These vegetation types and their general locations within the Project Area are included in Table 3.3-2.

Table 3.3-2
General Categories of Vegetation and Specific
Vegetation Types that Occur within the Project Area

General Vegetation	Specific Type	General Location in Project Area
Woodland	Juniper	East slope of Horse Mountain, upper Watson Creek, lower slopes of Grand Mesa on BLM land (Sink Creek, Lockhart Draw, Whitewater Creek, North Fork and Kannah Creek. Also in patches on north facing slopes of Reeder Mesa.
	Pinyon-Juniper (unaltered)	West-facing slopes of Grand Mesa (BLM land and Grand Mesa National Forest land) that have not been altered by chaining, clearing, or burning.
	Pinyon-Juniper (altered)	Altered by chaining/clearing on west-facing slopes of Grand Mesa (BLM land and Grand Mesa National Forest land), upper North Fork, upper Lockhart Draw, upper Sink Creek and upper Watson Creek.
	Pinyon-Juniper (altered)	Altered by fire on Long Mesa and upper Whitewater Creek.
Shrubland	Gambel Oak	Isolated patches between Lockhart Draw and Whitewater Creek.
	Big Sagebrush	Predominant in a transition zone on slopes between desert shrub (lower slopes) and pinyon-juniper (upper slopes).
	Greasewood Fans and Flats	Prevalent on slopes of Purdy Mesa, Reeder Mesa, Hall Basin and along dry washes in the Project Area, usually interspersed with Desert Shrub vegetation at lower elevations and with big sagebrush vegetation at intermediate elevations.
	Desert Shrub	Saltbush with other shrubs such as horsebrush, winterfat – on slopes along Kannah Creek, slopes of Purdy Mesa, predominant on western Reeder Mesa, throughout Hall Basin and Callow Creek in northwestern portion of Project Area and the slopes of Horse Mountain.
	Disturbed Shrubland	Present along power line corridors, pipeline corridors and OHV trails.
Grassland	Mountain-Foothills Grasslands	On Horse Mountain and eastern Halls Basin.
	Disturbed Grassland	Present along power line corridors, pipeline corridors and OHV trails.
Wetland-Riparian	Forest-Dominated wetland/riparian	On portion of Sink Creek, Whitewater Creek, Lockhart Draw and drainages from Reeder Mesa and Purdy Mesa and North Fork and Kannah Creek.
	Shrub-Dominated wetland/riparian	Along Kannah Creek, North Fork, Whitewater Creek, upper Lockhart Draw and ephemeral drainages from Reeder Mesa and Purdy Mesa.
	Gramminoid and Forb-Dominated wetlands	On upper Brandon Ditch and upper Lockhart Draw, interspersed with hayfield/pastures.
Open Water	Open Water	Includes stock ponds, reservoirs (Hallenbeck Res., Juniata Res., Reeder Res.), perennial water bodies (upper Sink Creek, Whitewater Creek, upper North Fork, Kannah Creek).
	Dry Washes	Ephemeral drainages with bare ground, sand, gravel and rocks in defined channels: tributaries to Long Mesa Ditch, tributaries to lower Whitewater Creek, tributaries to Brown and Chapman Ditch, Callow Creek and tributaries in the western Project Area, tributaries to Kannah Creek.
Barren	Barren Lands	Associated with non-vegetated or very sparsely vegetated hillsides, often with cactus sparse grasses and xeric sub-shrubs along narrow dendritic drainages through gently sloping barren ground.
Human Altered	Human Settlements	Houses, yards, barns and driveways.
	Other Agriculture	Includes native hayfields, livestock pastures, dryland and irrigated cropland.
	Mining Operations, Other bare ground disturbances	Sand and gravel operations, oil and gas field developments (active and abandoned well pads, compressor stations).
	Roads	Surfaced and unsurfaced roads.

Juniper woodland (dominated by Utah juniper) occurs in the northeastern part of the Project Area, becoming pinyon-juniper woodland with co-dominant pinyon pine at higher elevations along the eastern border. Several mountain shrub species provide understory components to the woodlands, including mountain mahogany and Utah serviceberry. Grasses are generally sparse; Indian ricegrass is most common although non-native cheatgrass is present. Juniper and pinyon-juniper woodlands have been altered in some areas by chaining, with debris windrowed, by roller-chopping, or by fire (wildfire or controlled burn).

Small stands of Gambel oak occur near the interface of woodland vegetation and big sagebrush shrublands which, in addition to big sagebrush, support other shrubs such as rabbitbrush (rubber and green rabbitbrush), as well as more forb species than are found in woodland vegetation. Other shrub-dominated vegetation occurs in the Project Area, including black greasewood flats and fans and desert shrub, which is the most widespread vegetation type in the area.

Desert shrublands are dominated by shadscale, four-wing saltbush, spiny horsebrush, winterfat and yucca, often with forbs such as scarlet globemallow, broom snakeweed and desert parsley. Grasses include James' galleta, needle-and-thread, squirreltail and western wheatgrass. Non-native cheatgrass is ubiquitous in these shrublands.

Numerous utility rights-of-way associated with pipelines and power lines in the Project Area have been revegetated over time by native shrub species (big sagebrush, black greasewood and rabbitbrush) and by non-native, invasive weeds including lambsquarters, clasping pepperweed and Russian thistle. In other disturbed areas, including abandoned well pads, quarries, barrow pits and altered pinyon-juniper woodlands, weedy species are established. Halogeton, clasping pepperweed, cheatgrass, lambsquarters, Russian thistle, blue mustard, and tumble mustard are common, along with native species such as curly-cup gumweed, and scarlet globemallow.

Mountain-foothill grasslands are most extensive in the northern portion of the Project Area. Native species include Indian ricegrass, needle-and-thread grass and western wheatgrass. Many areas are dominated by invasive non-native grasses (disturbed grasslands), including cheatgrass and annual wheatgrass, along with other weed species such as halogeton, blue mustard, lambsquarters and Russian thistle (see Noxious Weeds, above).

In the southern part of the Project Area, the following vegetation types occur: disturbed shrub and grasslands that are often associated with existing roadsides, human settlements and sites of previous oil and gas activities, desert shrublands and barren ground found on clay-dominated slopes. Much of the Project Area overlies Mancos Shale, which is exposed on the surface as barren clay and rock outcrops. Prickly-pear, hookless cactus (see above), broom snakeweed, mat saltbush and galleta grass may also occur.

Riparian and wetland forest, shrubs, and herbaceous vegetation are restricted to the few perennial water bodies (Kannah Creek, Whitewater Creek) and along portions of some ephemeral drainages (Lockhart Draw, Sink Creek) in the Project Area (see Table 3.3-2). Box elder, birch, narrow-leaf cottonwood and Rio Grande cottonwood provide riparian forest components, while coyote willow and non-native, invasive species such as Russian olive and tamarisk (see above) grow as shrubs or as trees along water body margins. Gambel oak occurs along the upper elevations of several drainages. Inland saltgrass, bluejoint and orchardgrass are the predominant riparian herbaceous vegetation.

Public Land Health Standard 3

Standard 3: Healthy, productive plant and animal communities of native and other desirable species are maintained at viable population levels commensurate with the species' and habitat's potential.

The BLM recently conducted Land Health Assessments for the Kannah Creek Common and combined Whitewater Common-North Fork Kannah Creek grazing allotments, which occur in the southern and northern portions of the Project Area, respectively.

The Land Health Assessment for the combined Whitewater-Kannah Creek allotment indicates that 51 percent of the total area assessed is meeting Land Health Standards, while 23 percent of the area is meeting standards but with problems, and 26 percent of the area is not meeting standards. Where Land Health Standard 3 is not being met in the allotment, perennial grasses are absent, greasewood is dominant, juniper is increasing and/or invasive annual species, especially cheatgrass, have become dominant and are preventing the recovery of function structural groups (woody shrubs, perennial grasses).

The assessment conducted within the Kannah Creek Common Allotment determined that 27 percent of the area met overall Land Health Standards, 48 percent of the area did not meet the Standards, and 25 percent was meeting but with problems. Only a small portion of the Kannah Creek Common Allotment occurs within the southern portion of the Project Area, of which the majority (74 percent) is meeting the Land Health Standard 3, but with problems. Approximately 16 percent of the allotment within the Project Area along Kannah Creek is not meeting Standard 3, generally due to loss of native perennial plants and because the site is dominated by cheatgrass and broom snakeweed.

3.3.2.2 Environmental Consequences

Proposed Action Alternative

The Proposed Action could affect vegetation through one or more of the following pathways:

1. Direct removal of vegetation during clearing and grading for well pads, pipelines and roads.
2. Damage or mortality of plants by dust deposited on photosynthetic surfaces during construction and operation.
3. Changes in herbivory by domestic and/or native herbivores caused by displacement from affected areas or attraction to newly re-vegetated sites.
4. Introduction or an increase in noxious weeds could alter vegetation cover and species composition, potentially out-competing native plant species.

Construction of the Proposed Action would directly affect vegetation by removal. Direct effects to herbaceous vegetation would be expected to be short-term (assuming vegetation becomes re-established within 5 years of disturbance), whereas effects to shrub-dominated and forest-dominated vegetation would persist for more than 10 years. For example, sagebrush can take up 10 to 15 years to become re-established (West, 1988). Mature pinyon-juniper woodlands may be more than 140 years old, originating in pre-settlement times (Miller et al., 2008) and would not be re-established in the life of the Project. Effects to forest-dominated riparian vegetation, deciduous oak woodlands, and possibly other shrub-dominated vegetation would also persist for more than 10 years. Fram would use brush-hogging techniques for clearing in big sagebrush shrublands, where appropriate, to leave root structure intact and to preserve seed stock and promote faster sagebrush revegetation (see Biological Resources Protection Plan, Appendix E). Topsoil would be salvaged and replaced to utilize native seedbanks present.

Damage or mortality to individual plants as a result of decreased light transmission due to dust deposited directly on leaves or other photosynthetic surfaces could occur due to increased traffic along existing roads during construction and operation. Dust from construction and related traffic could impair photosynthesis, gas exchange, transpiration, leaf morphology and stomata function (Farmer, 1993; Sharifi et al., 1997; Rai et al., 2009). Dust from construction and related traffic could also interfere with plant reproduction by affecting pollinators during the flowering season.

Fugitive dust would be controlled on the access roads and within disturbed surfaces during construction, to minimize effects to adjacent vegetation. Speed limits would be enforced from the beginning of construction throughout the life of the Project and where speed limits are not posted on unpaved access roads, speeds would not exceed 20 mph (see Biological Resources Protection Plan, Appendix E).

Indirect effects to vegetation might occur if the Proposed Action displaced native and domestic herbivores, causing excessive browsing and/or grazing on vegetation resources that otherwise would not occur. Alternatively, herbivores could be attracted to unaffected vegetation adjacent to newly revegetated locations, causing excessive browsing and/or grazing following reclamation. To eliminate negative effects on restored surfaces from grazing, cattle would be excluded from revegetated areas to help support successful revegetation of the disturbed area (see Biological Resources Protection Plan, Appendix E). Reducing speeds to 10 to 15 mph would further minimize effects to vegetation.

Indirect effects to native vegetation could occur if invasive, non-native species became established in cleared, disturbed areas and resulted in infestations that would limit or prohibit growth of native and/or desirable species. Weed seeds or cuttings of some species could be transported naturally (wind and water) or accidentally (vehicles or other equipment) to the disturbed areas. Weed seeds may be present in the native soil materials and the removal of vegetative cover and soil disturbance might promote weed establishment at the expense of desirable species. Pipeline-related disturbed surfaces would be re-vegetated upon completion of construction to minimize noxious weed establishment. Temporarily disturbed surfaces such as fill slopes would be seeded which would also help fight weed establishment. Additionally, interim reclamation would occur within one year of the last well drilled on a well pad (see Biological Resources Protection Plan, Appendix E).

The Proposed Action would require clearing 162.99 acres of vegetation (Table 3.3-3). The majority of effects would be to greasewood (23 percent), desert shrub (16.5 percent) and juniper woodland (13 percent). Surface disturbances within unaltered pinyon-juniper woodland, chained pinyon-juniper woodland, big sagebrush shrubland, grassland and barren ground would each affect approximately 5 percent of the total disturbance. Over 45 percent of all disturbances to vegetation would occur during upgrades to existing roads and pipelines; 31 percent would be due to well pad construction and 24 percent would occur during construction of new roads and pipelines. Disturbance to grasslands, greasewood, saltbush, barren ground and pastureland (other agriculture) could be re-established within 5 years after reclamation is initiated. Use of the 3.1-mile C Road extension (northern access route) would not include any new disturbance to vegetation and effects by use of the road are not included in Table 3.3-3.

Table 3.3-3
Areas (acres) of Vegetation Types Affected by the Proposed Action

Vegetation Type	Total Area Affected (acres)	Percent of Total
Woodland		
Juniper	24.65	15.12
Pinyon-Juniper (unaltered)	9.47	5.81
Pinyon-Juniper (altered - chained)	14.93	9.16
Pinyon-Juniper (altered - burned)	1.48	0.91
Shrubland		
Big Sagebrush	7.68	4.71
Greasewood Fans and Flats	45.04	27.64
Desert Shrub	31.93	19.59
Disturbed Shrubland	2.07	1.27
Grassland		
Mountain-Foothills Grasslands	8.91	5.47
Disturbed Grasslands	0.23	0.14
Riparian-Wetland		
Forest-Dominated Wetland/Riparian	1.10	0.67
Open Water		
Open Water	0.03	0.02
Dry Washes	0.04	0.02
Barren		
Barren Lands	9.18	5.63
Disturbed		
Human Settlements	0.09	0.06
Other Agriculture	4.12	2.53
Bare Ground Disturbances	0.42	0.26
Roads	1.62	0.99
TOTALS	**162.99**	**100.00**

Protective/Mitigation Measures

In addition to the Project Design Features listed in Chapter 2 and the BLM GJFO Standard COAs in Appendix C, the BLM would require the following measures to further reduce impacts to vegetation:

- Berms of salvaged topsoil should be placed around well pad perimeters to keep appropriate seed banks segregated and allow them to be replaced in the spatial context from which they were removed during pad construction.
- Exclusion fencing should be erected along the revegetated pipeline and road disturbance in highly vulnerable areas (e.g., along streambanks) to exclude livestock, accelerate reclamation of surface disturbances and minimize weed infestations, until monitoring has determined reclamation is successful. The BLM will determine areas for potential exclusion and evaluate reclamation success.
- An on-site post-construction meeting should be required, to ensure that construction is in accordance with all specifications, approved permit and COAs. At least 48 hours prior to post-construction meeting, contact Julia Christiansen at 970-244-3093 or the Grand

Junction Field Office at 970-244-3000. Post-construction storm water BMPs should be installed before inspection.

- Cleared rocks may be salvaged and stored for later redistribution over reshaped cut-and-fill slopes, reclaimed areas or along linear features. Salvaged native rocks should be used where appropriate as perimeter storm water controls, toe slope anchors or angular armor against erosion protection.

Single Access Alternative

Direct and indirect impacts to vegetation under the Single Access Alternative would be similar to those described above for the Proposed Action Alternative. Under this alternative, the use of the southern access road throughout the year during operations would continuously expose roadside vegetation to dust and other potential vehicle effects.

B Road Alternative

Most of the undeveloped lands along the alternate northern access route are saltbush desert shrub that is dominated by Gardner's saltbush, mat saltbush, shadscale saltbush, forbs, and grasses. Portions of the vegetation along the access route are dominated by galleta grass, as well as non-native halogeton and Russian thistle, especially in highly disturbed areas (see Section 3.3.1 and WestWater Engineering, 2013). Direct and indirect impacts to vegetation under the B Road Alternative would be similar to those described above for the Proposed Action.

No Action Alternative

Under the No Action Alternative, none of the direct and indirect effects to vegetation that are expected by implementing any of the action alternatives would occur. Vegetation present in the Project Area (see Table 3.3-2) would persist into the foreseeable future as described above. It is likely that native, unaltered vegetation and existing disturbed shrub vegetation would continue to be affected by infestations of non-native annual species, especially cheatgrass, in the foreseeable future. Noxious weeds would continue to affect native vegetation cover, vegetation composition and species diversity and plant vigor. The No Action Alternative would eliminate proposed treatments of noxious weeds by Fram, as described in Chapter 2.

Finding on the Public Land Health Standard 3

The Proposed Action might contribute to the weed infestations in the local landscape which, if not controlled, would contribute to the Project Area and vicinity not meeting Land Health Standard 3. Ground disturbance could contribute to the proliferation of invasive annual species, especially cheatgrass. Implementation of measures to eliminate or reduce the spread or introduction of noxious weeds, as outlined in the BLM's weed management plan (see BLM, 2007a) would help prevent the Proposed Action from contributing to further degradation of plant communities in the Project Area and vicinity. No changes in Land Health Standard 3 are anticipated under the Proposed Action if the Project Design Features and mitigation measures are properly implemented.

Impacts to Land Health Standard 3 under the Single Access Alternative would be similar to those under the Proposed Action Alternative. Impacts to Land Health Standard 3 under the B Road Alternative would be similar to those under the Proposed Action Alternative.

Under the No Action Alternative, effects from existing and new surface disturbances (unrelated to the Proposed Action) would continue and could affect Public Land Health Standard 3.

3.3.3 Wetlands and Riparian Zones (includes a finding on Standard 2)

3.3.3.1 Current Conditions

Wetlands are subject to protection under federal law and Executive Order 11990, regardless of land ownership. The EPA and the USACE use the following definition of wetland to administer the Clean Water Act's Section 404 permit program for dredge and fill activities: those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas (40 CFR §230.3 and 33 CFR §328.3).

WestWater Engineering performed wetland evaluations within the Whitewater Unit from 2010 through 2012 (WestWater Engineering, 2010, 2011, 2012a and 2012b). Potentially jurisdictional wetlands were identified on the basis of the vegetation, soils and hydrologic characteristics present at the site, in accordance with the 1987 USACE Wetlands Delineation Manual and the Arid West Regional Supplement to USACE Wetland Delineation Manual, April 2008. Wetland vegetation was documented in the Project Area including along Kannah Creek, Brandon Ditch diversions and North Fork Kannah Creek tributaries near Lands End Road (WestWater Engineering, 2012a). Wetlands in the Project Area were not delineated, but were noted and evaluated.

Riparian areas occur as narrow zones adjacent to drainages and wetland areas. Sink Creek, Whitewater Creek, North Fork Kannah Creek, Kannah Creek and two ditches with perennial flow (Lockhart Ditch and Brandon Ditch), as well as numerous ephemeral drainages occur in the Project Area. Shrub-dominated riparian zones have been invaded by exotic species including saltcedar or tamarisk, Russian olive and Russian knapweed (Doyle et al., 2002; Rocchio et al., 2001; WestWater Engineering, 2011). Other native vegetation observed within riparian areas in the Whitewater Unit consists of bluejoint, boxelder, birch, Rio Grande cottonwood, Gambel oak, narrowleaf cottonwood, sandbar willow, wood's rose, horsetail, rushes, sedges and skunkbush. Seeps also occur within the Project Area and often support similar plant species found along drainages. Scientific names of plant species discussed in the text for this section are provided in Appendix I.

Public Land Health Standard 2 (Riparian Systems)

Standard 2: Riparian systems associated with both running and standing water that function properly and have the ability to recover from major disturbance such as fire, severe grazing, or 100-year floods.

BLM conducted Proper Functioning Condition (PFC) assessments within the Project Area on two lower reaches of Whitewater Creek and the upper North Fork Kannah Creek during 2005 and the upper BLM Reach (City Area) in 2006. For lotic (flowing water) systems, riparian-wetland area is considered to be in proper functioning condition when adequate vegetation, landform, or large woody debris is present to accomplish the following (BLM et al., 1998):

- Dissipate stream energy associated with high water flow, thereby reducing erosion and improving water quality;
- Filter sediment, capture bed load, and aid floodplain development;
- Improve floodwater retention and groundwater recharge;
- Develop root masses that stabilize streambanks against cutting action;
- Restrict water percolation;

- Develop diverse ponding and channel characteristics to provide the habitat and the water depth, duration, and temperature necessary for fish production, waterfowl breeding, and other uses;
- Support greater biodiversity.

In 2005 and 2006, 5.50 miles of Whitewater Creek and 1.49 miles of North Fork Kannah Creek were found to be in proper functioning condition. No upward or downward trends were reported.

3.3.3.2 Environmental Consequences

Proposed Action Alternative

Construction in wetlands and riparian zones could potentially degrade water quality, affect hydrology and affect wildlife. Five drainages with wetland vegetation were identified within 100 feet of proposed gathering pipelines and existing access roads (see Table 3.3-4). No wetlands were found within 100 feet of proposed well pad locations. Construction of the proposed gathering pipelines within the Project Area could affect fringe wetlands associated with five drainages that would be crossed.

Table 3.3-4
Potential Wetlands Documented during
Wetland Evaluations within 100 feet of the Proposed Action

Project Component	Wetland Description	Location in Relation to Proposed Action
Proposed Gathering Line/ Existing Access Road	One fringe wetland (2011) approximately 2 inches wide on each side of potential COE drainage.	Proposed pipeline crosses potential COE drainage along Whitewater Creek Road.
Proposed Gathering Line/ Existing Access Road	One fringe wetlands (2011) approximately 3 inches wide on each side of potential COE drainage.	Proposed pipeline crosses potential COE drainage along Whitewater Creek Road.
Proposed Gathering Line/ Existing Access Road	One fringe wetland (2011) approximately 2 inches wide on each side of potential COE drainage.	Proposed pipeline crosses potential COE drainage near Divide Road and Lands End Road intersection.
Proposed Gathering Line/ Existing Access Road	Fringe wetland (2011) at Kannah Creek crossing.	Proposed pipeline crosses Kannah Creek and fringe wetland along unnamed access road to Federal 13-98-12-2 and Federal 13-97-8-2.
Proposed Gathering Line/ Existing Access Road	18” culvert with wetland plants present.	Proposed pipeline crosses potential jurisdictional wetland along Lands End Road.

Minimizing the pipeline corridor width at drainage crossings with wetland fringe present (Table 3.3-4) could avoid or reduce effects to wetlands. Use of wooden mats or other protective mats during construction across or near the drainages, as recommended in the BLM GJFO Standard Conditions, could minimize effects to fringe wetlands. Implementation of BMPs and other construction techniques identified in Fram’s SWMP would also reduce the effects of construction in wetlands.

Effects to riparian zones along the pipeline routes could be minimized by reducing the corridor width at drainage crossings. Table 3.3-3 identifies that approximately 1.11 acres of forest-dominated riparian vegetation would be affected by the Proposed Action.

Protective/Mitigation Measures

In addition to the Project Design Features listed in Chapter 2 and the BLM GJFO Standard COAs in Appendix C, the BLM would require the following measures to further reduce impacts to wetland and riparian zones:

- In wetland and riparian zones adjacent to proposed gathering pipelines, pipeline disturbance widths should be reduced to minimize direct effects to the wetlands and riparian zones.
- To minimize effects to vegetation in riparian zones adjacent to drainages crossed by the proposed gathering pipelines, Fram should reduce the 20-foot width of the pipeline construction disturbance width should be reduced, or a BLM-approved biological monitor should be present during surface disturbance and construction.
- In areas where a wetland evaluation has not been conducted, Fram should have a monitor on-site during pipeline routing to identify potential wetlands and avoid, if feasible.
- A wetland delineation should be conducted for any wetlands that cannot be avoided. Appropriate permits from the USACE should be required and provided to the BLM before surface disturbance.

Single Access Alternative

Under this alternative, Project-related impacts to wetlands and riparian zones would be the same as described above for the Proposed Action Alternative. No wetlands or riparian areas occur along the proposed northern access route.

B Road Alternative

WestWater Engineering (2013) identified five potential WoUS crossings along the alternate northern access route that could fall under the jurisdiction of the COE; no associated wetlands were observed. Under this alternative, Project-related impacts to wetlands and riparian zones would be the same as described above for the Proposed Action.

No Action Alternative

Under this alternative, no Project-related impacts to wetlands and riparian zones would occur on BLM-administered lands from construction and operation of any of the action alternatives.

Finding on the Public Land Health Standard 2 (Riparian Habitat)

The existing access road to well pad 12-98-24-2 and northern well pads would cross the North Fork Kannah Creek. The existing access road to well pad 12-97-7-1 and northern well pads would cross Whitewater Creek, upstream from the PFC assessments. There is a potential effect to PFC in both watercourses by increased sedimentation to surface water during construction at stream crossings and during increased vehicular traffic during drilling and well completion, which would be on-going for 4 years. Sediment transport from disturbed areas near streams could also be triggered by high precipitation and flow events and could enter adjacent drainages or ditch areas, until disturbed areas are completely stabilized by reclamation. Possible effects could include increased erosion and stream sedimentation due to changes in channel morphology associated with clearing and grading of stream banks, placement of fill for access roads in stream channels, installation of culverts and armored road crossings, in-stream trenching for gathering line placement and trench backfilling. In addition, near-surface soil compaction caused by construction equipment activity could reduce the soil's ability to absorb water and could increase surface runoff and the potential for ponding.

In addition to the potential effects of sedimentation, there would also be a potential risk of contamination of surface water and riparian zones during accidental releases of drilling fluids, completion fluids, produced water, condensate, lubricants and fuels and other chemicals that could flow into streams or ditches during transport. Well pads would be designed as zero discharge areas and any accidental releases at these sites would be contained. Fram also has prepared and would follow a Spill Prevention Control and Countermeasure Plan. No changes in Land Health Standard 2 are anticipated under the Proposed Action if the Project Design Features and mitigation measures are properly implemented.

Effects to Land Health Standard 2 under the Single Access Alternative and the B Road Alternative would be similar to those described above for the Proposed Action Alternative.

Under the No Action Alternative, effects from existing and new surface disturbances (unrelated to the Proposed Action) would continue and could affect Public Land Health Standard 2.

3.3.4 Threatened, Endangered, Candidate and Sensitive Animal Species

3.3.4.1 Current Conditions

Threatened and Endangered Species include those species listed by the FWS under the ESA (ESA-Listed Species) and those listed by the State of Colorado. Species that are candidates for listing under ESA are also discussed below (under ESA-Listed Species). Sensitive Species include those species identified by the BLM as being sensitive, as well as those listed by the State of Colorado as threatened or endangered or species of special concern, but not listed under the ESA.

ESA-Listed and Candidate Species. The FWS (2012a) identified seven vertebrate species listed under the ESA that potentially occur in Mesa County. Wolverines in Colorado were proposed for listing as threatened in February 2013, Gunnison sage-grouse was proposed for listing as endangered with proposed critical habitat in September 2013, and the yellow-billed cuckoo was proposed for listing as threatened in October 2013. Species' federal designations and status in Colorado are included in Table 3.3-5.

Table 3.3-5
ESA-Listed and State-Listed Endangered, Threatened and Candidate Animal Species that are Known or Have Potential to Occur within Mesa County

Species Common Name Scientific Name	ESA Status [1]	State Status [2]	Critical Habitat [3]
Mammals			
Canada lynx *Lynx Canadensis*	FT	SE	Not in County
North American wolverine *Gulo gulo luscus*	FPT	SE	None Proposed
Birds			
Mexican spotted owl *Strix occidentalis lucida*	FT	ST	Not in County
Yellow-billed cuckoo *Coccyzus americanus*	FPT	SC	None Proposed
Gunnison's sage-grouse *Centrocercus minimus*	FPE	SC	Proposed in County
Fish			
Greenback cutthroat trout *Oncorhynchus clarki stomias*	FT	ST	None
Colorado pikeminnow *Ptychocelius Lucius*	FE	ST	Present
Humpback chub *Gila cypha*	FE	ST	Present
Bonytail *Gila elegans*	FE	SE	Present
Razorback sucker *Xyrauchen texanus*	FE	SE	Present

[1] ESA Status: FE = Federal Endangered, FT = Federal Threatened, FTP = Federal Proposed Threatened, FPE=Federal Proposed Endangered, Colorado State Status: SE = State Endangered Species, ST = State Threatened Species, SC = State Special Concern (not a statutory category).
[2] CPW, 2011a.
[3] FWS, 2012a.

Canada Lynx. Federally threatened (FWS, 2000) Canada lynx are likely to occur within the GJFO Resource Management Plan Planning Area (RMPPA) as they expand their range within Colorado and they have been documented on National Forest System lands adjacent to the RMPPA (BLM, 2009a). Between 1999 and 2007, CPW reintroduced 218 Canada lynx to the San Juan Mountains in southwestern Colorado (Shenk, 2005). Typically, Canada lynx are associated with boreal forests of Canada and Alaska. Lynx also are found in the northern contiguous United States bordering Canada and in isolated and/or dispersing populations in states that are farther south including Utah, Wyoming and Colorado (FWS, 2003a). Suitable habitat for lynx has been delineated in the Grand Mesa National Forest, specifically within the Grand Valley Ranger District, which is adjacent to the Project Area. Lynx were documented within the Grand Valley Ranger District from 2000 to 2006 (Grode, 2008) but no records of lynx exist and no suitable denning or foraging habitat is present in the Project Area. Suitable habitat is present on the Grand Mesa approximately 6 miles east of the Project Area.

Wolverine. The FWS (2013a) proposed listing the North American wolverine as threatened under the ESA. The distribution of records documenting wolverines in Colorado was compiled by Nead et al. (1985). Four reports were in eastern Rio Blanco County and seven reports of wolverine were in Garfield County. Although a viable population of wolverines in Colorado could not be verified, the potential for some animals to occur in certain areas of the state was proposed, including in the southwestern portion of the Flat Tops Wilderness area in Garfield County (Nead et al., 1985). The FWS (2013a) concluded that wolverine populations currently exist in the Rocky Mountains, although there is no evidence of an extant population in Colorado. In 2009, a male wolverine emigrated 500 miles from Grand Teton National Park to northern Colorado (Harmon, 2009), indicative of their ability for long-distance movements but not of possible population re-establishment (FWS, 2013a). Wolverines have not been reported in Mesa County. The North American wolverine would not be affected by the Proposed Action and the species is not considered further.

Mexican Spotted Owl. The FWS listed the Mexican spotted owl as a threatened species in 1993 (FWS, 1993). At the time they were listed, there were only 20 historic records (13 records accepted) of spotted owls in Colorado, mostly from the San Juan Mountains in southwestern Colorado. Mexican spotted owls occur in old-growth or mature conifer forests that possess complex structural components and are near some type of water source. Spotted owls can also be found in canyon habitat dominated by vertical-walled rocky cliffs within complex watersheds that have small isolated patches or stringers of forested vegetation for roosting and foraging (FWS, 2011a). No records of Mexican spotted owl or suitable habitat occur in the Project Area.

Greenback Cutthroat Trout. Recent discoveries indicate that the threatened (FWS, 1978) greenback cutthroat trout occurs within some streams in Mesa County (FWS, 2012a). Genetic studies revealed that some populations of cutthroat trout west of the Continental Divide were genotypically similar to greenback cutthroat trout (Metcalf et al., 2007). Recent analyses of cutthroat trout in Colorado indicate that no greenback cutthroat trout occur in the Upper Colorado River Basin (Metcalf et al., 2012). Prior to that study, greenback cutthroat trout were believed to occur within tributaries to Plateau Creek, in the Grand Mesa National Forest (Dare et al., 2011) and are still being considered for ESA-consultation (FWS, 2012b). However, there is no connectivity between occupied streams (Coon Creek) on the National Forest and Kannah Creek or Whitewater Creek and greenback cutthroat trout do not occur in either drainage and do not occur within the Project Area.

Colorado River Fish. Four species of Colorado River Basin fish, the bonytail, Colorado pikeminnow, humpback chub and razorback sucker, are listed as endangered (FWS, 1970, 1980 and 1991) and critical habitat (FWS, 1994) has been designated for all four species in the Colorado River and 100-year floodplain within Mesa County and for Colorado pikeminnow and razorback sucker in the Gunnison River and 100-year floodplain in Mesa and Delta counties.

A naturally reproducing population of Colorado pikeminnow inhabits the lower 54 kilometers (33.6 miles) of the Gunnison River mainstem (FWS, 2002a). Colorado pikeminnows move between the Colorado River and the Gunnison River by passing over the Redlands fish ladder at the Redlands Diversion Dam on the Gunnison River. Although the population size in the Gunnison River has not been estimated, there are fewer pikeminnows than in the Colorado River, based on fish captured and tagged (Osmundson and White, 2009). Young pikeminnows primarily utilize backwaters, preferring warm, turbid, relatively deep sites (<2 feet) with little to no flow (Tyus and Haines, 1991).

The wild population of razorback sucker in the Gunnison River is considered to be extirpated. The current population has been stocked with hatchery fish in the lower 33.6 miles of the Gunnison River (FWS, 2002b). Razorback suckers use the fish ladder at the Redlands Diversion Dam to move between the Colorado and Gunnison rivers. The razorback sucker is most often found in quiet, muddy backwaters along the river (FWS, 1994; Colorado Division of Wildlife - CDOW, 2007a). Juvenile rearing habitats are in quiet, warm, shallow water associated with various river and floodplain features (FWS, 2002b).

Critical habitat for Colorado pikeminnow and razorback sucker has been designated in the Gunnison River from its confluence with the Colorado River to the Uncompahgre River confluence at Delta. Three primary constituent elements (PCEs) of the critical habitat include water, physical habitat and the biological environment (FWS, 1994). The water PCE includes quantity of water with sufficient quality (adequate temperature, dissolved oxygen, lack of contaminants, nutrients, turbidity) that would provide for a life stage for each of the listed species at a specific location (FWS, 1994). The physical habitat PCE provides spawning, nursery feeding and rearing habitats, or access to those habitats and is found in river channels as well as bottom lands, side channels, secondary channels, oxbows, backwaters and other areas within the 100-year floodplain of the Gunnison River, which when inundated, provides habitats for the species' various life stages (FWS, 1994). Floodplains that have been previously developed are not likely to provide PCEs (FWS, 1994). The biological environment PCE includes food resources for the listed species. Predation and competition by other species are additional components of the biological environment that are of concern because introduced, nonnative fish species have limited population growth of listed species at some locations (FWS, 1994).

Bonytail chubs and humpback chubs inhabit the Colorado River, but not the Gunnison River. The distribution of humpback chub in 1990 included the Colorado River mainstream reaches in the vicinity of Westwater Canyon, Utah and Black Rocks, Colorado but the distribution did not include the Gunnison River (FWS, 1990a, FWS, 2002c). During the 1960s through the early 1980s, adult bonytail were captured in the Upper Colorado River Basin but none have been reported in the Gunnison River since 1889 (FWS, 2002d). The FWS designated critical habitat for the bonytail and humpback chub in river channels and flooded, ponded, or inundated riverine habitats suitable for adults and young on the Colorado River in Mesa County from Black Rocks (River Mile 137) in Ruby Canyon, downstream to Fish Ford River on the Utah-Colorado border (FWS, 1994), but critical habitat does not include the Gunnison River.

The Federal Emergency Management Agency (FEMA) has not delineated the 100-year floodplain for the Gunnison River. However, the floodplain likely extends into Whitewater Creek and Kannah Creek some distance from their confluence with the Gunnison River. Listed fish species are not expected to occur in those water bodies, although physical and/or water quality and quantity PCEs for Colorado pikeminnow and razorback suckers may be present near the confluence with the Gunnison River. Adult pikeminnows move to floodplain habitats, flooded tributary mouths and flooded side canyons that are only present during high spring flows (see Figure 3.3-1), probably in search of other fish as prey (Tyus, 1990; Osmundson et al., 1995).

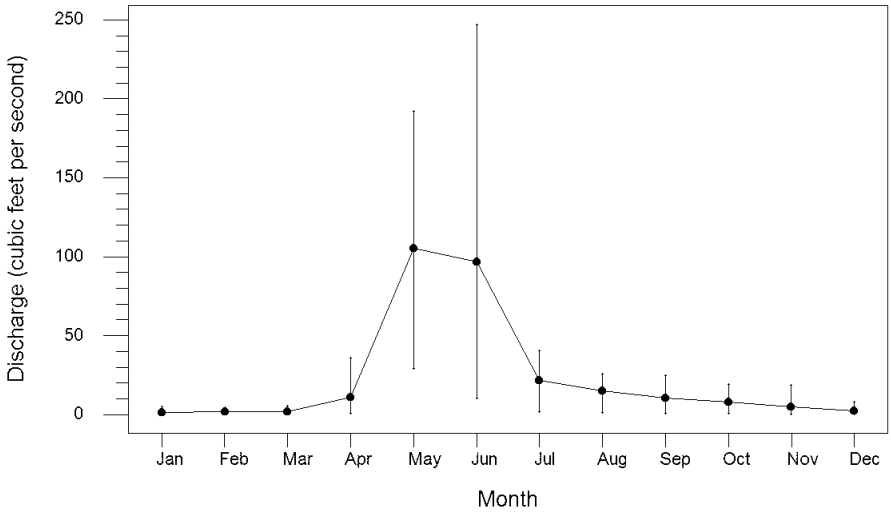


Figure 3.3-1
Average Monthly Discharge in Kannah Creek, 1961 to 1982, Measured at USGS Gage 09152000. Vertical Lines are Minimum and Maximum Monthly Flows.

Western Yellow-billed Cuckoo. The FWS (2001) found that listing the western Distinct Population Segment (DPS) of yellow-billed cuckoos (including those in Colorado) as threatened was warranted but precluded for listing. Since then, FWS (2013b) proposed listing the species' western DPS that nests west of the Continental Divide, for listing as threatened under the ESA. In Colorado, the western DPS includes the upper Rio Grande drainage and Colorado River Basin. Yellow-billed cuckoos are considered a riparian obligate species and are usually found in large tracts of cottonwood/willow habitats with dense sub-canopies, but may also be found in urban areas with tall trees (FWS, 2007a).

The species has been confirmed along the Yampa River near Craig, the Rio Grande River near Del Norte, and in the San Luis Valley of south-central Colorado (FWS, 2013b). Yellow-billed cuckoos were detected along the Uncompahgre and Gunnison rivers in Delta County as recently as the mid-1980s (FWS, 2013b). The species had been reported during the 1950s and 1960s along the Colorado River near Palisade in Mesa County (Kingery, 1998; FWS, 2013b). They were historically documented as rare summer visitors in the vicinity of Grand Junction (Wiggins, 2005) and have been documented as recently as 2013 at the confluence of the Gunnison and Colorado rivers (Toolen, 2013).

No known breeding populations of yellow-billed cuckoos exist within the RMPPA. An intensive search for the species was conducted in Dinosaur National Monument and adjacent private lands in 2009 where there are historical records of breeding, but no cuckoos were found (Beason, 2009). Most confirmed observations in Colorado have been on the eastern plains (Kingery, 1998). Riparian cottonwood/willow vegetation along portions of Kannah Creek might

provide marginal habitat but the species' lack of breeding activity in the region indicates it would not be expected. No yellow-billed cuckoos were observed during biological surveys conducted in 2010 and 2011 (WestWater Engineering, 2010 and 2011). The yellow-billed cuckoo would not be affected by the Proposed Action and the species is not considered further.

Gunnison's Sage-Grouse. The FWS (2010a) determined that listing Gunnison's sage-grouse as threatened or endangered was warranted but precluded by other higher priority actions.

In September 2013 FWS (2013c) proposed listing the species as endangered under the ESA. FWS (2013d) also proposed critical habitat for Gunnison sage-grouse within southwestern Colorado and southeastern Utah. Seven critical habitat units have been proposed, including the Piñon Mesa Unit 2 which is mostly within Mesa County and within the RMPPA. Portions of the Piñon Mesa Unit are occupied by Gunnison sage-grouse and other portions are potential habitat between or adjacent to occupied habitat and judged to be essential for conservation of the species (FWS, 2013d).

Gunnison's sage-grouse were recognized as a separate species from greater sage-grouse in 2000. They have similar life histories and habitat requirements; both are dependent on sagebrush for food and cover for nests (Connelly et al., 2000), which are made on the ground and subject to predation and destruction by ground disturbing activities.

The Piñon Mesa population of Gunnison's sage-grouse is present in western Mesa County on benches north of the Little Dolores River Canyon, in Fish Park adjacent to the Utah border and on Piñon Mesa east to the Grand Mesa-Uncompahgre National Forest. The Piñon Mesa population was estimated to be 74 sage-grouse in 2010 and only four of the ten known leks in the population were active in 2009 (FWS, 2010a). In pre-settlement times, Gunnison's sage-grouse may have inhabited the northeastern portion of the Project Area (Schroeder et al., 2004), but the closest habitat to the Project Area that is occupied by Gunnison's sage-grouse is 16 miles to the southwest, on Snyder Flats midway between Whitewater and Gateway. The closest proposed critical habitat is in Cactus Park, west of the Gunnison River, 7 miles southwest of the Project Area. That portion of the proposed Piñon Mesa Unit is currently unoccupied by Gunnsion sage-grouse; the closest occupied habitat is on the Piñon Mesa (FWS, 2013d), approximately 22.8 miles west of the Project Area. The Proposed Action would not affect Gunnison sage-grouse or proposed critical habitat and the species is not considered further.

BLM Sensitive Species. The BLM (2009b) identified seven species of mammals, 12 birds, three reptiles, three amphibians, five fish and one invertebrate as sensitive species of wildlife that are known or suspected to occur within the GJFO area including Garfield and Mesa counties (Table 3.3-6). Available information from CPW (2011a) indicates that some of the BLM-sensitive wildlife species are also listed by the State as endangered, threatened, or species of special concern. Additional species potentially occur in the area that are listed by the state but have no federal status and are included in Table 3.3-6.

Seven wildlife species in Table 3.3-6 have been observed within the Project Area: white-tailed prairie dog, burrowing owl, northern river otter, Brewer's sparrow, longnose leopard lizard, midget faded rattlesnake and Colorado River cutthroat trout. CPW (2011b) mapped the western and southern portions of the Project Area as white-tailed prairie dog habitat. Five prairie dog colonies, ranging from 1 acre to 64 acres, were mapped west and south of Horse Mountain in the northern portion of the Project Area (WestWater Engineering, 2011). An occupied burrowing owl nest (a BLM-sensitive and state threatened species) was observed in a burrow adjacent to one of the mapped prairie dog colonies. River otters, a state-threatened species, now occur in lower Kannah Creek and the Project Area boundary following their release into the Gunnison River during the 1970s (Boyle, 2006; CPW, 2011b). Other mammalian species listed in Table 3.3-6 may be present including Townsend's big-eared bat, fringed myotis, big free-tailed bat, Botta's and northern pocket gophers and kit fox. CPW (2011b) mapped kit fox habitat in the southern portion of the Project Area and some of the sensitive bat species have been observed to the north, in the Book Cliffs area (Chung-MacCoubrey, 2008).

In addition to burrowing owls, Brewer's sparrows have been documented in the Project Area (WestWater Engineering, 2011). They are a sagebrush obligate passerine that is relatively abundant in northwestern Colorado (Boyle and Reeder, 2005). The nesting season extends through early August (Kingery, 1998). Based on Breeding Bird Surveys (Sauer et al., 2011) conducted in the region surrounding the Project Area, populations of Brewer's sparrows have been decreasing during the past 20 years, from 1992 through 2011. Bald eagles may also occur, particularly during winter. CPW has mapped bald eagle winter habitat along the Gunnison River extending east to U.S. Highway 50 and along the Colorado River less than 1 mile north of the Project Area. Potential peregrine falcon nesting habitat has been mapped on cliffs along the western face of Grand Mesa including the headwaters of Whitewater Creek and North Fork Kannah Creek.

Longnose leopard lizards were seen in sagebrush shrubland in the central Project Area and one midget faded rattlesnake was seen in pinyon-juniper woodland in the northern portion during 2011 surveys (WestWater Engineering, 2011). Both are BLM-sensitive and state Species of Concern. Colorado River cutthroat trout are also BLM-sensitive and state Species of Concern and were documented in the Brandon Ditch, approximately 2.7 miles downstream from Whitewater Creek by CDOW in 2010. The fish were examined and are genetically pure lineage Colorado River cutthroat trout; they appear to be a reproducing population because several size and age classes were observed. Colorado River cutthroat trout could be expected to occur in any of the perennially flowing diversion channels and in Whitewater Creek. It is possible that other sensitive herpetofauna and fish listed in Table 3.3-6 also occur within the Project Area, although they were not observed during surveys done in 2011, surveys specific to these species were not conducted (WestWater Engineering, 2011).

Table 3.3-6
Federal and State of Colorado Sensitive Wildlife Species Not Listed Under the ESA that Could Potentially Occur in the Vicinity of the Project Area in Mesa County

Common Name Scientific Name	Habitat [1]	Potential Occurrence [2] Nearest Record	Federal Status [3]	State Status [4]	Global/State Rank [5]
Mammals					
Townsend's Big-eared Bat *Corynorhinus townsendii pallescens*	Montane forests, pinyon-juniper woodlands, semi-desert shrublands.	Possible Present in Mesa Co.	BLM-S	SC	G4/S2
Spotted Bat Euderma maculatum	Ponderosa pine in montane forest, pinyon-juniper woodlands, aspen, semi-desert shrublands.	Unlikely Present in Garfield Co.	BLM-S		G4/S2
Fringed Myotis *Myotis thysanodes*	Ponderosa pine, greasewood, oakbrush, saltbush shrublands.	Possible Book Cliffs area, Mesa Co.	BLM-S		G4G5/S3
Big Free-tailed Bat *Nyctinornops macrotis*	Rocky slopes, canyon lands, roosts in crevices.	Possible Occurs in Book Cliffs area.	BLM-S		G5/S1
White-tailed Prairie Dog *Cynomys leucurus*	Open shrublands, arid grass-shrub and mountain valleys mostly in semidesert shrublands, also agriculture/pasture.	Present Occupied habitat near Horse Mountain and scattered throughout Project Area.	BLM-S		G4/S4
Botta's Pocket Gopher *Thomomy bottae rubidus*	Agricultural land, grasslands, roadsides, open parklands, pinyon-juniper woodlands, open montane forest, montane shrublands and semidesert shrublands.	Possible Present in Mesa Co.		SC	S1
Northern Pocket Gopher *Thomomys talpoides macrotis*	Many different habitat types including agricultural and pasture lands, semidesert shrublands and grasslands, lower elevations into alpine tundra.	Possible Present in Mesa Co		SC	S1
Northern River Otter *Lontra* (*Lutra*) *canadensis*	Riparian habitats and permanent water with abundant fish and/or crustaceans. Present in the Colorado River and Reed Wash.	Present Whitewater Creek and Kannah Creek.		ST	none
Kit Fox *Vulpes macrotis*	Semidesert shrubland and margins of pinyon-juniper woodlands; saltbush, sagebrush, greasewood.	Possible Potential habitat south of Project Area.	BLM-S	SE	G4/S1
Desert Bighorn Sheep *Ovis canadensis nelson*	Introduced near Colorado National Monument in 1979; steep inaccessible cliffs, areas dominated by grasses.	None Occupied habitat is 18 miles away.	BLM-S		G4
Birds					
American White Pelican *Pelecanus erythrorhynchos*	Larger reservoirs, breeding on islands in eastern Colorado. Habitat during migration is present near the Colorado River.	None No records, no habitat present.	BLM-S		G3/S1B
Gunnison Sage-grouse *Cetrocercus minimus*	Expansive sagebrush with grasses, forbs and healthy riparian ecosystems.	None Occupied habitat is 16 miles away.	BLM-S FC	SC	G1/S1

Common Name Scientific Name	Habitat [1]	Potential Occurrence [2] Nearest Record	Federal Status [3]	State Status [4]	Global/State Rank [5]
Greater Sage-grouse *Cetrocercus urophasianus*	Sagebrush shrublands, also grasslands, meadows in summer.	None Occupied habitat is 14 miles away.	BLM-S FC	SC	G4/S4
Greater Sandhill Crane *Grus canadensis tabida*	Migrants - mudflats around reservoirs, agriculture, moist meadows. Habitat during migration is present near the Colorado and Gunnison rivers and Cheney Reservoir.	None No records, no habitat present.		SC	S2B
White-faced Ibis *Plegadis chihi*	Marsh edges, wet meadows, reservoir shorelines. Habitat during migration is present near the Colorado and Gunnison rivers and Cheney Reservoir.	None No records, no habitat present.	BLM-S		G5/S2B
Bald Eagle *Haliaeetus leucocephalus*	Reservoirs, rivers, wintering in semidesert and grasslands.	Possible Occupied winter habitat <1 mile away.	BLM-S	SC	G5/S3N
Northern Goshawk *Accipiter gentilis*	Forests of aspen, ponderosa pine, lodgepole pine.	None No records, no habitat present.	BLM-S		G5/S3B
Ferruginous Hawk *Buteo regalis*	Grassland, semidesert shrublands, rare in pinyon-juniper. Nests on isolated structures.	Unlikely Potential nesting habitat present.	BLM-S	SC	G4/S3B
American Peregrine Falcon *Falco peregrinus anatum*	Open conifer forests, riparian forests and cliffs; migrant in western Colorado.	Possible Potential nesting habitat <1 mile away.		SC	G4/S2B
Western Burrowing Owl *Athene cunicularia*	Grasslands in or near prairie dog towns. Potential habitat in any prairie dog colony.	Present Occupied habitat in Hall Basin.	BLM-S	ST	G4/S4B
Long-billed Curlew *Numenius americanus*	Short-grass grasslands, wheat fields, dry land agriculture near water. Habitat during migration is present near the Colorado River.	None No records, no habitat present.	BLM-S	SC	G5/S2B
Western Snowy Plover *Charadrius alexandrinus nivosus*	In Mesa County, migrants on mudflats and sandy shorelines of lower Gunnison River and Colorado River.	Unlikely No records, no habitat present.	BLM-S	SC	G4/S1B
Western Yellow-billed Cuckoo *Coccyzus americanus occidentalis*	Lowland cottonwood/willow riparian forests with dense sub-canopies and urban areas with tall trees.	Unlikely No records, no habitat present.	BLM-S FC	SC	G5Q/SNA
Brewer's Sparrow *Spizella breweri*	Mostly in sagebrush shrubland but also in mountain mahogany and rabbitbrush; mesas and foothills.	Present Observed nesting on-site.	BLM-S		G5/S4B
Reptiles					
Longnose Leopard Lizard *Gambelia wislizenii*	Flat or gently sloping, open ground shrublands.	Present Observed on-site.	BLM-S	SC	G5/S1
Milk Snake *Lampropeltis triangulum taylori*	Grasslands, sandhills, canyons, open woodlands ponderosa, pinyon-juniper. Not distributed in western Garfield County.	Possible Suitable habitat present.	BLM-S	SC	G5/S1

Common Name Scientific Name	Habitat [1]	Potential Occurrence [2] Nearest Record	Federal Status [3]	State Status [4]	Global/State Rank [5]
Midget Faded Rattlesnake *Crotalus oreganus concolor*	Most terrestrial habitats in western and west-central Colorado.	Present Observed on-site.	BLM-S	SC	G5/S3
Amphibians					
Great Basin Spadefoot Toad *Spea intermontana*	Pinyon-juniper woodlands, sagebrush, semidesert shrublands, stream floodplains, canyon bottoms.	Possible Record 6 miles away (CNHP).	BLM-S		G5/S3
Canyon Treefrog *Hyla arenicolor*	Intermittent streams in deep, rocky canyons with pinyon-juniper vegetation.	Possible Record 6 miles away (CNHP).	BLM-S		G5/S2
Northern Leopard Frog *Rana pipiens*	Margins, banks of marshes, ponds, streams, other permanent water.	Possible Suitable habitat present.	BLM-S	SC	G5/S3
Fish					
Colorado River Cutthroat Trout *Oncorhynchus clarkii pleuriticus*	Colorado River drainage, clear water with gravel bottoms in small headwater streams; spawns from April to June.	Present Brandon Ditch below Whitewater Ck.	BLM-S	SC	G4/S3
Roundtail Chub *Gila robusta*	Colorado River drainage, mostly large rivers, also streams and lakes. Spawns in early summer after spring runoff.	Possible Suitable habitat present.	BLM-S	SC	G3/S2
Bluehead Sucker *Catostomus discobolus*	Headwater streams to large rivers with moderate velocity, not in standing water; prefers rock substrate. Spawns in spring or summer.	Possible Suitable habitat present.	BLM-S	SC	G4/S4
Flannelmouth Sucker Catostomas latipinnis	Larger streams and rivers with riffles, eddies, backwaters. Spawns early May to early August.	Possible Suitable habitat present.	BLM-S		G3G4/S3
Mountain Sucker *Catostomas platyrhynchus*	Smaller rivers and streams with gravel, sand, mud bottoms, in areas of moderate current.	None Not in Mesa Co.	BLM-S	SC	G5/S2
Invertebrates					
Great Basin Silverspot Butterfly *Speyeria nokomis nokomis*	Spring-fed meadows, seeps, marshes, boggy streamside meadows with flowing water; bog violets are larval food plants.	Unlikely Record 25 miles away (CNHP).	BLM-S		G4/S1

[1] Sources: CPW, 2012a; Andrews and Righter, 1992; Hammerson, 1986; Woodling, 1985; Fitzgerald et al., 1994; Chung-MacCoubrey, 2008.
[2] Potential Occurrence:
Unlikely: May or may not occur in Garfield and/or Mesa counties but no suitable habitat
Possible: Occurs in Garfield and/or Mesa counties, suitable habitat is present, but not observed in the Project Area.
Likely: Occurs In Garfield and/or Mesa counties including the Project Area and/or immediate vicinity
[3] Federal Status: FC = Federal Candidate, BLM-S = BLM Sensitive.
[4] State Status: SC = State Species of Special Concern, SE= State Endangered , ST = State Threatened.
[5] Colorado Natural Heritage Program ranks:
Global Rank: G1 = Critically Imperiled, G2= Imperiled, G3= Vulnerable, G4 = Apparently Secure, G5 = Widespread, abundant. Q = Questionable Taxonomy
State Rank: S1= Critically Imperiled, S2= Imperiled, S3= Vulnerable, S4 = Apparently Secure. A "B" after the rank indicates the rank applies to Breeding Habitat; NA = Not Applicable

3.3.4.2 Environmental Consequences

Proposed Action Alternative

Threatened, Endangered and Candidate Species. The only animal species listed under the ESA that would be potentially affected by the Proposed Action are the four endangered Colorado River Fish species. None of the candidate species would be affected.

Colorado River Fish. The endangered fish could be affected through one or more of the following pathways:

1. Water depletions from the Colorado River system,
2. Decreased water quality from mobilized selenium in tributaries to the Colorado River that would be affected by construction of the Proposed Action,
3. Hazardous materials (diesel fuel, lubricants and herbicides) affecting tributaries crossing the Proposed Action and critical habitats downstream in the Colorado River.

Water Depletions. The FWS (2009a) has determined that any water depletions from the Gunnison River will adversely affect critical habitat for Colorado pikeminnow and razorback sucker in the Gunnison River and will adversely affect critical habitat for all the four endangered fish in the Colorado River from the confluence to Lake Powell. Freshwater required for drilling and testing of pipelines would be acquired from the City of Grand Junction. Approximately 13.88 acre-feet of water per year would be required during construction for well drilling, completion, hydrostatic testing and dust control. Exact amounts of water volume used in drilling operations would depend on the depth of the well and losses that occur during drilling. Water use is likely to be less than proposed because Fram intends to recycle water. The City of Grand Junction has existing water rights in the area and Fram would purchase water from the City.

In April 2002, the FWS issued a Final Biological Opinion for the City of Grand Junction Water Pipeline Replacement Project. The Biological Opinion allowed for continued average annual water depletion by the city's pipelines of 6,400 acre-feet based on requirements in the Biological Opinion. The water purchased by Fram from the City of Grand Junction would not cause the allowed total depletion to exceed 6,400 acre-feet included in the FWS consultation.

Decreased Water Quality. Selenium is a semi-metallic trace element that is widely distributed in Upper Cretaceous and Tertiary marine sedimentary rocks in the Western United States (U.S. Bureau of Reclamation - BOR et al., 1998). Selenium is an essential trace element for animals in small amounts but exposures to slightly higher amounts is toxic to vertebrates, often compounded by bioaccumulation of selenium through terrestrial and aquatic food chains (Hamilton, 2004; BOR et al., 1998; Lemly, 1993 and 1996; Peterson and Nebeker, 1992).

High concentrations of selenium have been found in Colorado pikeminnows inhabiting the Colorado River downstream from the Grand Valley Diversion Dam at Palisade (Osmundson et al., 2000). The levels of selenium in muscle tissue of pikeminnows in the river exceeded levels recognized as toxic to fish (Lemly, 1993; Lemly 1996). Selenium concentrations at low levels (2 to 5 µg/L) in water can affect fish reproduction and populations, but higher selenium levels (10 to 20 micrograms per kilogram - µg/kg) could result in teratogenesis, or abnormal embryonic developmental, in embryos (BOR et al., 1998; Lemly, 1996).

Selenium is widely distributed in Upper Cretaceous and Tertiary marine sedimentary rocks including Mancos Shale, in the Western United States (BOR et al., 1998). Approximately 59 percent of all proposed surface disturbances (96.23 acres) would be to soils derived from Mancos Shale. Forty-one percent of Project-related disturbance would be to Quaternary gravels and colluvial deposits that are also selenium-containing (seleniferous). Runoff from these strata

has been related to elevated loads of salt and selenium concentrations in the Upper Colorado River Basin (Lieb et al., 2012).

The northern access route alternative is not included in the estimates, above, of surface disturbances to seleniferous substrates. Approximately 2.7 miles of C Road coincides with Mancos Shale, the remaining 0.4 mile coincides with Quaternary gravels. Use of C Road could potentially mobilize additional selenium with input to the Upper Colorado River Basin.

Water quality reported by USGS (USGS gage 385600108250301) in lower Kannah Creek indicated an average selenium concentration of 20.7 µg/L between 1999 and 2002; an average of 37.2 µg/L in lower Whitewater Creek (USGS 385839108264401) during the same period and 14.9 µg/L in Callow Creek (USGS 09152520) between 1999 and 2003. Table Value Standards (TVS) for selenium concentrations in tributaries to the Gunnison River in Segment 4a (Whitewater Creek, Callow Creek) and Segment 4b (Kannah Creek) are 18.4 µg/L for acute toxicity and 4.6 µg/L for chronic toxicity (CDPHE, 2012b). However, none of these water bodies is included in Colorado's Section 303(d) list of impaired waters, due to concentrations of selenium (CDPHE, 2012c). A temporary modification (effective 3/30/2013) in the Lower Gunnison River Segment 2 (including the three water bodies in the Project Area) for the selenium TVS standard is 5 µg/L chronic and 20 µg/L acute. Additional surface disturbances within the Callow Creek, Whitewater Creek and Kannah Creek watersheds could increase selenium concentrations in those surface waters and critical habitat for Colorado pikeminnow and razorback sucker in the Gunnison River. The water PCE for critical habitat could be affected by increased selenium concentrations.

Selenium-laden sediment could also be mobilized during pipeline construction across drainages with water present. When crossing water bodies with water present, dry open-cut pipeline construction, whether by flume or by dam-and-pump, generates considerably less suspended sediment than wet open cut construction (Trettel et al., 2002; Reid et al., 2004). Application of measures proposed in the Biological Resources Protection Plan and SWMP would minimize potential discharge of selenium-bearing sediments during construction and operational that could increase selenium concentrations above acute (18.4 µg/L) or chronic (4.6 µg/L) standards (CDPHE, 2012a).

The BLM GJFO provided a Programmatic Biological Assessment (PBA) to the FWS Western Colorado Ecological Services Field Office requesting formal ESA consultation for the proposed Whitewater Unit MDP with a determination that the water withdrawals and decreased water quality may affect, is likely to adversely affect the four endangered Colorado River Fish. The PBA describes expected effects to the Colorado River Fish and provides conservation measures to minimize effects to ESA-listed species. Site-specific minimization measures are included in the PBA to avoid or minimize direct, indirect and cumulative impacts. In the event that the Proposed Action changes as a result of on-site inspections or other resource issues, the conservation measures outlined in the PBA would be implemented to ensure that no additional adverse effects to ESA-listed species occur beyond water depletions. Newly proposed site-specific minimization measures would be resubmitted to the FWS, if necessary. However, if changes to the Project could not incorporate the conservation measures outlined in the PBA, Section 7 consultation would be reinitiated. On September 3, 2013, the FWS issued a Biological Opinion for the Fram Whitewater Unit MDP. The FWS determined that although the Proposed Action is likely to adversely affect the Colorado River endangered fish species, but the Proposed Action and conservation measures would avoid the likelihood of jeopardy to the species. The FWS has also found that the Proposed Action would not result in the destruction or adverse modification of critical habitat for the Colorado River fish other than water depletions. The FWS has reached these conclusions because the BLM and Fram have committed to a series of conservation measures designed to avoid or minimize impacts from Project activities

on the species, such that the effects would not be expected to reduce, directly or indirectly, the survival or recovery of the species.

Hazardous Materials. Diesel fuel spills could affect freshwater stream macroinvertebrates for more than one year after a spill (Lytle and Peckarsky, 2001). Diesel fuels and lubricating oils are considerably more toxic to aquatic organisms than other, more volatile products (gasoline) or heavier crude oil (Markarian et al., 1994). Impacts to aquatic habitats that primarily affect aquatic substrates – hence fish spawning, incubating and rearing habitats – can remain for much longer periods (Lytle and Peckarsky, 2001; Markarian et al., 1994). Application of measures in the Biological Resources Protection Plan and SWMP would minimize potential for inadvertent fuel spills or release of other hazardous materials that might affect endangered Colorado River fish and designated critical habitat downstream from the Project Area.

Herbicides. Control of noxious weeds on ground surfaces disturbed by the Proposed Action could require the use of several commercial herbicides, that may present a high toxicity risk to endangered fish species (e.g., Fairchild, 2003), although some herbicides are practically non-toxic to fish (WSDOT, 2011b). Application of measures in the Biological Resources Protection Plan and SWMP would minimize the potential effects of herbicides on endangered Colorado River fish and designated critical habitat downstream from the Project Area.

BLM and State Special Status Species. Special status animal species that were observed or could occur in the Project Area (listed as "present" or "possible" in Table 3.3-6) including white-tailed prairie dog, northern and Botta's pocket gophers, river otter, midget faded rattlesnake, long-nosed leopard lizard and Colorado River cutthroat trout and other special status fish are discussed here. Effects to BLM-sensitive bird species observed within the Project Area (Brewer's sparrow, bald eagle, ferruginous hawk, peregrine falcon, burrowing owl) and appropriate conservation measures are discussed in Section 3.3-6, Migratory Birds. Habitat loss, increased fragmentation, temporary animal displacement and possible direct impacts to individuals (e.g., mortality, abandonment of nesting territories, harassment) are possible.

Construction would remove approximately 162.99 acres of habitat that could be used by special status species including previously disturbed areas. Special status species could be displaced from habitats that are cleared of vegetation and from adjacent habitats. Displacement from adjacent habitats would be reduced once interim reclamation of disturbed areas is complete and human activity is reduced to a few visits per week. Previously disturbed vegetation would become re-established to some degree within one to three growing seasons after construction, but shrub-dominated habitat would take longer. Light pollution from 24 hour drilling and completion would be short term and is expected to be minimized by the use of hooded and downcast lighting. Removal of pinyon-juniper woodland and big sagebrush shrubland would be long-term effects, possibly affecting summer and/or winter bat roosts, cavity-nesting bird species and sagebrush-dependent vertebrate species (see Table 3.3-6).

Some special status wildlife species may be directly impacted by construction of well pads, pipelines and roads if they are killed by vehicles traveling to and from construction sites. Species most susceptible to vehicle-related mortality include those that are inconspicuous (lizards, frogs, snakes and small mammals) and those with limited mobility (amphibians). Observing speed limits and limiting most construction traffic to daylight hours (Biological Resource Protection Plan) would minimize the potential for vehicle collisions with special status species.

Direct effects to fossorial species (those living underground), such as the white-tailed prairie dog, pocket gophers and Great Basin spadefoot toad could also occur during Project construction. Prairie dogs often burrow in previously disturbed areas (Koford, 1958; Knowles, 1982). To minimize effects to active white-tailed prairie dog towns within the Project Area, Fram

would avoid activities within active white-tailed prairie dog towns during pupping season on BLM-administered lands from April 1 through July 15 (see the Biological Resource Protection Plan, Appendix E).

Aboveground tanks can serve as perching and nesting sites for ravens and raptors which can prey on a variety special status species, including white-tailed prairie dogs, burrowing owls, pocket gophers, kit fox and longnose leopard lizards. Avian predators' use of aboveground tanks has indirectly affected sage-grouse nesting success and survival (Braun et al., 2002; Sage-grouse National Technical Team, 2011) and could similarly affect special status species.

Effects to Colorado River cutthroat trout could be affected by increased salt loads and selenium concentrations similar to effects described for Colorado pikeminnows, discussed above. Bioaccumulation of selenium in eggs with selenium-caused teratogenesis and possible reproductive failure has been documented in trout species exposed to selenium contamination (Holm et al., 2005). Bluehead sucker, flannelmouth sucker and roundtail chubs may be affected similarly but those three species are not expected to inhabit the upper reaches of streams within the Project Area.

Fish, particularly juveniles, may be susceptible to entrainment and impingement at pump water intakes. Entrainment occurs when a fish is diverted into the pump intake (usually fatal) while impingement occurs when the water flow velocity at the intake exceeds the swimming ability of fish, trapping them against the pump intake screen, usually with injury (National Marine Fisheries Service, 2011). Impact due to entrainment and impingement of fish on pump intake screens depends on size of the fish, its swimming ability and behavior in the vicinity of the intake as well as the water velocity, flow and depth, screen mesh size and design of the water intake (Canada Department of Fisheries and Oceans, 1995).

Colorado River cutthroat trout likely spawn in several of the drainages within the Project Area. Spawning in the region may extend from April through July, with the peak typically occurring in May and June. Eggs hatch and fry emerge from intergravel spaces between August and October (depending upon the time of spawning and water temperature) while juveniles may require three years to mature to adults (Dare et al., 2011). Water withdrawn directly from North Fork Kannah Creek, tributary to the North Fork and Brandon Ditch during any time of year could impinge and entrain juvenile and fry cutthroat trout in pump intakes.

Larval amphibians could be similarly entrained or impinged on pump intakes by water withdrawals from surface water and be affected by hazardous materials (diesel fuel, lubricants and herbicides) affecting tributaries crossed by the Proposed Action and habitats downstream in the Colorado River. Application of measures in the Biological Resources Protection Plan and SWMP would minimize potential for contaminated surface runoff, inadvertent fuel spills and/or release of other hazardous materials that might affect sensitive aquatic species present within or downstream from the Project Area.

Protective/Mitigation Measures

In addition to the Project Design Features listed in Chapter 2 and the BLM GJFO Standard COAs in Appendix C, the BLM would require the following measures to further reduce impacts to threatened, endangered and sensitive animal species:

- A background analytical report on the source water for hydrostatic testing should be provided to the BLM before use, per CDPHE recommendations.
- New pipe should be required to ensure avoidance of any contaminants that previously used pipe could introduce.

- Fram should use a flume crossing technique (dry open-cut) when water is present in drainages to install gathering pipelines in order to maintain water flow, minimize changes in water body flow characteristics, and reduce downstream turbidity and sedimentation. A biological monitor should be present during this process and prior to dewatering the isolated in-stream workspace. Aquatic species (fish, amphibians) present should be removed and released in the same stream outside the workspace.
- Construction at perennial, intermittent, and ephemeral drainage crossings (e.g. burying pipelines, installing culverts) should be timed to avoid high flow conditions and should consists of dry open-cut crossing.
- Shutoff valves should be installed on pipelines at sensitive water crossings. Fram should submit shutoff valve proposal to BLM for approval before installation.
- Culverts at drainage crossings should be designed and installed to pass a 25-year or greater storm event. However, due to the flash flood nature of area drainages and anticipated culvert maintenance, the USACE recommends designing drainage crossings for the 100-year event. On perennial and intermittent streams, culverts should be designed to allow for passage of aquatic biota. The minimum culvert diameter in any installation for a drainage crossing or road drainage should be 24 inches.
- Crossing structures, such as bridges, culverts or hard-bottoms should be installed before construction (with approval from the BLM) where Project-related traffic must cross any aquatic habitat where water would be present during all or portions of the year, such as the Brandon and Lockhart ditches. Any proposed culvert or bridge installations should be constructed during dry periods to minimize erosion and sedimentation. These structures should also not limit fish passage in appropriate creeks.
- Vehicular crossings should only be allowed during periods of low flow where an access road crosses small drainages and intermittent streams not requiring culverts.
- During dust suppression, water should not be applied to surfaces in volumes that would flow into drainages.
- All herbicides used in the vicinity of drainages should be non-toxic to fish and other aquatic organisms and should be labeled for aquatic use. If use of non-toxic herbicides is not possible, other methods such as biological or mechanical should be used.
- Spills of oil, gas, or any other potentially hazardous substances should be reported immediately to the BLM and other responsible parties, such as landowners or the City of Grand Junction, as applicable. Spills should be mitigated immediately according to an EPA approved spill contingency plan, and spilled material removed to an approved disposal site.

Single Access Alternative

Under the Single Access Alternative, impacts to terrestrial or aquatic BLM and State special status species would be similar to those described above for the Proposed Action. There is slightly less potential for selenium mobilization under the Single Access Alternative because the northern access route would not be used under this alternative, resulting in less soil disturbance from road use and maintenance.

B Road Alternative

Five additional potential WoUS would be crossed with possible connection to the Colorado and Gunnison Rivers (see Table 3.2-29 in Section 3.2.4). Approximately 5.52 miles of B Road coincides with seleniferous substrates: 4.96 miles crosses Mancos Shale, and 0.56 mile crosses

Quaternary gravels. Approximately 2.73 miles of road along the alternative northern route and within the seleniferous substrates would require new construction (0.11 mile) or road improvements (2.62 miles). Construction and improvement of roads along the B Road Alternative, as well as use of the B Road Alternative could potentially mobilize additional selenium with input to the Upper Colorado River Basin. Under the B Road Alternative, direct and indirect effects to Colorado River endangered fish and their designated critical habitats, or BLM and state special status animal species would be similar to those described above for the Proposed Action.

No Action Alternative

Under the No Action Alternative, none of the direct and indirect effects to Colorado River endangered fish and their designated critical habitats, or to BLM and state special status animal species would occur from any of the action alternatives.

3.3.5 Threatened, Endangered, Candidate and Sensitive Plant Species

3.3.5.1 Current Conditions

ESA-Listed and Candidate Species. The FWS (2012a) identified two plant species listed as threatened under the ESA that potentially occur in Mesa County: Colorado hookless cactus and DeBeque phacelia, including critical habitat designated for DeBeque phacelia in Mesa County. No candidate plant species were identified.

Colorado Hookless Cactus**.** Colorado hookless cactus is a federally-listed threatened plant (FWS, 1979, 2007b and 2009b) that occurs on river benches, valley slopes and rolling hills in Delta, Garfield, Mesa and Montrose counties, Colorado (FWS, 1990b). Colorado hookless cactus generally grows on soils that are unusually coarse, gravelly river alluvium above river floodplains and usually with Mancos Shale with volcanic cobbles and pebbles as components on the surface (FWS, 2010b). Two population centers occur in Colorado, one of which occupies alluvial river terraces of the Colorado River and in the Plateau of Roan Creek drainages in the vicinity of De Beque, Colorado and the other which is located on alluvial river terraces of the Gunnison River extending from Delta, Colorado to southern Mesa County including the Project Area.

Barrel cactus of the genus *Sclerocactus* were found within the Project Area during surveys conducted from 2010 through 2012 (WestWater Engineering, 2010, 2011, 2012a and 2012b) in accordance with the BLM GJFO Special Status Plant survey protocols (BLM, 2012c). Although surveys along the northern access route occurred outside of the Colorado hookless cactus flowering season, WestWater Engineering conducted high intensity surveys using 1 to 5 meter transect-spacing within 20 meters of the proposed access route and 5 to 10 meters transect-spacing within 100 meters of the proposed route, as recommended by the BLM GJFO (WestWater Engineering, 2012b). Some individual plants observed during the survey resemble the intermediate fishhook cactus. In May 2010, samples of *Sclerocactus* were collected from the Horse Mountain area by the FWS and sent to the Denver Botanic Gardens in Denver, Colorado for analysis and determination of the purity of potential Colorado hookless cactus. Currently, the BLM is considering all *Sclerocactus* spp. in the Project Area to be Colorado hookless cactus rather than the intermediate fishhook cactus (Lincoln, 2011). Over 8,600 Colorado hookless cactus plants were identified in the north half of the Project Area and approximately 220 cactus plants were found in the south half of the Project Area near Reeder Mesa. Approximately 4,724 individual cactus plants were specifically documented and locations recorded and more than 3,800 were estimated within 15 areas (19.1 acres) delineated with high cacti densities (0.1 cactus plant per meter-square) along the proposed northern access route (WestWater Engineering, 2010, 2011, 2012a and 2012b).

DeBeque Phacelia. DeBeque phacelia was proposed for listing in 2010 (FWS, 2010c) and was listed as threatened on July 27, 2011 (FWS, 2011b). It is currently known only to occur in Garfield and Mesa counties (Ladyman, 2003). DeBeque phacelia is an annual species endemic to Colorado and is found exclusively on sparsely vegetated, steep slopes in brown or gray clay on Atwell Gulch and Shire members of the Wasatch Formation within a 20-mile radius of DeBeque, Colorado (Lyon et al., 1996; Ladyman, 2003). According to the Geologic Map of Colorado (Green, 1992), neither geologic formation is present within the Project Area. The species' distribution is roughly centered on the Pyramid Rock Area of Critical Environmental Concern (ACEC) in Mesa County, which is approximately 15.4 miles north of the Project Area. The closest proposed critical habitat for DeBeque phacelia (Unit 7) is near Baugh Reservoir (FWS, 2011b), 6 miles southeast of Pyramid Rock ACEC in Mesa County and approximately 12.4 miles northeast of the closest Project Area boundary. No suitable habitat was identified during botanical surveys conducted during 2010 and 2011 (WestWater Engineering, 2010 and 2011) and the species is not expected to be present within the Project Area.

BLM Sensitive Species. The BLM (2009a) identified 22 species of sensitive vascular plants that are known or could occur within the GJFO area (Table 3.3-7). Available information from Colorado Natural Heritage Program (CNHP) and records from Colorado State University Herbarium (CSUH), University of Colorado Herbarium (CUH) and the Rocky Mountain Herbarium (RMH) indicate that six of the sensitive plant species might occur in the vicinity of the Project Area based on the species' known distributions and/or characteristic habitat associations (Table 3.3-7): narrowstem gilia, Jones blue star, grand buckwheat, Ferron's milkvetch, Naturita milkvetch and Grand Junction suncup. However, none of these species or other BLM-sensitive plant species in Table 3.3-7 were observed within the Project Area during biological surveys conducted in 2010, 2011, 2012, 2013, and 2014 (WestWater Engineering, 2010, 2011, 2012a, 2013 and 2014).

Public Land Health Standard 4

Standard 4: Special status, threatened and endangered species (federal and state), and other plants and animals officially designated by the BLM, and their habitats are maintained or enhanced by sustaining healthy, native plant and animal communities.

The BLM recently assessed Land Health Standards within the Project Area: the combined Whitewater Common-North Fork Kannah Creek Allotment in the northern portion and Kannah Creek Common Allotment in the southern portion of the Project Area. In the Kannah Creek Common Allotment (3,931 acres evaluated), 14 percent of the area were meeting land health standards, 63 percent were meeting standards but with problems, and 23 percent were not meeting standards. In the Whitewater Common-North Fork Kannah Creek Allotment (27,114 acres evaluated), 57 percent of the area were meeting land health standards, 20 percent were meeting health standards but with problems, and 23 percent were not meeting standards. Loss of plant diversity, absence of perennial grasses and dominance of invasive non-native species has created a degraded habitat for wildlife in the Project Area. Landscape conditions result from past and present grazing practices, drought and surface disturbances associated with oil and gas. Sensitive species' habitats that are currently degraded could be improved through protection of soils, restoration of native vegetation and weed management.

Approximately half of the BLM-administered lands that are not meeting standards or are meeting standards but with problems are considered to be affected by noxious weed infestations, especially cheatgrass as well as loss of perennial vegetation and general plant diversity.

Table 3.3-7
BLM-Sensitive Vascular Plant Species Not Listed Under the ESA that Could Potentially Occur in the Vicinity of the Project Area in Mesa County

Common Name Scientific Name	Habitat [1]	Potential Occurrence [2] Nearest Record	Federal Sensitive	Global/State Rank [3]
Narrowstem Gilia *Aliciella (Gilia) stenothysra*	Silt, loam, gravel soils from Green River/Uinta Formation; 5,000 to 6,000 feet.	Possible Mesa Co. 4 miles away (CNHP)	BLM	G3/S1
Jones Blue Star *Amsonia jonesii*	In runoff-fed draws on (Mancos Formation) sandstone, desert-steppe, rocky gorges, canyons, 4,500 to 5,000 feet.	Possible Mesa Co. 7 miles away (CNHP)	BLM	G4/S1
DeBeque Milkvetch *Astragalus debequaeus*	Varicolored, fine-textured, seleniferous, saline soils of Wasatch Formation-Shire Member; 5,100 to 6,400 feet.	Unlikely Mesa Co. 2 miles away (CNHP)	BLM	G2/S2
Horseshoe Milkvetch *Astragalus equisolensis* (*Astragalus desperatus* var. *neeseae*)	Dolores River Canyon, sagebrush, greasewood, mixed desert shrub, on Duchesne River Formation.	Unlikely Mesa Co. 36 miles away (CNHP)	BLM	G5/S1
Grand Junction Milkvetch *Astragalus linifolius*	Pinyon-juniper, sagebrush on Chinle, Morrison Formation; 4,800-6,200 feet.	Unlikely Mesa Co. 14 miles away (CUH)	BLM	G3/S3
Ferron's Milkvetch *Astragalus musiniensis*	Pinyon-juniper, desert shrub on shale, sandstone, or alluvium; 4,700-7,000 feet.	Possible Mesa Co. 29 miles away (CSUH)	BLM	G3/S1
Naturita Milkvetch *Astragalus naturitensis*	Pinyon-juniper woodlands, sandstone mesas, ledges, crevices; 5,000-7,000 feet.	Possible Mesa Co. 7 miles away (CNHP)	BLM	G2G3/S2S3
Fisher Milkvetch *Astragalus piscator*	Sandy, gypsiferous soils in valley benches, gullied foot hills; 4,300-5,600 feet.	Unlikely Mesa Co. 42 miles away (RMH)	BLM	G1/S1
San Rafeal Milkvetch *Astragalus rafaelensis*	Gullied hills, washes, tallus, seleniferous clay, silt, sand; 4,400-6,500 feet.	Unlikely Mesa Co. 37 miles away (RMH)	BLM	G3/S1
Grand Junction Suncup *Camissonia eastwoodiae*	Adobe hills, clay soil, in lower valleys, near Utah border; Mesa County and Delta County; 4,800-5,800 feet.	Possible Mesa Co. 17 miles away (CNHP)	BLM	G2/S1
Gypsum Valley Cateye *Cryptantha gypsophila*	In gypsum soils with other selenium-tolerant species (i.e., Atriplex); 5,700-6,400 feet.	Unlikely Mesa Co. 49 miles away (RMH)	BLM	G1G2/S1S2
Osterhout cryptantha C*ryptantha* (*Oreocarya*) *osterhoutii*	Dry, barren sites in red-purple decomposed sandstone; 4,500-6,100 feet.	Unlikely Mesa Co. 13 miles away (CNHP)	BLM	G3/S1S2
Kachina Fleabane (Daisy) *Erigeron kachinensis*	Found on saline sols in alcoves and seeps in canyon walls, Montrose County and eastern Utah: 4,800-5,600 feet.	Unlikely Montrose Co. 41 miles away (RMH)	BLM	G2/S1
Grand Buckwheat *Eriogonum contortum*	Mancos Shale badlands, shadscale, other salt desert shrubs; 4,500-5,100 feet.	Possible Mesa Co. 8 miles away (CNHP)	BLM	G3/S2
Tufted Green Gentian (Frasera) *Frasera paniculata*	Western Mesa County; near Utah border, sandy soils in desert shrub, pinyon-juniper. 4,000-6,500 feet.	Unlikely Mesa Co. 43 miles away (CUH)	BLM	G4/S1
Piceance Bladderpod *Lesquerella parviflora*	Shale in Green River Formation, ledges, canyon slopes; 6,200-8,600 feet.	Unlikely Mesa Co. 26 miles away (RMH)	BLM	G2/S2

Common Name Scientific Name	Habitat [1]	Potential Occurrence [2] Nearest Record	Federal Sensitive	Global/State Rank[3]
Wideleaf Bisquitroot (Canyonlands Lomatium) *Lomatium latilobum* (*Aletes latilobus*)	Pinyon-juniper, desert shrub, sandy soils from Entrada Formation; 5,000-7,000 feet.	Unlikely Mesa Co. 13 miles away (CNHP)	BLM	G1/S1
Dolores River Skeleton Plant *Lygodesmia doloresensis*	Endemic to Dolores River Valley on benches between canyon walls and river. 4,000-5,500 feet.	Unlikely Mesa Co. 17 miles away (CNHP)	BLM	G1G2/S1
Roan Cliffs Blazingstar *Mentzelia rhizomata* [*Nuttallia* (*Mentzelia*) *argillosa*]	Steep talus of Green River Formation shale, Roan Cliffs in Garfield County; 5,800-9,000 feet.	Unlikely Garfield Co. 30 miles away (RMH)	BLM	G2/S2
Eastwood Monkey-Flower *Mimulus eastwoodiae*	Shallow caves, seeps, in canyon walls; 4,700-5,800 feet.	Unlikely Delta Co. 22 miles away (CSUH)	BLM	G3G4/S1
Aromatic Indian Breadroot *Pediomelum aromaticum*	Sandy soils, barren hills, in sagebrush, pinyon-juniper, Montrose-southern Mesa counties; 5,000-5,600 feet.	Unlikely Mesa Co. 12 miles away (CNHP)	BLM	G3/S2
Cathedral Bluff (Sun-loving) Meadowrue *Thalictrum heliophilum*	Sparsely vegetated, steep shale talus slopes of the Green River Formation; 6,300-8,800 feet.	Unlikely Mesa Co. 25 miles away (CNHP)	BLM	G2/S3

[1] Sources: CNHP, 2012; Colorado State University Herbarium (CSUH); University of Colorado Herbarium (CUH); Rocky Mountain Herbarium (RMH), Colorado Natural Heritage Program (CNHP) records.

[2] Potential Occurrence:
Unlikely: May or may not occur in Garfield and/or Mesa counties but no suitable habitat.
Possible: Occurs in Mesa County, suitable habitat is present, but species not observed in the Project Area.
Likely: Occurs in Mesa County including the Project Area and/or immediate vicinity.

[3] Colorado Natural Heritage Program Ranks:
Global Rank: G1 = Critically Imperiled, G2= Imperiled, G3= Vulnerable, G4 = Apparently Secure, G5 = Widespread, abundant.
State Rank: S1= Critically Imperiled, S2= Imperiled, S3= Vulnerable, S4 = Apparently Secure.

3.3.5.2 Environmental Consequences

Proposed Action Alternative

The Proposed Action could affect special status plant species through one or more of the following pathways:

1. Direct mortality of plants and/or destruction of seed banks during clearing and grading, construction and reclamation.
2. Fragmentation and isolation of existing populations and areas of suitable habitat.
3. Damage or mortality of plants and/or seed banks due to increased off-road vehicle use in the Project Area.
4. Increased human access to occupied habitats and destruction of plants through illegal collection.
5. Increased populations of invasive noxious weed species that interfere with growth and survival of special status plants.
6. Damage or mortality of individual plants by dust deposited on photosynthetic surfaces during construction and operation.
7. Changes in characteristics (shade, temperature, soil moisture, species composition, etc.) that alter suitable habitat.
8. Loss of pollinators due to habitat alteration, dust and/or increased presence of invasive, noxious weeds.
9. Accidental release of toxic compounds during construction and/or operation.

These pathways are consistent with criteria developed cooperatively by federal agencies (FWS and BLM) to address impacts to listed plant species in Colorado. In Colorado, the FWS and the BLM (2007) recommended avoiding surface disturbances within at least 100 meters (328 feet) of habitat occupied by Colorado hookless cactus and BLM-sensitive species. Disturbance closer than 20 meters from a listed plant could be considered an adverse effect (FWS and BLM, 2007). More recent draft guidance from the FWS (Glenne, 2012) has suggested that effects to Colorado hookless cactus could extend out 300 meters, with adverse effects possible within 100 meters of proposed disturbance. These draft guidelines (Glenne, 2012) are similar to information presented in the Colorado hookless cactus recovery outline (FWS, 2010b). Consultation with the FWS for this Proposed Action would consider that effects to cactus could occur at distances to 100 meters from proposed disturbance, with adverse effects within 20 meters of Project disturbances (Sharp, 2012). In some instances, FWS and BLM (2007) have considered proposed disturbances within 20 meters of listed plants to not have an adverse effect if existing disturbance was between the Proposed Action and plants or if the listed plant was screened from proposed disturbance.

ESA-Listed Plant Species. The BLM GJFO provided a Programmatic Biological Assessment (PBA) to the FWS Western Colorado Ecological Services Field Office requesting formal ESA consultation for the proposed Whitewater Unit MDP with a determination that the Proposed Action is likely to adversely affect the Colorado hookless cactus. The PBA describes expected effects to Colorado hookless cactus and provides conservation measures to minimize effects to ESA-listed species. Site-specific minimization measures are included in the PBA to avoid or minimize direct, indirect and cumulative impacts to the Colorado hookless cactus. In the event that the Proposed Action changes as a result of on-site inspections or other resource issues in the vicinity of Colorado hookless cactus plants, the conservation measures outlined in the PBA would be implemented to ensure that no additional adverse effects to ESA-listed species occur. Newly proposed site-specific minimization measures would be resubmitted to the FWS, if necessary. However, if changes to the Project could not incorporate the conservation measures outlined in the PBA to ensure no additional adverse effects to ESA-listed species, Section 7 consultation would be reinitiated. On September 3, 2013, the FWS issued a Biological Opinion for the Fram Whitewater Unit MDP. The FWS determined that although the Proposed Action is likely to adversely affect the Colorado hookless cactus and its habitat, the Proposed Action and conservation measures would avoid the likelihood of jeopardy to the species. The FWS has reached these conclusions because the BLM and Fram have committed to a series of conservation measures designed to avoid or minimize impacts from Project activities on the species, such that the effects would not be expected to reduce, directly or indirectly, the survival or recovery of the species.

Colorado Hookless Cactus. Direct effects to Colorado hookless cactus could occur within 20 meters of the Proposed Action, which could result in loss or degradation of cactus populations, decreased cactus seed production, decreased recruitment and increased occurrence of plant damage or individual mortality. Impacts could include removal or crushing of individual plants during road, pipeline and well pad construction if plants are located within areas proposed for disturbance. Increased fugitive dust from construction and operation of the Proposed Action, especially increased traffic along existing access roads could cause impacts to cacti within 20 meters of the activities. Peak traffic volumes expected during construction, drilling and completion as well as production traffic for completed wells within the Project Area could be up to 48 round trips per day (20 light vehicles and 28 heavy vehicles) using the southern access route or 38 round trips per day (19 light vehicles and 19 heavy vehicles) using the northern access route in the winter months (December 1 through April 30). The peak traffic volumes are expected to drop off in Year 3 when well pad, access road and pipeline construction is

complete. During the production-only phase of operations (estimated up to 20 years), peak traffic in the summer (southern access route only) would consist of 14 round-trips per day (2 light-vehicles and 12 heavy vehicles) and in the winter (December 1 through April 30) would consist of 7 round-trips per day (1 light vehicle and 6 heavy vehicles) on both the southern and northern access routes (see Transportation Plan, Appendix D). Production only traffic is assumed to be less once remote telemetry is functional at producing wells. Dust could impair photosynthesis, gas exchange, transpiration, use efficiency, leaf morphology and stomata function (Farmer, 1993; Sharifi et al., 1997; Rai et al., 2009).

Indirect impacts to Colorado hookless cactus plants are expected within 100 meters of the Proposed Action (see FWS and BLM, 2007) and could occur from heavy dust created during construction activities and use of access roads from both construction and operation traffic, changes in hydrology and soil characteristics, an increase in noxious weeds and alterations of vegetation cover and species composition. Dust from construction and related traffic could also interfere with cactus reproduction by affecting pollinators during the flowering season. Soil compaction at well pads would result in a change in soil hydrology, possibly indirectly altering vegetation composition that might compete with the Colorado hookless cactus. Access roads are designed and maintained (e.g., crowned) to have water flow off the road, potentially affecting local hydrology in cactus habitat. Introduction of or an increase in noxious weeds could also alter vegetation cover and species composition, potentially out-competing the cactus. Construction of new roads and upgrades to existing roads could also increase the risk of motorized off-road recreationists diverging from roads and traveling cross country, crushing plants, damaging the soil that could lead to increased erosion, sedimentation and infestation by weeds.

Botanical survey efforts from 2009 through 2012 in the Project Area have documented (or estimated) over 8,741 Colorado hookless cactus plants within 100 meters of Project components that could be affected by construction- and operation-related activities (Table 3.3-8). The majority of plants occur along the proposed northern access route, of which proposed road improvement and use would occur generally from December 1 through April 30. Avoiding use of the northern proposed access route in April would minimize effects to cactus plants within 100 meters of the proposed route and potential pollinators during the flowering season (April through May). Approximately 2,189 cactus plants have been estimated within 20 meters of existing access roads (2,165 plants estimated) and proposed gathering pipeline disturbance (115 plants documented) and may be indirectly impacted (see Table 3.3-8); however, disturbance associated with the Proposed Action would be no closer to the documented plants than pre-existing disturbance. Although cacti have been documented adjacent to the northern access route (within 1 meter or less), road improvements would occur within existing disturbance and a biological monitor would be on-site during all disturbance activities including installation of BMPs (see Biological Resources Protection Plan, Appendix E). Table 3.3-8 summarizes the number of Colorado hookless cactus plants within 100 meters of the Proposed Action. No cactus plants were documented within proposed surface disturbance limits; therefore, no plants would be directly removed by the Proposed Action.

Table 3.3-8
Summary of Colorado Hookless Cactus
Plants within 100 meters of Proposed Disturbance [1]

Proposed Project Component	Number of Plants > 0 m but < 20m	Number of Plants > 20m but < 100m	Total Number of Plants < 100m of Proposed Action
Well Pads [2]	0	24 [5]	24
Gathering Pipelines [2]	115	532	647
New Access Roads	0	7	7
All Existing Access Roads [2, 3]	2,165	6,041	8,206
Northern Access Route – Only [3]	2,049	4,931	6,980
Proposed Action Total [3,4]	2,189	6,552	8,741

[1] Colorado hookless cactus locations determined from survey efforts conducted in 2009 through 2012 where survey permission acquired (see WestWater Engineering, 2010, 2011, 2012a, and 2012b, O&G, 2009).
[2] Many of the cacti identified for each component of the Proposed Action are also included in totals identified within other Project components listed separately.
[3] Total includes estimate of cactus plants within delineated polygons along the proposed northern access route (0.1 cactus/meter^2), as well as individual documented plants. Approximately 1,355 plants and 4,398 plants were estimated within 20 meters or between 20 and 100 meters, respectively of the northern access route within the delineated polygons.
[4] Proposed Action considers all cactus plants within 100 meters proposed well pads, gathering pipelines, and access roads, without overlap of Project component.

Approximately 213.03 acres within 100 meters of the Proposed Action were denied survey access by the private landowner and have not been surveyed, generally along Lands End Road and Divide Road (200.07 acres), as well as approximately 12.96 acres within one private parcel along the northern access route. Within these areas, Fram would have a biological monitor present during construction and/or necessary road improvements to identify and avoid or minimize effects to Colorado hookless cactus along the pipeline alignment and northern access route, which may include minor alteration of the pipeline alignment or minimization of the pipeline construction disturbance, if practical or installation of conservation measures (see Biological Resources Protection Plan, Appendix E).

Measures proposed in the Biological Resources Protection Plan, SWMP and Transportation Plan could minimize or avoid direct and indirect effects on Colorado hookless cactus plants within 100 meters of the Proposed Action. It is not expected that the Proposed Action would substantially affect the Colorado hookless cactus population within the Project Area.

BLM Sensitive Species. Similar to effects described above for the Colorado hookless cactus, sensitive plants that are “possible” within the Project Area (see Table 3.3-7) could be directly or indirectly impacted. Direct impacts to sensitive species might include removal or crushing of individual plants as a result of construction or mortality of individual plants might be caused by decreased light transmission if fugitive dust is deposited directly on the plants. These direct impacts are more likely to occur if they are located within 20 meters (66 feet) of the Proposed Action (FWS and BLM, 2007). Indirect impacts to sensitive plant species could be possible including those from heavy construction dust and from use of access roads during both construction and operation. Other indirect changes could occur in hydrology, soil characteristics and abundance of pollinators; noxious weeds might increase and vegetation cover and species composition could be altered. Indirect effects to sensitive species could occur out to 100 meters

(328 feet) from proposed surface disturbance (FWS and BLM, 2007). No BLM-sensitive plants were found during botanical surveys from 2010 through 2012 (see WestWater Engineering, 2010, 2011, 2012a and 2012b). No effects to BLM-sensitive plant species would be expected from the Proposed Action.

Protective/Mitigation Measures
In addition to the Project Design Features listed in Chapter 2 and the BLM GJFO Standard COAs in Appendix C, the BLM would require the following measures to further reduce impacts to threatened, endangered and sensitive plant species:

- Well pads and associated Project components with suitable Colorado hookless cactus habitat that have not been previously surveyed should have botanical surveys conducted prior to ground-disturbing activities during the appropriate survey season, to verify whether or not they are present.
- Where permission to survey suitable Colorado hookless cactus habitat was denied, Fram should have a biological monitor present to avoid impacts to the plants. Avoidance could include minor alteration of pipeline alignment or well pad placement to avoid removal of cacti.
- A biological monitor should be on-site during all ground-disturbing activities within 100 meters of Colorado hookless cactus, including installation of BMPs and reclamation activities, to ensure that unauthorized disturbance of the cacti will be avoided.
- Fram should work with the FWS and the BLM to ensure that new data collected in subsequent surveys is provided to the FWS and that conservation measures are applied to known and future plants identified.
- No Colorado hookless cactus plants should be directly removed during construction or operation.
- Vehicle speed should not exceed 10 miles per hour on the northern access route to minimize effects of fugitive dust on Colorado hookless cactus plants that occur within 100 meters of the proposed route.
- No heavy truck traffic should occur on the northern access route during April, to minimize effects during the flowering season (April through May) to more than 6,300 cactus plants that occur along the proposed route.
- The following well pads and associated access roads and pipelines, which had cactus plants documented within 100 meters of proposed disturbance should not be constructed during the Colorado hookless cactus flowering period (April through May): Federal 1-2-16-1, Federal 1-2-22-1, Federal 1-2-26-2 and Federal 1-2-33-1.
- Hydrostatic test water should be discharged using a temporary discharge structure. Discharge locations should be in vegetated upland areas at a distance from drainages and more than 100 meters from Colorado hookless cactus, to encourage infiltration and minimize flow into drainages (or disposed of in a commercial facility) to avoid an increase of selenium in the soil. BLM approval should be obtained prior to discharge.

- Colorado hookless cactus plants documented within 20 meters (328 feet) of proposed disturbance should be monitored annually during the flowering period (April and May) for at least 3 years after ground-disturbing activities A monitoring report should be submitted to the BLM and the FWS by December 1, annually.
    - Plants should be photographed from a staked location prior to ground-disturbing activities and annually during the appropriate flowering season.
    - Plant status and health should be described, including presence of weed species, if any.
    - A monitoring report should be submitted to BLM GJFO and FWS after each annual survey.
- Fram should establish a long-term monitoring plan that would be developed by the BLM GJFO and the FWS for a select number of sites with Colorado hookless cactus plants to monitor fugitive dust. Sites should be monitored every 3 to 5 years, depending on results of monitoring, throughout the life of the Project. Initially, these sites should be monitored annually. Long-term monitoring sites should be established prior to construction, to provide baseline data.
- If detrimental effects are detected through monitoring, corrective actions should be taken through adaptive management measures such as:
    - Place wooden mats on road and/or pad surfaces that contribute to fugitive dust at cactus locations (remove mats after construction);
    - Erect dust-control fencing;
    - Fabric could be placed beneath mats, if necessary, to further control dust.
    - Remove silt fence from access roadsides during seasons when roads are not used to avoid shading cactus.

Single Access Alternative

The northern access route would not be used under this alternative. As a result, the approximate 6,890 cactus plants (see Table 3.3-8) that occur within 100 meters of the proposed northern access route would not be affected by road improvements or construction and operation traffic. Table 3.3-9, summarizes the number of Colorado hookless cactus plants within 100 meters of the Single Access Alternative. No cactus plants were documented within proposed surface disturbance limits; therefore, no plants would be directly removed by the Proposed Action.

Effects to the approximate 1,761 cactus plants identified within 100 meters of the Single Access Alternative would be the same as described for the Proposed Action. Similarly to the Proposed Action, it is expected that application of measures proposed in the Biological Resources Protection Plan, SWMP and Transportation Plan would minimize or avoid direct and indirect effects to Colorado hookless cactus plants within 100 meters of the Single Access Alternative. It is not expected that the Single Access Alternative would substantially affect the Colorado hookless cactus population within the Project Area.

Table 3.3-9
Summary of Colorado Hookless Cactus Plants
within 100 meters of the Single Access Alternative [1]

Proposed Project Component	Number of Plants > 0 m but < 20m	Number of Plants > 20m but < 100m	Total Number of Plants < 100m of Proposed Action
Proposed Well Pads [2]	0	24 [4]	24
Proposed Pipeline Corridors [2]	115	532	647
New Access Roads	0	7	7
Existing Access Road [2]	122	547	669
Proposed Action Total [3]	146	629	775

[1] Colorado hookless cactus locations determined from survey efforts conducted in 2010 through 2012 where survey permission could be acquired (see WestWater Engineering, 2010, 2011, 2012a, and 2012b).
[2] Many of the cacti identified for each component of the Proposed Action are also included in totals identified within other Project components listed separately.
[3] Proposed Action considers all cactus plants within 100 meters of proposed well pads, gathering pipelines and access roads, without overlap of Project component.

B Road Alternative

WestWater Engineering conducted surveys for Colorado hookless cactus and other BLM sensitive plant species within 100 meters of the proposed alternate access route off of Mesa County B Road where surveys were permitted (BLM-administered lands and City of Grand Junction). Surveys were conducted within 20 meters of the proposed alternate access route on approximately 48.6 acres in November 2013 (WestWater Engineering, 2013). Surveys were conducted according to BLM-GJFO plant inventory standards (BLM, 2012c), although they were conducted outside of the recommended survey seasons (i.e., Colorado hookless cactus flowering period of April through May). Additional full-protocol surveys were conducted during the flowering period in 2014 within 100 meters of the proposed access route (approximately 381 acres), including the 20 meters surveyed in November 2013 (WestWater Engineering, 2014).

Survey efforts in November 2013 and April 2014 documented 709 Colorado hookless cactus plants within 100 meters of the proposed alternate access route, of which 147 cacti are within 20 meters of the proposed alternate access route. No cacti would be removed during road improvements or new road construction. No BLM-sensitive plant species were documented.

Use of the proposed alternate northern access route (Mesa County B Road) would have less impact to Colorado hookless cactus than the northern access route (Mesa County C Road) included in the Proposed Action in the Whitewater MDP PBA, where it has been estimated that at least 2,049 cacti occur within 20 meters of the proposed northern access route off of Mesa County C Road (see Table 3.3-8). Table 3.3-10, below, summarizes the number of Colorado hookless cactus plants that would occur within 100 meters of the Project under the B Road Alternative, considering results from surveys conducted in November 2013 and April 2014.

Under the B Road Alternative, impacts to federally threatened Colorado hookless cactus, and BLM and State special status plant species, would be similar to those described above for the Proposed Action.

Table 3.3-10
Summary of Colorado Hookless Cactus Plants within 100 meters of the B Road Alternative [1]

Proposed Project Component	Number of Plants > 0 m but < 20m	Number of Plants > 20m but < 100m	Total Number of Plants < 100m of Proposed Action
Proposed Well Pads [2]	0	24 [4]	24
Proposed Pipeline Corridors [2]	115	532	647
New Access Roads	0	7	7
Existing Access Road [2]	122	547	669
Northern Access Route – B Road Alternative	147	4,562	709
Proposed Action Total [3]	293	1,191	1,484

[1] Colorado hookless cactus locations determined from survey efforts conducted in 2010 through 2013 where survey permission was acquired (see WestWater Engineering, 2010, 2011, 2012a, 2012b, 2013, O&G, 2009).
[2] Many of the cacti identified for each component of the Proposed Action are also included in totals identified within other Project components listed separately; exception is the alternate northern access route – these are exclusive of other survey results.
[3] Proposed Action considers all cactus plants within 100 meters proposed well pads, gathering pipelines, and access roads, without overlap of Project component.

No Action Alternative

Under this alternative, there would be no Project-related impacts to endangered, threatened, candidate, or BLM-sensitive plant species on BLM-administered lands from construction of any of the action alternatives.

Finding on the Public Land Health Standard 4 (Special Status, Threatened and Endangered Animal and Plant Species)

Further habitat degradation from invasive vegetative species could occur under the Proposed Action Alternative and could affect special status species in the Project Area. However, with implementation of minimization measures, management of invasive and noxious weeds and timely reclamation of the disturbed area, the Proposed Action would not be expected to substantially affect the area's capacity to meet Public Land Health Standard 4. No changes in Land Health Standard 4 are anticipated under the Proposed Action if the Project Design Features and mitigation measures are properly implemented.

Similar to the Proposed Action Alternative, the Single Access Alternative would not be expected to substantially affect the area's capacity to meet Public Land Health Standard 4.

Under the No Action Alternative, effects from existing and new surface disturbances (unrelated to the Proposed Action) would continue and could affect Public Land Health Standard 4.

Similar to the Proposed Action Alternative, the B Road Alternative would not be expected to substantially affect the area's capacity to meet Public Land Health Standard 4.

3.3.6 Migratory Birds

3.3.6.1 Current Conditions

The Migratory Bird Treaty Act (MBTA) of 1918, as amended, implements treaties for the protection of migratory birds. Executive Order (EO) 13186, issued in 2001, directed actions that would further implement the MBTA. As required by the MBTA and EO 13186, the BLM signed a

Memorandum of Understanding (MOU) with the FWS in 2010 which is intended to strengthen migratory bird conservation efforts by identifying and implementing strategies to promote conservation and reduce or eliminate adverse impacts on migratory birds. At the project level, the BLM should:

- Evaluate the effects of their actions on migratory birds and identify where take reasonably attributable to those actions may have a measureable negative effect on migratory bird populations,
- Develop conservation measures and ensure monitoring of the effectiveness of measures used to minimize, reduce or avoid unintentional take,
- Consider approaches, to the extent practicable, for identifying and minimizing take that is incidental to otherwise lawful activities including:
    - altering the season of activities to minimize disturbances during the breeding season,
    - retaining the integrity of breeding sites, especially those with long histories of use and
    - coordinating with the FWS when planning projects that are likely to have a negative effect on migratory bird populations as well as cooperating in development of methods to minimize negative impacts and maximize benefits to migratory birds.

The focus of the BLM's conservation efforts is on migratory species and some non-migratory game bird species that are listed as BCC. BCC have been identified by the FWS (2008) for different Bird Conservation Regions (BCR) in the United States. The Project Area is in BCR 16, the Southern Rockies/Colorado Plateau.

Six of the 27 species of BCC identified within BCR 16 have been observed within the Project Area: golden eagle, prairie falcon, burrowing owl, pinyon jay, juniper titmouse and Brewer's sparrow. Golden eagles nest in cottonwood trees within the Kannah Creek riparian zone and on cliffs above Watson Creek (near The Blowout), northeast of the Project Area. Burrowing owl nesting was discussed above (Section 3.3.4.1, BLM-Sensitive Species) and prairie falcons were observed incidentally. Pinyon jays and juniper titmouse were observed in pinyon-juniper woodlands in the Project Area and are likely to nest in that habitat. Brewer's sparrows were documented nesting in sagebrush shrublands and they were discussed above (Section 3.3.4.1, BLM-Sensitive Species). Estimates of population trends for pinyon jay and Brewer's sparrow within BCR 16 (Sauer et al., 2011) indicate that both species declined between 1981 and 2010.

Forty-three bird species were observed within the Project Area during 2010, 2011 and 2012 (WestWater Engineering, 2010, 2011 and 2012a), of which 41 species are listed as Nearctic and Neotropical migratory birds by the FWS, Division of Bird Habitat Conservation, pursuant to the Neotropical Migratory Bird Conservation Act and are protected under the MBTA (FWS, 2010d). Nesting chronologies for the 41 migratory species observed were compiled from data in Kingery (1998) and show considerable variation within a species and especially between species. The median date that the 41 species initiate nest building in Colorado is May 11 (range from January 19 to June 10). The median date for fledging young by each of the 41 species is August 12 (range from June 16 to September 21). In addition to burrowing owls, golden eagles and Cooper's hawk are raptors that nest in the Project Area (WestWater Engineering, 2010, 2011 and 2012a).

Data compiled for 11 National Biological Survey Breeding Bird Survey (BBS - Sauer et al., 2011) routes in the region surrounding the Project Area reveal that populations for six of the migratory bird species observed on-site appear to be increasing, but populations for eight of the

species observed have been decreasing over the past 20 years, 1992 to 2011. Black-billed magpie, blue-gray gnatcatcher, Brewer's sparrow, vesper sparrow, chipping sparrow, common nighthawk and mountain bluebird are some of the species with declining populations in the region. Alternatively, the lark sparrow, common raven, plumbeous vireo, ash-throated flycatcher, Say's phoebe and western tanager are species with increasing populations in the region and occur on-site.

Public Land Health Standard 3 (Migratory Birds)

Standard 3: Healthy, productive plant and animal communities of native and other desirable species are maintained at viable population levels commensurate with the species and habitat's potential.

The BLM recently assessed Land Health Standards within the Project Area: the combined Whitewater Common-North Fork Kannah Creek Allotment in the northern portion and Kannah Creek Common Allotment in the southern portion of the Project Area. Loss of plant diversity, absence of perennial grasses and dominance of invasive non-native species have degraded habitat for wildlife in the Project Area. The landscape results from past and present grazing practices, drought and surface disturbances associated with oil and gas. Sensitive species' habitats that are currently degraded could be improved through protection of soils, restoration of native vegetation and weed management.

That approximately half of BLM-administered lands are not meeting standards, or are meeting standards but with problems, is generally attributed to noxious weed infestations, especially cheatgrass, with loss of perennial vegetation and general plant diversity.

3.3.6.2 Environmental Consequences

Proposed Action Alternative

The FWS has primary responsibility for administering the MBTA, which prohibits taking, killing, or possessing migratory birds, their parts (feathers, talons), nests or eggs. EO 13186 directed federal agencies to avoid take under the MBTA, whether intentional or unintentional (with BCC as priorities) and to implement conservation measures to restore and enhance habitat for migratory birds, including the development of surface operating standards for oil and gas developments, management of invasive species to benefit migratory birds, minimization or prevention of pollution, or avoidance of detrimental alteration of habitats utilized by migratory birds.

In the 2010 MOU pursuant to EO 13186, the BLM committed to identify where take under the MBTA could be reasonably attributable to agency actions that could have a measurable negative effect on migratory bird populations, focusing first on species of concern, priority habitats and key risk factors. One approach to lessening take is to avoid actions during nesting seasons. BLM (2007b) determined that impacts to nesting migratory birds could be minimized or avoided by imposing a timing limitation on use authorizations to mitigate vegetative disturbing activities during the primary portion of the nesting season (May 15 to July 15) when most migratory birds nest, but cautioned that dates should be adjusted for the timing or intensity of breeding activity by BCC and migratory bird species affected by the Project and species' environmental conditions (BLM, 2007b). Some BCC observed within the Project Area are known to fledge young after July 15. In Colorado, young Brewer's sparrows fledge by August 6, juniper titmice fledge by August 10 and pinyon jays fledge by August 12. However, over half of migratory bird species that could nest within the Project Area might fledge by July 15 (nest chronology data in Kingery, 1998).

Construction during the core nesting season (May 15 through July 15) could result in nest abandonment, displacement of birds and possible mortality of nestlings, more likely early in the

nesting season (egg laying, incubation) than late in the season (Romin and Muck, 2002), although many species will re-nest at alternate sites if abandonment occurs early. Risk of mortality of nestlings and dependent fledglings is greater if adults abandon nests late in the season or if nests are destroyed prior to fledging young. Such risk could increase if predators were attracted to areas occupied by humans (Andren, 1994; Chalfoun et al., 2002). Displacement of nesting migratory birds from nesting habitats due to noise, human activity and dust associated with oil and gas activities could also occur (Ingelfinger and Anderson, 2004; Knick and Rotenberry, 2002) within a "zone of effect" surrounding Project components, including well pads, production facilities and roads. Displacement/avoidance could be short-term if related to noise and human presence or long-term if related to habitat removal, alteration and/or fragmentation (Gilbert and Chalfoun, 2011).

Additionally, noise produced by machinery and other human activities can interfere with bird vocalizations used for territory establishment, mate attraction and selection, food begging and predator alarms (Marler, 2004). As proposed, vegetation clearing would not occur between May 15 and July 15 (Biological Resources Protection Plan), effectively avoiding the core migratory bird nesting period for most species but might affect late or second nesting attempts. Take of active nests, if it occurred, would not be expected to have measurable negative effects on migratory bird populations.

Attractions of migratory birds to night lights on oil and gas drilling rigs have not been reported but artificial light effects on birds by off-shore drilling rigs (Poot et al., 2008), wind turbines (Kerlinger et al., 2010), and other sources (Gauthreux and Belser, 2006) have been documented and effects from lighting on drilling rigs are possible. Nocturnally migrating birds die or lose a large amount of their energy reserves during migration as a result of encountering artificial light sources (Gauthreux and Belser, 2006). The Project Area is in the vicinity of a principal migration route for birds migrating to southern wintering grounds (see Figure 18 in Lincoln et al., 1998) making the possibility more likely.

The Proposed Action would affect 162.99 acres of potentially suitable migratory bird nesting habitat (woodlands, shrublands, grasslands, barren ground and unaltered, forested wetland/riparian habitat (see Table 3.3-3). These habitats are expected to support nesting by BCC (e.g., pinyon jay, juniper titmouse and Brewer's sparrow) and other migratory birds that have been observed in the Project Area. Successful revegetation could occur within three growing seasons of construction, which could be expected to provide nesting and/or foraging habitat for some passerine migratory species, but reestablishment of sagebrush and forested habitat would take longer than 10 years and might not occur within the life of the Project. Under natural succession regimes it would take at least 20 years to replace a mature sagebrush stand and 100 to 300 years to replace mature pinyon-juniper habitat. Brush-hogging and shredding large woody vegetation in place would leave big sagebrush, greasewood, rabbitbrush and other shrubs' roots intact in case they could reestablish from the roots, potentially increasing restoration of any migratory bird nesting shrubland habitat. Shredding of woody vegetation results in addition of organic matter to salvaged topsoil and can improve soils, which could facilitate native revegetation and habitat restoration. The Proposed Action could affect bird species through degradation of nesting habitats due to noxious weed infestations that alter native vegetation cover and plant species composition. Implementation of the *Noxious and Invasive Weed Management Plan for Oil and Gas Operators* (BLM, 2007a) could help minimize weed infestations.

The Proposed Action would remove vegetation within golden eagle sensitive wildlife habitat, defined under COGCC Rule 1200 (COGCC, 2009; also see Section 2.2.2 for a brief description). Rule 1200 requires operators of proposed new oil and gas locations that are within SWH to consult with CPW, the surface owner and the COGCC Director to identify possible

Conditions of Approval (see sections 1202(a), (b) and (c), with exceptions in sections 1202(d) and (e)). Approximately 0.42 mile of proposed pipeline disturbance passes through greasewood and disturbed grassland vegetation within the buffer area surrounding the golden eagle nest site. Access on Kannah Creek Road to well pads Federal 13-98-12-2 and Federal 13-97-8-2 is also within the nest buffer. The BLM (2011a) recommends avoiding human activities within 0.5 mile of an active golden eagle nest from December 15 through July 15. Because traffic to the well pads would travel on an existing paved road (Kannah Creek Road) and the golden eagle nest site is flanked by residences, additional traffic to the two well pads on the road would not be expected to further disrupt golden eagle nesting. Upgrading the existing pipeline, however, would occur after the nesting period, depending on the nest status during the year of construction.

In addition to temporal and spatial buffers for active golden eagle nest sites, the BLM (2011a) has draft recommendations applicable to other raptor species observed or likely to occur within the Project Area (see Table 3.3-11).

Table 3.3-11
Temporal and Spatial Buffers Recommended by the BLM for Raptor Species

Raptor Species	Breeding Season Timing Buffer	Breeding Season Spatial Buffer (mile)
Bald Eagle	November 15 - July 31	0.5
Burrowing Owl	February 1 -August 15	0.25
Northern Goshawk and Ferruginous Hawk	Contact BLM	0.25
Golden Eagle	February 15-August 15	0.5
Peregrine Falcon	March 15 – July 31	0.5
Prairie Falcon	March 15 – July 15	0.5
Red-tailed Hawk	February 15-July 15	0.25
Swainson's Hawk	April 1 – July 15	0.25
Osprey	April 1 – August 31	0.25
Other Raptors Not Listed Above	February 1 – August 15	0.25
[1] Buffers based on Klute, 2009.		

Protective/Mitigation Measures
In addition to the Project Design Features listed in Chapter 2 and the BLM GJFO Standard COAs in Appendix C, the BLM would require the following measures to further reduce impacts to migratory birds:

- Before any intensive activities take place, if more than two nesting seasons have passed since the last migratory bird raptor survey, a new full survey should be conducted.

Single Access Alternative
Impacts to migratory birds under the Single Access Alternative would be similar to those described above for the Proposed Action Alternative.

B Road Alternative
Impacts to migratory birds under the B Road Alternative would be similar to those described above for the Proposed Action Alternative.

No Action Alternative
Under this alternative, there would be no Project-related impacts to migratory birds on BLM-administered lands from construction of any of the action alternatives.

3.3.6.3 Finding on the Public Land Health Standard 3 (Migratory Birds)

Habitat degradation from invasive vegetative species could occur and could affect migratory birds in the Project Area. However, management of invasive and noxious weeds and timely reclamation of the disturbed area could help minimize effects on meeting Public Land Health Standard 3 in the Project Area. The Proposed Action would affect potentially suitable migratory bird nesting habitat (woodlands, shrublands, grasslands, barren ground and unaltered, forested wetland/riparian habitat). Successful revegetation could occur within three growing seasons of construction, which could provide nesting and/or foraging habitat for some passerine migratory species. No changes in Land Health Standard 3 are anticipated under the Proposed Action if the Project Design Features and mitigation measures are properly implemented.

Effects to Land Health Standard 3 under the Single Access Alternative would be similar to those described above for the Proposed Action.

Under the No Action Alternative, effects from existing and new surface disturbances (unrelated to the Proposed Action) would continue and could affect the area's capacity to meet Public Land Health Standard 3.

3.3.7 Wildlife (includes fish, aquatic and terrestrial) (includes a finding on Standard 3)

3.3.7.1 Current Conditions

Fish. Whitewater Creek and Kannah Creek are perennial fish-bearing streams within the Project Area. Fish species likely to be present in both were sampled in the Gunnison River in the vicinity of Whitewater during 1996 (Deacon and Mize, 1997). Native fish species observed were white sucker, bluehead sucker, flannelmouth sucker, roundtail chub, speckled dace and fathead minnows. Non-native species observed included rainbow trout, brown trout, and common carp. White suckers, speckled dace and fathead minnows are expected in the upper reaches of perennial steams within the Project Area.

The roundtail chub, bluehead sucker and flannelmouth sucker are likely to occur in portions of Whitewater Creek and Kannah Creek given their presence in other tributaries to the Gunnison and the Colorado rivers. All three species are declining throughout their ranges and are the focus of a multi-state conservation strategy to minimize threats to the species and habitats (Karpowitz, 2006).

Maximum flows in Kannah Creek and presumably in Whitewater Creek, occur between May and June as snow melts in the basin upstream (see Figure 3.3-1, above). The native fish species that potentially occur in the Project Area spawn during spring (Woodling, 1985) when flows in the creeks are highest. However, Brandon Ditch diverts water from Whitewater Creek at a point about ½ mile to the east and upstream of the Project Area boundary from April through October (see Section 3.2.4.1, Surface Water Hydrology). Brandon Ditch flows perennially with the majority of diversion occurs from April through October and spawning by native fish species could occur in Brandon Ditch.

Terrerstrial Species and Habitats. CPW (2011b) lists 405 wildlife species expected to occur in Mesa County. Of those, 323 species would be classified as non-game (not legally harvested or identified as sensitive by state and/or federal agencies). During surveys conducted in 2010, 2011 and 2012, a total of 50 species of wildlife and/or their sign were observed within the Project Area (WestWater Engineering, 2010, 2011, 2012a and 2012b); 44 species were non-game wildlife (one amphibian, two reptiles, 39 birds and two mammals).

Small game includes a variety of mammal and bird species. Harvest is compiled by county. During the 2010/2011 harvest year, eight small game species were harvested in Mesa County, of which only four species are likely to occur in the Project Area: cottontails (desert cottontail

and mountain cottontail), coyote, Gambel's quail and mourning dove. The eastern third of the Project Area coincides with overall ranges used by wild turkeys. Turkeys are generally associated with stands of Gambel oak shrublands, pinyon-juniper woodlands and riparian forests. Wild turkey winter range and winter concentration area have been mapped (CPW, 2011b) in upper Lockhart Draw and upper Whitewater Creek, primarily in pinyon-juniper woodland, pinyon-juniper that has been altered by chaining and native hay meadows. During spring 2011, 122 turkeys were harvested in Mesa County.

The Project Area coincides with CPW's Game Management Unit (GMU) 41. Mule deer, elk, pronghorn, moose, black bear and mountain lion are big game species hunted within GMU 41, although no habitats used by moose are present in the Project Area. Harvest data have been reported by CPW (2012b and 2012c). Annual averages of 368 mule deer and 261 elk have been harvested within GMU 41 between 1999 and 2011 but there are no discernible trends for hunter success or hunter-days per animal harvested for either species during that period. Only one pronghorn has been harvested within the GMU since 2007.

GMU 41 is within deer Data Analysis Unit (DAU) D-12. According to CPW estimates (see CPW, 2012b), the post-harvest mule deer population in DAU D-12 has decreased between 2004 and 2010. The peak population was 33,190 mule deer in 2006 but was estimated to be 19,210 animals in 2011. Elk inhabiting the Project Area are within Elk DAU E-14. The post-hunt elk population in DAU E-14 has been increasing from 11,570 in 2004 to 17,610 elk in 2011. Although there was no estimate provided in 2011, the pronghorn population in DAU A-27 (includes GMU 41) has been constant at 60 animals from 2008 through 2010. CPW transplanted 24 pronghorns into the DAU A-27 in 2012 to monitor telemetered animals movements and study fawn recruitment in the population.

Elk, pronghorn antelope and mule deer are likely to be present on winter ranges from the first heavy snowfall (November or December) to spring green-up (CPW, 2011b), usually in April to May. CPW (2012d) has defined expected distributions of big game on winter ranges under different winter conditions:

- Winter range is utilized by 90 percent of the population during an average five out of ten winters.
- Winter concentration areas are smaller areas within winter range where animal densities are (at least) 200 percent greater than the density on surrounding winter range during an average five of ten winters.
- Severe winter ranges are sub-areas within winter range where wintering animals are highly concentrated (severe winter ranges support 90 percent of the population) during the most severe two out of ten winters (when snowpack depths are greatest and/or temperatures are lowest).
- Critical winter ranges are parts of the winter ranges that are of highest priority for protection from disturbance and which are critical to sustain mule deer populations. Critical winter ranges generally comprise combinations of winter concentration areas and severe winter ranges. (CPW, 2012d).

The eastern half of the Project Area is within mule deer winter range and the eastern third is within elk winter range. Mule deer critical winter range, winter concentration areas, severe winter range and elk winter concentration areas and severe winter range occur at the base of Grand Mesa, coinciding with the upper Whitewater, North Fork and Kannah Creek drainages in the eastern Project Area. Pronghorn winter habitat is present in the southern portion of the Project Area, mostly south of Reeder Mesa, and a small area of pronghorn winter concentration range is present between Indian Creek and Kannah Creek. Map 2.2-1 identifies the sensitive big game winter habitats as defined and delineated by CPW (2011b). Elk and Pronghorn Winter

Concentration Areas and Mule Deer Critical Winter Range are classified as Sensitive Wildlife Habitats (SWH) under COGCC Rule 1200 (COGCC, 2009; also see Section 2.2.2 for a brief description). The COGCC SWH corresponds to 2011 CPW coverages for elk and pronghorn winter concentration areas and mule deer critical winter range (see Map 2.2-1). The Project Area encompasses three blocks of piñon juniper chaining; the treatments blocks are 16.5 acres, 4.5 acres, and 15 acres in size. The road runs along the edge of all three treatment blocks. These treatments were designed to increase understory vegetation vigor so as to improve winter habitat for mule deer. The project was completed 40 to 50 years ago and is currently providing the desired seral stage of growth and vegetation components.

Densities of wintering big game within the Project Area vary by big game species, population and winter range type. Estimates of densities in Table 3.3-12 are based on CPW (2012d) definitions of animal distributions (above), total mapped winter range types within a population area and the number of animals in the population during the current year. For any species and population in the Project Area, expected animal densities would be highest on severe winter range, intermediate on winter concentration areas and lowest on winter range depending on winter conditions in any given year. Alternatively, the amount of winter range that is available for each wintering animal in the Project Area is least for severe winter range and greatest for winter range (see Table 3.3-12).

Table 3.3-12
Expected Big Game Densities on Existing Winter Range Types within the Project Area

Big Game Population	2011 Population	Big Game Winter Range Type	Total Area (acres) of Winter Range for Population	Estimated Animal Density (animals/acre) on Winter Range	Area (acres) Available for Each Animal
Mule Deer D-12	19,210 deer	Winter Range	350,917	0.0493	20.3
		Winter Concentration	146.649	0.0805	12.4
		Severe Winter Range	108,457	0.1594	6.3
Elk E-10	17,610 elk	Winter Range	786,841	0.0201	49.6
		Winter Concentration	214,233	0.0391	25.6
		Severe Winter Range	179,335	0.0884	11.3
Pronghorn A-27	60 pronghorn (2010)	Winter Range	121,037	0.0005	2,241.4
		Winter Concentration	7,650	0.0012	841.6
		Severe Winter Range	0	N/A	N/A

The Project Area coincides with habitats utilized by black bears year-round (black bear overall range). Black bear autumn concentration habitat is used by bears from August 15 through the end of September to build fat reserves as they feed on mast (e.g., acorns) and berries prior to hibernation. Such habitat is present along the slopes of Grand Mesa and the eastern edge of the Project Area. Human conflicts with bears are possible, although CPW (2011b) has noted that there are no areas of human-bear conflicts near the Project Area. Seven black bears, on average, have been harvested in GMU 41 each year since 2000 (CPW, 2012b).

The entire Project Area coincides with mountain lion overall range. On average, 2.6 mountain lions have been harvested annually in GMU 41 since 2001 (CPW, 2012c). CPW has mapped areas of mountain lion conflicts with humans within Lockhart Draw and along Whitewater Creek, as well as the Purdy Mesa area and upper Kannah Creek drainage. Conflict areas include reports of mountain lions attacks on humans, predation on domestic pets or depredation on livestock near human habitation.

Public Land Health Standard 3 (Terrestrial Wildlife)

Standard 3: Healthy, productive plant and animal communities of native and other desirable species are maintained at viable population levels commensurate with the species and habitat's potential.

The BLM recently assessed Land Health Standard 3 within the Project Area: the combined Whitewater Common-North Fork Kannah Creek Allotment in the northern portion and Kannah Creek Common Allotment in the southern portion of the Project Area (see discussion for Vegetation, above). In the Kannah Creek Common Allotment (3,931 acres evaluated), 14 percent of the area were meeting land health standards, 63 percent were meeting standards but with problems, and 23 percent were not meeting standards. In the Whitewater Common-North Fork Kannah Creek Allotment (27,114 acres evaluated), 57 percent of the area were meeting land health standards, 20 percent were meeting health standards but with problems, and 23 percent were not meeting standards. Loss of plant diversity, absence of perennial grasses and dominance of invasive non-native species has created a degraded habitat for wildlife in the Project Area.

3.3.7.2 Environmental Consequences

Proposed Action Alternative

Fish. Construction of the Proposed Action could directly and/or indirectly affect aquatic species and habitats present in the Project Area through some of the same pathways that might affect endangered Colorado River fish, Colorado River cutthroat trout and other sensitive species (Section 3.3.4.2). In particular, the Proposed Action could cause, 1) decreased water quality from mobilized selenium in tributaries to the Colorado River, 2) potential impingement and entrainment in pump intakes of larval or juvenile aquatic species and 3) accidental release of hazardous materials (diesel fuel, lubricants and herbicides) in aquatic habitats in the Project Area with potential effects downstream in the Colorado River. Several aquatic wildlife protection measures are included in the Biological Resource Protection Plan (Appendix E). Crossing drainages with water present by dry open-cut pipeline construction methods could minimize effects to aquatic species that may be present within the drainage (see protection/mitigation measure in Section 3.3.4.2).

Terrestrial Species and Habitats. Construction and operation of the Proposed Action could directly and/or indirectly affect terrestrial wildlife present in the Project Area through one or more of the following pathways:

- Direct mortality by vehicles during construction and operation of the Project, and poaching coincidental with increased human use.
- Removal and alteration of vegetation composition and structure of existing habitats, making them less functional for wildlife.
- Fragmentation of habitats (also see Section 3.3.6.2, Migratory Birds).
- Decreased habitat use, mostly within a zone of effect near Project components results in displacement of animals to alternative habitats.
- Direct and indirect effects to population carrying capacities.

Direct Mortality. Project-related traffic could result in wildlife mortalities, especially for mammals and reptiles. Species most susceptible to vehicle-related mortality include those that are inconspicuous (lizards, snakes and small mammals), those with limited mobility, burrowing species (mice and voles), wildlife with behavioral activity patterns (e.g., nocturnal activity) and wildlife that may scavenge roadside carrion (Leedy, 1975, Bennett, 1991, Forman and Alexander, 1998). For example, wildlife-vehicle collisions documented for mule deer indicate that mortality increases with traffic volume during winter and other seasons (Arnold, 1978; Romin and Bissonette, 1996). Observing speed limits (Biological Resources Protection Plan, Appendix E) and taking precaution where wildlife crossing signs are placed along roads, should reduce the potential for vehicle collisions with terrestrial wildlife.

Poaching wildlife is a possible consequence of additional human access within wildlife habitats (Comer, 1982). Fram would provide environmental awareness training to all employees to address consequences of poaching and provide information about federal and state wildlife laws. Native rock, cleared and shredded vegetative material would be scattered or redistributed with topsoil when pipelines are reclaimed following construction. Scattering rocks and large woody debris and slash helps maintain soil surface roughness, decreases soil moisture loss and discourages off-road vehicle use on revegetated areas (Biological Resources Protection Plan, Appendix E).

Habitat Loss and Alteration. Construction would remove habitats used by big game, upland and small game and non-game wildlife species including migratory birds (see Section 3.3.6.2). The Proposed Action would affect 490 acres of potentially suitable habitats for wildlife species within the Project Area habitat with 163 acres of new disturbance (woodlands, shrublands–disturbed, grasslands, exposed rock and unaltered, forested and non-forested wetland/riparian habitat (see Table 3.3-3). Non-game wildlife species would potentially be displaced from habitats cleared of vegetation, but, displacement would be expected to be short-term when it was related to noise and intensive human presence (construction). It would be more likely to be long-term when related to habitat removal, alteration and/or fragmentation (operation).

Noxious weeds can interfere with reestablishment of native vegetation species and many weeds are unpalatable to wildlife (Whitson et al., 1996). Successful restoration of vegetated seasonal ranges would provide more suitable habitat, especially on previously disturbed lands and could reduce deer and elk densities on unaffected ranges. Full restoration of shrub-dominated habitats and forest-woodland habitats would occur over the long-term.

Construction would require removal of 106.6 acres of mule deer winter range, including 23.9 acres of winter concentration area and critical winter range and 9.9 acres of severe winter range (CPW, 2011b), all of which partially or completely overlap. Sensitive big game winter habitats (not including pronghorn, mule deer and elk overall winter ranges that are included in Table 3.3-13) are shown on Map 2.2-1. Project effects on mule deer winter ranges would remove habitat that could support 2 to 5 mule deer (based on expected mule deer densities (Table 3.3-13), potentially for the life of the Project if animal densities remain constant. It is estimated that 66.6 acres of elk winter range would be removed, including 11.1 acres of elk winter concentration area and 32.1 acres of severe winter range (Table 3.3-13), parts of which overlap (see Map 2.2-1). Project effects on elk winter ranges would remove habitat that could support between 1 and 3 elk (based on winter range densities in Table 3.3-12). In addition, 11.3 acres of pronghorn antelope overall winter range would be affected. Big Game SWH (elk winter concentration area and mule deer critical winter range would be effected, but would be subject to COGCC Rule 1200 (COGCC, 2009; also see Section 2.2.2 for a brief description). Rule 1200 requires operators of proposed new oil and gas locations that are within SWH to consult with CPW, the surface owner and the COGCC Director to identify possible Conditions of Approval (see sections 1202(a), (b) and (c), with exceptions in sections 1202(d) and (e). Sensitive big game winter habitats (CPW) affected by the Proposed Action are included in Table 3.3-13.

Surface disturbances by pipeline construction is proposed to be reclaimed at the time of installation (Biological Resource Protection Plan) and approximately 76 percent of surface disturbance associated with well pad construction would be reclaimed within 6 months after completion of the last well planned for the well pad or after a year has passed with no new wells drilled (assuming a working area of about 1.0 acre per pad would remain disturbed throughout the long-term production phase of the well, see Section 2.2.2.2, Construction, above). Such reclamation could reduce some of the effects to sensitive big game winter habitats in Table 3.3-13.

Table 3.3-13
Proposed Surface Disturbances within Big Game
Winter Ranges Including Sensitive Big Game Winter Habitats

Sensitive Big Game Winter Habitat	Total Area Affected (acres)
Mule Deer	
Overall Winter Range	106.6
Winter Concentration Area	23.9
Severe Winter Range	9.9
Critical Winter Range	23.9
Elk	
Overall Winter Range	66.6
Winter Concentration Area	11.1
Severe Winter Range	32.1
Pronghorn	
Overall Winter Range	11.3

[1] Sensitive Big Game Winter Habitat considers CPW 2011 mule deer and elk severe winter range, winter concentration area and/or critical winter range. Within the Project Area, the 2011 CPW and 2008 COGCC (mule deer critical winter range and elk winter concentration area) GIS coverages overlap entirely.

Zone of Effect. Vehicular traffic would be expected to affect mule deer, elk and pronghorn distributions within the Project Area for some distance away from Project components, including well pads and roads; (see Rost and Bailey, 1979; Easterly et al., 1991). Studies conducted on the effects to mule deer and elk from traffic volumes associated with development of a natural gas well field in Wyoming concluded that a variable "zone of effect" persists beyond the actual physical disturbance of big game habitats (Sawyer et al., 2006; Sawyer et al., 2007; and Sawyer et al., 2009). In some instances, mule deer and elk were observed to avoid disturbances during winter development by up to 4.7 miles and 0.75 mile or more, respectively; avoidance distance depended on the level of human activity. Portions of the Project Area coincide with various big game winter habitats used by mule deer, elk and/or pronghorn under varying winter conditions, including sensitive winter habitats (see Map 2.2-1). Although conditions within the Project Area are different than the Sawyer et al. (2006, 2007 and 2009) study areas, similar indirect effects to wintering mule deer and elk could be expected to occur due to the "zones of effect" phenomenon and due to displacement caused by construction and operation during winter months. Zones of effect would also result in displacement/avoidance of Project components (well pads, roads, production facilities) by migratory birds (Section 3.3.6.2) and other terrestrial species. Table 2.2-5 identifies seven well pads that either occur within sensitive big game winter habitats and/or would be accessed through sensitive big game winter habitats. These do not include Project components within overall winter range as in Table 3.3-13.

In winter months many wildlife species, including big game species, rely on fat reserves. Disturbances resulting in greater energy expenditures are detrimental to survival because of reduced ability to replace expended energy in the winter months. Animals on winter ranges are likely to escape from human activities if allowed. Increased vehicular access could induce glucocortioid stress in animals (Creel et al., 2002; Sheriff et al., 2011) in the vicinity of the Project Area and roads during winter. Chronic stress might lead to increased mortality. More likely would be increased mortality if animals, especially juveniles, increased their energy expense, especially travelling through snow during winter (Parker et al., 1984) while escaping from vehicles (Hobbs, 1989). Such effects to individual animals due to the Proposed Action would be direct impacts, potential causing decreased survival in stressed animals.

To minimize effects to wintering big game, no construction (including drilling and completion) or associated traffic would occur from December 1 through April 30 for five well pads within

sensitive big game winter habitats (see Section 2.2.2.7 Table 2.2-2 in Chapter 2). Two other well pads in winter ranges, which have no big game lease stipulations, are proposed by Fram for construction outside the timing limitation of January 1 through March 1 (see Table 2.2-5). This would somewhat reduce potential effects to wintering big game along access routes, but the full winter timing limitation from December 1 through April 30 would be preferable. Fram would access and construct five well pads that occur outside sensitive big game winter habitats from the northern access route. The northern access route would also be used to access well pad Federal 2-2-2-1 if construction activities were planned outside of January and February (see Map 2.2-1).

Project-related traffic through mule deer and elk winter ranges would occur during operation (the production phase) and might displace animals from areas near roads. Access to the Reeder Mesa Facility by oil and water tanker trucks would pass through 3.37 miles of mule deer overall winter range. A daily average of four or fewer vehicles (traffic volume of eight vehicles trips per day on the Reeder Mesa access road) would use the southern access route through mule deer winter range (see Section 2.2.2.7), part of which would be on the Kannah Creek Road, a public thoroughfare with limited existing traffic. With moderate traffic volume on the rest of the access road to the Reeder Mesa Facility, mule deer might avoid winter habitats adjacent to the road by about 0.5 mile (Sawyer et al., 2006).

To reduce operational traffic through overall winter range and sensitive big game winter habitats, Fram would use the northern access route from December 1 through April 30, transporting oil and produced water directly from five well pads and from the Sink Creek Facility (which would service four pads). Access to the Sink Creek Facility would require operational traffic such as water trucks to pass through 2.63 miles of mule deer and elk winter ranges. During the operational phase, an average of 11 vehicles per day would use the northern access route during winter (see Section 2.2.2.7). The number of vehicles travelling through mule deer and elk winter ranges to access the Sink Creek Facility would average about five vehicles per day (based on the proportion of well pads serviced by the facility) with average traffic volume of 11 vehicles per day. Similar to the effects described above for winter access to the Reeder Mesa Facility, mule deer might avoid the road to the Sink Creek Facility by about 0.5 mile. However, the road passes through winter concentration areas and severe winter range, where mule deer densities are higher than on overall winter range, so displacement might affect numerous wintering mule deer. Similar effects would occur to wintering elk, potentially displacing them 0.75 mile or more from habitats along the road to Sink Creek (Sawyer et al., 2007). Zones of effect along access roads through sensitive big game winter habitats/ranges and SWH might also cause more indirect loss of habitat in amounts that exceed those of direct habitat losses.

Table 3.3-14 summarizes the distances, in miles, of sensitive big game winter habitats that would be crossed by operational traffic (pumper/maintenance trucks and tanker trucks) under the Proposed Action during winter months. During the operational phase, all well pads would be initially accessed by an average of one pumper truck daily (two vehicles per day) until telemetry at each well head was fully operational. Other maintenance vehicles would access well pads for 10 days per year. Mule deer might avoid roads with low traffic volumes (up to 12 vehicles/day) by about 0.5 mile (Sawyer et al., 2006). Table 3.3-14 also provides the distances of sensitive big game winter habitat that would be crossed under the Single Access Alternative during winter months.

Table 3.3-14
Distance of Access Road through All
Winter Ranges and Sensitive Big Game Winter Habitat[1]

Well Pad	Location	Proposed Action Alternative [2]		Single Access Alternative [2]
		Northern Access Route (miles)	Southern Access Route (miles)	Southern Access Route (miles)
Pumper and Maintenance Trucks				
Federal 13-98-12-2	Well Pad	N/A	6.98 (1.91)	6.98 (1.91)
Federal 13-97-8-2	Well Pad	N/A	7.98 (2.56)	7.98 (2.56)
Federal 12-97-30-1	Well Pad	N/A	5.78 (2.34)	5.78 (2.34)
Federal 12-98-24-2	Well Pad	N/A	6.71 (2.44)	6.71 (2.44)
Federal 12-97-7-1	Well Pad	N/A	8.68 (3.84)	8.68 (3.84)
Federal 1-2-15-1	Well Pad	0.06 (0)	N/A	11.07 (6.17)
Federal 1-2-16-1	Well Pad	0 (0)	N/A	11.01 (6.17)
Federal 1-2-22-1	Well Pad	0 (0)	N/A	11.01 (6.17)
Federal 1-2-26-2	Well Pad	0 (0)	N/A	11.01 (6.17)
Federal 1-2-33-1	Well Pad	0 (0)	N/A	11.01 (6.17)
Federal 1-2-25-2	Well Pad	1.74 (1.36)	N/A	12.56 (7.53)
Federal 2-2-2-1	Well Pad	2.71 (1.17)	N/A	13.72 (7.34)
Oil and Produced Water Tanker Trucks [3]				
Federal 13-98-12-2	Reeder Mesa Facility	N/A	3.37 (0)	3.37 (0)
Federal 13-97-8-2	Reeder Mesa Facility	N/A	3.37 (0)	3.37 (0)
Federal 12-97-30-1	Reeder Mesa Facility	N/A	3.37 (0)	3.37 (0)
Federal 12-98-24-2	Sink Creek Facility	2.67 (1.81)	N/A	9.20 (4.36)
Federal 12-97-7-1	Sink Creek Facility	2.67 (1.81)	N/A	9.20 (4.36)
Federal 1-2-15-1	Well Pad	0.06 (0)	N/A	11.01 (6.17 [3])
Federal 1-2-16-1	Well Pad	0 (0)	N/A	11.01 (6.17 [3])
Federal 1-2-22-1	Well Pad	0 (0)	N/A	11.01 (6.17 [3])
Federal 1-2-26-2	Well Pad	0 (0)	N/A	11.01 (6.17 [3])
Federal 1-2-33-1	Well Pad	0 (0)	N/A	11.01 (6.17 [3])
Federal 1-2-25-2	Sink Creek Facility	2.67 (1.81)	N/A	11.01 (6.17 [3])
Federal 2-2-2-1	Sink Creek Facility	2.67 (1.81)	N/A	11.01 (6.17 [3])

[1] Sensitive Big Game Winter Habitat considers CPW 2011 mule deer and elk severe winter range, winter concentration area and/or critical winter range. Within the Project Area, the 2011 CPW and 2008 COGCC (mule deer critical winter range and elk winter concentration area) GIS coverages overlap entirely

[2] Distance (miles) through all big game winter ranges. In parentheses, distance (miles) through Sensitive Big Game Winter Habitat as shown in Map 2.2-1.

[3] Oil and produced water would not be picked up at the individual well pads if only accessing through the southern access route; rather, oil and produced water would be picked up at Sink Creek Facility.

Effects to Carrying Capacity. Expected densities of mule deer and elk on winter ranges during varying winter conditions (see Table 3.3-12) would likely be less than before the Project was implemented, with fewest animals close to Project components and greater animal density farther away. Direct removal of vegetated habitats by construction could indirectly affect big game by causing displacement, increasing densities of animals on habitats away from the Project components. Indirect effects that reduce habitat effectiveness, such as the "zone of effect" discussed above, could also increase animal densities on habitat away from Project activities and operations. Such increased densities can lead to effects like overcrowding and overuse and degradation of remaining habitats, increased intraspecific competition (competition for resources among individuals of the same species) and increased incidences of disease,

predation and physiological stress. In other Project areas with intense wellfield development, declines in mule deer populations have been associated with direct habitat loss and indirect habitat losses (see Sawyer and Nielson, 2011). Studies in western Colorado have shown that malnutrition in mule deer fawns strongly affects their over-winter survival rates. The effects of malnutrition in pregnant females on winter ranges also affects survival of fawns following birth (Watkins et al., 2007). Malnutrition is one possible consequence of overcrowding, habitat degradation and reduced habitat function, and could further contribute to population declines that are widespread across the Colorado Plateau (Watkins et al., 2007). Because the mule deer population within DAU D-12 has been declining steadily since 2006, additional habitat loss from the Proposed Action could contribute to further decline. Reclamation of pipeline disturbance and well pads with wildlife friendly seed mixes and noxious weed control could increase the quality of forage for wildlife species in the Project Area. Additionally, use of the proposed northern access route, maintaining locked winter gates and altering operational traffic to avoid or reduce travel through sensitive big game winter habitats would minimize indirect habitat losses and reduce effects to wintering big game.

Wildlife Mitigation Plan. Fram and CPW have developed and signed a Wildlife Mitigation Plan to: 1) identify best practices for oil and natural gas development within the Whitewater Unit to protect wildlife, and 2) to document that consultation on wildlife issues has occurred. Fram has included the Wildlife Mitigation Plan in their MDP and accepted all measures in the Wildlife Mitigation Plan as part of the Proposed Action.

According to the Wildlife Mitigation Plan, indirect impact may be any of the following factors individually or in combination: 1) physiological stress to wildlife; 2) disturbance and displacement of wildlife; 3) habitat fragmentation and isolation; 4) alteration of environmental functions and processes (e.g., stream hydrology, water quantity/quality); 5) introduction of competitive and predatory organism; and 6) secondary effects created by workforce assimilation and growth of service industries. The six categories constitute the various indirect impact mechanisms that can affect wildlife and represent the disturbance spectrum that form the basis of compensatory mitigation.

In addition, Fram's Federal 13-97-8-2 well pad and access road would be located within a mule deer habitat treatment area. The area encompasses three blocks of pinyon juniper chaining; the treatment blocks are approximately 16.5 acres, 4.5 acres, and 15 acres in size, for a total of 36 acres. The proposed road upgrade runs along the edge of all three treatment blocks. The treatment areas were designed to increase understory vegetation vigor so as to improve winter habitat for mule deer. The project was completed in the 1960s and 1970s and is currently providing the desired seral stage of winter vegetation for mule deer.

The proposed access road to Federal 13-97-8-2 crosses through the three treatment areas and is approximately 3,716 feet long. If the well proves to be productive, it is proposed to be widened to BLM Gold Book standards. Total direct disturbance would be approximately 2 acres for the road and 2.5 acres for the well pad. Because CPW has invested considerable time, money, and effort to improve mule deer winter habitat and because the proposed disturbance would result in an absolute loss of 4.5 acres and the diminished value of 36 acres of treated habitat, CPW requires that Fram compensate for the direct habitat loss at a 2 for 1 acre replacement and the indirect impacts be compensated for on and acre-for-acre basis.

CPW would require Fram and Fram has agreed to provide offsets to CPW for replacement due to direct disturbance (4.5 acres at $800.00 per acre for a total of $3,600.00) and indirect disturbance (36 acres at $400.00 per acre for a total of $14,400.00). CPW would use the compensation to make habitat improvements to mule deer and pronghorn winter habitat.

Protective/Mitigation Measures

In addition to the Project Design Features listed in Chapter 2 and the BLM GJFO Standard COAs in Appendix C, the BLM would require the following measures to further reduce impacts to wildlife:

- Vehicles traveling through big game winter ranges should proceed at constant speeds not exceeding 20 miles per hour and drivers should not stop or get out of their vehicles to view wildlife until outside of winter range areas, except under emergency conditions.
- Bear-proof trash containers should be used and refuse should be collected frequently to minimize potential for conflicts with bears within the Project Area (see assistance in CPW, 2012e).
- Disturbed areas should be reclaimed as quickly as possible, using a wildlife-friendly seed mix as recommended by the BLM GJFO and developed in coordination with CPW.
- Application of water used for dust control should be limited to road surfaces farther than 300 feet from any reservoir, lake, wetland, or natural perennial or seasonally flowing stream or river, the same restriction that would apply to refueling.
- Duplicate roads should be reclaimed where multiple roads go to the same location.

Single Access Alternative

Impacts to wildlife under the Single Access Alternative would be similar to those described above for the Proposed Action Alternative, except that the northern access road would not be used. To minimize effects to wintering big game within the Project Area, no construction activities would occur between December 1 and April 30, with the exception of well pad Federal 13-98-12-2, to which a timing limitation from January 1 through March 1 would be applied along the access road. This schedule could increase the construction period from 4 years to 7 years.

The most notable difference between the Single Access Alternative and the Proposed Action Alternative is the increased distance that vehicles would travel through all big game winter ranges, including sensitive big game winter habitat, throughout the year for the operational life of the Project (see Table 3.3-14, above). Pipelines would deliver oil and produced water from wells to the Sink Creek facility. Pumper and maintenance trucks would travel up to 13.72 miles daily through winter ranges (7.53 though sensitive big game winter habitat), to service wells, until telemetry at each wellhead is fully operational (generally within the first year of production). Tanker trucks removing oil and produced water from the Sink Creek facility would travel 11.01 miles through winter ranges (6.17 miles through sensitive big game winter habitat). Up to 11 vehicle round trips per day could be required to remove oil and produced water from the Sink Creek facility, including at least one pumper truck to service the six well pads accessed north and west of the Sink Creek Facility.

Traffic volumes through 11.01 miles of winter range could exceed 22 vehicles per day under the Single Access Alternative. Mule deer wintering along the 11.01 miles of access road could avoid the road by one mile, possibly more in areas of high visibility, given the observations of mule deer distributions during winter on natural gas fields in Wyoming (Sawyer et al., 2006 and 2009). Daily traffic to the Sink Creek Facility could cause mule deer to utilize habitats farther away than a mile, possibly avoiding the facility site by greater distances (up to 2.7 miles) if mule deer response to vehicular traffic is similar to deer displacement around natural gas well pads (Sawyer et al., 2009). Elk could likewise avoid the access road, perhaps by distances up to 1.70 miles, similar to elk inhibiting sagebrush-dominated habitats in Wyoming (Sawyer et al., 2007).

Under the Single Action Alternative, the amount of sensitive big game winter habitats that would be functionally less effective due to animal displacement/avoidance away from Project components would exceed similar effects under the Proposed Action. Further, access to the Sink Creek Facility would be through sensitive big game winter habitats that may support higher

densities of wintering mule deer and elk, depending on winter conditions. The overall effect of the Single Action Alternative is likely to be a greater reduction in carrying capacity than the Proposed Action, with possible attendant density-dependent effects that could lead to decreased populations.

B Road Alternative

Impacts to terrestrial and aquatic wildlife under the B Road Alternative would be similar to those described above for the Proposed Action.

No Action Alternative

Under the No Action Alternative, there would be none of the direct and indirect effects to terrestrial and aquatic wildlife that are expected by implementing any of the action alternatives, discussed above. Use of sensitive big game winter habitats present in the Project Area (see Table 3.3-12) would continue into the foreseeable future, but levels of use would be dependent on populations rather than be affected by human presence and activities, as described above.

3.3.7.3 Finding on the Public Land Health Standard 3 (Terrestrial Wildlife)

Effects to the Project Area landscape have mainly been from past and present grazing practices, drought, and surface disturbances associated with oil and gas. Habitat loss, fragmentation and degradation could occur from the proposed action and could affect wildlife in the Project Area. However, management of invasive and noxious weeds and timely reclamation of the disturbed area could help minimize effects to the area's capacity to meet Public Land Health Standard 3.

It is also conceivable that wildlife habitat might be improved through better soils protection, restoration of native vegetation and weed management under the Proposed Action Alternative, which could support the landscape's capacity to meet Public Land Health Standard 3. No changes in Land Health Standard 3 are anticipated under the Proposed Action if the Project Design Features and mitigation measures are properly implemented.

Effects to Land Health Standard 3 under the Single Access Alternative and the B Road Alternative would be similar to those under the Proposed Action described above.

Under the No Action Alternative, effects from existing and new surface disturbances unrelated to the Proposed Action would continue and could affect the area's ability to meet Public Land Health Standard 3.

3.4 HERITAGE RESOURCES AND HUMAN ENVIRONMENT

3.4.1 Cultural Resources

3.4.1.1 Current Conditions

The BLM manages cultural resources on public lands in accordance with the Antiquities Act of 1906, National Historic Preservation Act (NHPA) of 1966, Native American Graves Protection and Repatriation Act of 1990, the Archaeological Resources Protection Act of 1979, and various other laws and Executive Orders. The management process is also governed by the Colorado BLM's Protocol with the State Historic Preservation Officer (SHPO), implementing the BLM's National Programmatic Agreement with the Advisory Council on Historic Preservation. Section 106 of NHPA applies to consideration of the presence of and effect to cultural resources on both public and private lands in the APE.

Alpine conducted a file search and literature reviews through the BLM GJFO and the Colorado Historical Society Office of Archaeology and Historic Preservation. These searches provide an

overview of the existing known cultural resources in the vicinity of the APE and the locations where previous cultural resource inventory has occurred. A total of 45 previous cultural resource surveys have occurred within the APE of this Project (Table 3.4-1).

Table 3.4-1
Previous Cultural Resource Inventories within Project APE

SHPO or BLM Document Number	Previous Cultural Resource Survey Report Title
N/A	Class III Cultural Resource Inventory For Five Proposed Well Locations And Related Linear Routes In Mesa County, Colorado For Aspen Operating, LLC And O&G Environmental Consulting
N/A	Class III Cultural Resource Inventory North Fork Wildland Urban Interface Project, Mesa County, Colorado (BLM GJFO CRIR 14506-06)
N/A	Report Of The 1984 Field Season Cultural Resource Inventory For The Grand Junction To Delta Segment Of The Colorado-Ute Electric Association Rifle To San Juan Transmission Line Project
N/A	Cultural Resources Inventory Report Of Five Proposed Gas Wells/Access Roads (V-12-1, V-13-1, V-14-1, V-15-1, V-30-1)For Colorado-Pacific Petroleum
N/A	Cultural Resources Inventory Report On Proposed Gas Wells MC1-18-12-97, MC1-19-12-97 And Access In Mesa County, Colorado
MC.LM.R139	Cultural Resource Inventory Of Access Roads, Centerline Realignments, And Pipeyards Associated With The Planned TransColorado Gas Transmission Project Western Colorado And Northwestern New Mexico >Addendum Report #1 Cultural Resource Inventory Of Pipeyard
MC.LM.R354	Cultural Resources Inventory Of The Grand Valley Gas Play Mainline Gathering System
MC.LM.R355	Preliminary Report Of The 1984 Field Season Cultural Resources Inventory For The Rifle To Grand Junction Segment Of The Colorado-Ute Electric Association Rifle To San Juan 345 Kv Transmission Line Project - Report #7 (Original Report And Three Addenda)
MC.LM.R376	Report #11, Cultural Resources Inventory Of Conductor Pulling Sites For The Rifle Grand Junction Segment Of Colorado-Ute Electric Association Rifle To San Juan 345 Kv Transmission Line Project (S#902)
MC.LM.R601	Grazing Permit Renewal 2010: Class III CRI Of 52.8 Acres, Reeval Of 25 Sites And Recording Of 3 New Sites In Garfield & Mesa Counties, CO (CRIR1010-06)
MC.LM.R627	Grand Junction Predictive Model
ME.LM.NR13	Public Service Company Of Colorado Grand Junction 230 Kv. Conversion Transmission Line, Segment #1, Mesa County, Colorado
ME.LM.NR141	Archaeological Survey For Mitchell Energy - Fed. 1-17-13-97 Well Pad And Access
ME.LM.NR159	Class III Inventory For The City Of Grand Junction
ME.LM.NR266	Negative Cultural Resource Inventory Report Of The Homestead Catchment, Mesa County, Colorado (S# 1935)
ME.LM.NR323	The Vineland-Cu Grand Junction 69kv Transmission Line, Mesa County, Colorado Cultural Resources Inventory
ME.LM.NR529	Class I For Proposed 34 Road Orchard Mesa Open Area For CTTMP & RMP Revision For BLM GJFO (CRIR 1011-06)
ME.LM.NR65	Archaeological Survey For Mitchell Energy - Fed. 2-12-12-98 And 1-18-12-97 Well Pads And Access
ME.LM.NR67	Archaeological Survey For Mitchell Energy - Federal 1-15-1-2, 1-25-1-2, And 1-21-1-2 Well Pads And Access
ME.LM.R132	Cultural Resources Inventory Of The Whitewater P-J Treatment Fence line Project Area, Mesa County, Colorado
ME.LM.R134	Class III Cultural Resource Inventory Report On The Proposed Whitewater Fire Treatment Area In Mesa County, Colorado (GRI# 95108)
ME.LM.R156	The 1996 Class III Cultural Resource Inventory Of Nine Whitewater Parcels In The Grand Mesa Slopes Land Exchange Program, Mesa County, Colorado (GRI# 507)
ME.LM.R183	Class III Cultural Resources Inventory Report For The Proposed East Orchard Mesa Fence Line In Mesa County, Colorado For The Bureau Of Land Management, Grand Junction Resource Area (Gri# 9868)
ME.LM.R190	A Cultural Resource Inventory Of 803 Acres For The Grand Mesa Slopes Exchange Parcels, Mesa County, Colorado
ME.LM.R216	Class III Cultural Resources Inventory Of Two Proposed Areas Of Fenceline As Part Of The Lumbardy Land Exchange In Mesa County, Colorado For The Bureau Of Land Management

SHPO or BLM Document Number	Previous Cultural Resource Survey Report Title
	Grand Junction Area Office (Gri No. 9966)
ME.LM.R250	Class III Cultural Resource Inventory For A Proposed 11 Mile-Long East Grand Junction Reinforcement Pipeline Between Palisade And Whitewater In Mesa County, Colorado (GRI No. 2107)>Class III Cultural Resource Inventory Of A 10 Acre-Block And Associated 1
ME.LM.R360	Class III Cultural Resources Inventory For The Proposed Fed. 24-1 Well Location Near The North Fork Of Kannah Creek In Mesa County, Colorado
ME.LM.R361	Class III Cultural Resources Inventory Of Six Proposed Well Locations And Related Access Corridors In Mesa County, Colorado (Original And Addendum)
ME.LM.R416	Cultural Resources Inventory Report On Proposed Gas Wells Mc171297, Mc1181297 Mc1191297 And Access In Mesa County, Colorado For CMO Resources, Inc.
ME.LM.R420	Cultural Resource Inventory Of Two Proposed Borrow Areas In Mesa County, Colorado.
ME.LM.R453	Class III Cultural Resource Inventory Of Six Proposed Locations And Related Linear Routes In Mesa County, Colorado For South Oil, Inc. (GRI No. 2579)
ME.LM.R456	A Class III Inventory For The Sink Creek Gate, Mesa County (GJFO CRIR 1005-13)(NEPA Co 130 2005-19ea)
ME.LM.R475	A Report Of The Class III Inventory Of The City Of Grand Junction Somerville Pipeline, Mesa County, Colorado (BLM GJFO CRIR 14505-13)
ME.LM.R552	Class III Cultural Resource Inventory Blowout Emergency Fire Rehabilitation Project Mesa County, Colorado (BLM GJFO CRIR 15906-01)
ME.LM.R625	Grand Junction Watershed Fuels Reduction Project A Class III Cultural Resource Inventory In Mesa County, Colorado CRIR 15408-01
ME.LM.R639	An Intensive Cri Of The Aspen Whitewater-Grand Mesa Slopes Project, Mesa County, Colorado (BLM GJFO CRIR 8307-05)
ME.LM.R671	Renewable Energy ARRA Project, A Class III CRI In Mesa County, Colorado (BLM GJFO CRIR 17310-02)
ME.LM.R702	A Class III CRI Of Lands Associated With FRAM Operating's Whitewater Project, Mesa County, Colorado
ME LM.R702a	Addendum 1 To A Class III CRI Of Lands Associated With Fram Operating's Whitewter Project, Mesa County, Colorado
ME.LM.R75	Cultural Resource Inventory Report Of The Proposed Kannah Creek Amp Vegetation Manipulation Areas In Mesa County, Colorado For The Bureau Of Land Management (Gri# 9085)
ME.LM.R755	Addendum To Archaeological Survey For Mitchell Energy Corp. Mitchell Fed. 1-23-1-2
ME.LM.R789	Archaeological Survey For Mitchell Energy Corp. Mitchell Fed. Well 1-7-13-97
ME.LM.R79	Cultural Resource Management Report USDI Bureau Of Land Management Kannah Creek Allotment Inventory Mesa County, Colorado
ME.R.R20	Cultural Survey For The Colorado River Basin Salinity Control Project, Grand Valley Unit (GJFO 4476, S#134)
ME.SC.R2	Class I And Class II Inventory Of Orchard Mesa Canals #1 And #2 Proposed Laterals For The Natural Resource Conservation Service's Colorado River Salinity Control Program

In the greater region encompassing the Project Area, cultural resources span about 12,000 years and represent use of Paleoindian, Archaic, Formative, Protohistoric, and historic populations. The region contains prehistoric and historic sites and traditional cultural places. Examples of known cultural resources in the Project Area include but are not limited to lithic scatters, historic homesteads, prehistoric open camps, prehistoric hunting sites, trails, wagon roads, canals and ditches.

Alpine recently completed an intensive Class III cultural resource inventory (Cultural Resource Inventory Report 8310-07/ME.LM.R702) in the APE of the Proposed Action, as defined in the NHPA (Landt et al., 2013) for portions of the Project not inventoried by previous surveys. During the inventory, the previously recorded sites described above were revisited to either confirm the original recordings and their evaluations, or to reevaluate them. For well pads and centralized facilities, 40-acre blocks were surveyed, centered on the proposed disturbance area. For linear routes (roads/pipelines) 200-foot-wide corridors were surveyed. A total of 1,659 acres have

been surveyed by Alpine and previous inventory in the Project Area (Table 3.4-1). The Project inventories and evaluations are in compliance with the NHPA, the Colorado State Protocol Agreement, and other federal law, regulation, policy, and guidelines regarding cultural resources.

Approximately 73 acres (approximately 5 miles) of roadways on private land were not surveyed due to either private landowner denials or because there was no response from the landowner. The parcels include: 2969-251-00-230, 2969-262-00-178, 2969-353-00-322, 2971-251-00-011, 3199-062-00-013, 3201-011-00-083, 3201-012-00-065, 3201-012-06-002, 3201-021-06-001, 3201-024-00-061, 3201-024-00-062, 3201-111-09-002, 2941-161-01-002, 2941-161-01-008, 2969-244-00-383, 2969-353-00-094, 2969-353-01-003, 2969-364-02-004, 2973-302-00-022, 2973-302-00-023, 3201-013-00-060, 3201-013-03-002, 3201-021-00-052, 3201-111-09-001, 3201-114-00-114, 3201-122-00-050, 3201-122-00-089, 3203-011-00-175, 3203-012-00-162, 3203-012-00-219, 3203-021-00-176, 2941-094-00-187, 2941-094-00-188, and 2943-361-00-002.

Seventy-seven (77) cultural resource sites were found during the inventory. Table 3.4-2 summarizes all known revisited and newly recorded sites in the APE. It provides field-evaluated recommendation for National Register of Historic Places (NRHP) eligibility. A total of 102 isolated finds were found during inventory and were evaluated in the field as not eligible for listing on the NRHP and are not further discussed in this EA. Recommendations for eligibility are pertinent in guiding the final determination of site significance and are currently in consultation with the SHPO and the BLM. Sites that may be eligible or potentially eligible (needs data) are further discussed in Table 3.4-3, below.

Table 3.4-2
Previously and Newly Recorded Sites Located within the APE

Site Number	Site Type	NRHP Eligibility
5ME.760	Historic Homestead	Officially Eligible
5ME.1057	Prehistoric Open Architectural, Rock Art, Historic Artifact Scatter	Listed on State Register
5ME.1187.2	Historic Trail	Field Not Eligible
5ME.1204*	Historic Homestead	Needs Data - Field
5ME.3647	Open Camp, Historic Trash Dump	Field Not Eligible
5ME.3648	Prehistoric Artifact Scatter	Field Not Eligible
5ME.3649	Prehistoric Artifact Scatter	Field Not Eligible
5ME.3650	Open Lithic	Officially Not Eligible
5ME.3818	Prehistoric Artifact Scatter	Officially Not Eligible
5ME.3820*	Prehistoric Open Architectural	Field Needs Data
5ME.3826	Open Lithic	Field Not Eligible
5ME.3827	Open Lithic	Field Eligible
5ME.3830	Open Lithic	Field Not Eligible
5ME.3832	Prehistoric Open Camp	Officially Eligible
5ME.3833	Prehistoric Open Camp	Officially Eligible
5ME.3847*	Prehistoric Open Camp	Officially Eligible
5ME.3911	Prehistoric Open Camp	Officially Not Eligible
5ME.4778	Open Lithic and Historic Isolated Find	Officially Not Eligible
5ME.6494*	Open Lithic	Officially Needs Data
5ME.6495	Open Lithic	Officially Not Eligible
5ME.6715	Prehistoric Open Camp	Officially Eligible
5ME.6716	Lithic Scatter	Officially Not Eligible
5ME.6717	Lithic Scatter	Officially Not Eligible
5ME.6721	Historic Homestead	Field Needs Data
5ME.8006	Open Camp	Officially Eligible

Site Number	Site Type	NRHP Eligibility
5ME.8037	Open Camp	Officially Eligible
5ME.8055	Lithic Scatter	Officially Not Eligible
5ME.8056	Historic Artifact Scatter	Officially Not Eligible
5ME.8072	Lithic Scatter	Officially Not Eligible
5ME.8073	Open Camp	Officially Not Eligible
5ME.8079.1	Historic Canal	Officially Not Eligible
5ME.8079.3	Historic Canal	Field Not Eligible
5ME.8079.4	Historic Canal	Field Not Eligible
5ME.8079.5	Historic Canal	Field Not Eligible
5ME8079.6	Historic Canal	Field Not Eligible
5ME.8080	Historic Artifact Scatter	Officially Not Eligible
5ME.11526	Lithic Scatter	Officially Not Eligible
5ME.11527	Prehistoric Open Camp	Officially Not Eligible
5ME.11534	Prehistoric Artifact Scatter	Officially Not Eligible
5ME.11716	Open Camp	Field Not Eligible
5ME.15504	Lithic Scatter	Officially Not Eligible
5ME.15505	Lithic Scatter	Officially Needs Data
5ME.15506	Open Camp	Officially Eligible
5ME.15590.1	Historic Ditch	Officially Not Eligible
5ME.16144	Open Lithic, Historic Shelter	Officially Needs Data
5ME.16145	Open Lithic, Historic Artifact Scatter	Officially Not Eligible
5ME.16146	Prehistoric Lithic Scatter, Historic Artifact Scatter	Officially Not Eligible
5ME.16147	Lithic Scatter	Officially Not Eligible
5ME.16153	Prehistoric Open Camp	Officially Not Eligible
5ME.16154	Prehistoric Open Camp	Officially Eligible
5ME.16199	Prehistoric Artifact Scatter	Officially Not Eligible
5ME.16212	Lithic Scatter	Field Not Eligible
5ME16535.2	Historic Trail	Field Not Eligible
5ME18181	Lithic Scatter	Field Eligible
5ME18182	Lithic Scatter	Field Not Eligible
5ME18183	Lithic Scatter	Field Eligible
5ME18184	Lithic Scatter	Field Not Eligible
5ME18185	Historic Homestead	Field Eligible
5ME18186	Lithic Scatter	Field Not Eligible
5ME18187	Lithic Scatter	Field Not Eligible
5ME18188	Lithic Scatter	Field Not Eligible
5ME18190	Lithic Scatter	Field Not Eligible
5ME18191	Lithic Scatter	Field Not Eligible
5ME18275.1	Historic Ditch	Field Not Eligible
5ME18276.1	Historic Ditch	Field Not Eligible
5ME18511	Historic Homestead	Field Needs Data
5ME18512	Lithic Scatter	Field Not Eligible
5ME18513	Lithic Scatter	Field Not Eligible
5ME18514	Historic Artifact Scatter	Field Not Eligible
5ME18515	Lithic Scatter	Field Not Eligible
5ME18516	Historic Artifact Scatter	Field Not Eligible
5ME18518	Historic Artifact Scatter	Field Not Eligible
5ME18519	Historic Schoolhouse	Field Eligible
5ME18530.1	Historic Ditch	Field Eligible
5ME19470	Lithic Scatter	Field Not Eligible
5ME19471	Lithic Scatter	Field Not Eligible
5ME.19710	Multicomponent Artifact Scatter	Field Not Eligible
5ME.19712	Prehistoric Artifact Scatter	Field Not Eligible
* Site not relocated		

3.4.1.2 Environmental Consequences

Proposed Action Alternative

Direct impacts from the Proposed Action have the potential to irreparably damage or destroy subsurface sites that are culturally sensitive. Impacts that affect the physical setting could result in a loss of characteristics that make an area significant for listing in the National Register of Historic Places. Any significant cultural resources present on private lands where archaeology survey was denied have the potential to be adversely and permanently impacted by the Proposed Action. Unauthorized modification of roads, pipelines, and well pads may lead to impacts. Indirect and cumulative impacts could result to cultural resources in the area due to increased access through the construction of new or upgraded roads. Landscape fragmentation due to increased roads could cumulatively impact the area over time and result in general cultural site degradation.

Nineteen cultural resource sites determined to be eligible or potentially eligible to the NRHP have been identified within or adjacent to the proposed areas of disturbance. Table 3.4-3 summarizes the NHRP-eligible or potentially eligible sites located near, within, or adjacent to proposed areas of disturbance. The remainder of the sites that are not eligible for the NRHP require no further work.

Table 3.4-3
Potential Impacts and Mitigation Measures
for NRHP-Eligible and Potentially Eligible Sites within the APE

Proposed Well Pad	Sites Along the Proposed Southern Access[1]	Sites Along the Proposed Northern Access[1]	Sites Near Well Pads[1]
2-2-2-1	5ME.6715, 5ME.67212, 5ME.8006, 5ME.8037	5ME.3827, 5ME.3832, 5ME.3833, 5ME.6715, 5ME.67212	no sites
12-97-30-1	5ME.10573	NA	no sites
12-98-24-2	no sites	NA	no sites
13-97-8-2	5ME.760	NA	no sites
13-98-12-2	no sites	NA	no sites
12-97-7-1	5ME.16154	NA	no sites
1-2-15-1	5ME.3827, 5ME.3832, 5ME.3833, 5ME.8006, 5ME.8037	no sites	no sites
1-2-16-1	5ME.3827, 5ME.3832, 5ME.3833, 5ME.8006, 5ME.8037	no sites	no sites
1-2-22-1	5ME.3827, 5ME.3832, 5ME.3833, 5ME.8006, 5ME.8037	no sites	no sites
1-2-25-2	5ME.3827, 5ME.3832, 5ME.3833, 5ME.8006, 5ME.8037, 5ME.16144	5ME.16144	5ME.15505, 5ME.15506, 5ME.18181, 5ME.18183
1-2-26-2	5ME.3827, 5ME.3832, 5ME.3833, 5ME.8006, 5ME.8037	no sites	no sites
1-2-33-1	5ME.3832, 5ME.3833, 5ME.8006, 5ME.8037, 5ME.18185, 5ME.18511	no sites	no sites

[1] Unless otherwise noted, the preferred mitigation is avoidance or data recovery, with monitoring. Site-specific mitigation measures are being developed in consultation between the BLM, the proponent, and the SHPO.
[2] Further testing is recommended, though specific mitigation measures are being developed in consultation between the BLM, the proponent, and the SHPO.
[3] Preferred mitigation is monitoring, though specific mitigation measures are being developed in consultation between the BLM, the proponent, and the SHPO.
[4] Sites 5ME.18519 and 5ME.18530.1 are along a paved section of Divide Road and are not expected to be impacted, though specific mitigation measures are being developed in consultation between the BLM, the proponent, and the SHPO.

Increased development, easier access, construction, operation and maintenance may impact these sites and degrade their cultural significance by destroying the sensitive area or its landscape setting. Impacts to auditory and visual environments may be important in considering values placed on some sites by Native American tribes and could impact such values.

Protective/Mitigation Measures

In addition to the Project Design Features listed in Chapter 2 and the BLM GJFO Standard COAs in Appendix C, the BLM would require the following measures to further reduce impacts to cultural resources:

- Project components should be moved to avoid eligible or potentially eligible sites including proposed Well Pad Federal 1-2-25-2 and access and pipelines for Federal 12-97-7-1, Federal 2-2-2-1, Federal 12-97-30-1 and Federal 13-97-8-2. Proposed pipeline disturbance that would impact sites 5ME.3827, 5ME.3832, 5ME.3833, 5ME.8006, 5ME.8037, 5ME.16144, 5ME.18185, 5ME.18511, 5ME.18519 and 5ME.18530.1 should be rerouted around the sites.
- Monitoring and fencing should be implemented where appropriate to protect eligible or potentially eligible sites as well as during well pad construction, road construction and upgrading, and trenching.
- Site-specific mitigation measures for all 19 eligible or potentially eligible sites are fully described in a treatment plan that has been developed between the BLM, the proponent, tribes, and the SHPO. Additional tribal consultation is being sought for the treatment plan. The final treatment plan includes details of site-specific avoidance and data recovery measures for all nineteen sites, as well as Project-wide protocol for archaeological monitoring. The final treatment plan will meet the needs of the National Historic Preservation Act (NHPA) [16 USC 470, 36 CFR 800.13], the Archaeological Resources Protection Act (ARPA) [16 USC 433, 18 USC 641, 1170, and 1361], the Native American Graves Protection and Repatriation Act (NAGPRA) [25 USC 3001 et seq., 43 CFR 10.4], and the Colorado Revised Statute concerning unmarked human burials (24-80-1302), and will appropriately mitigate any impacts to significant cultural resources. The BLM, Fram, and the SHPO signed a Memorandum of Agreement (MOA) agreeing to the site specific mitigation measures (see Appendix J).
- Alternative mitigation will be utilized as part of the Section 106 process because of the high potential to impacts to unknown sites on the private land where access was denied and from cumulative impacts as a result of the Proposed Action. This mitigation has been worked out collaboratively among the BLM, Fram, and the SHPO and a MOA has been signed. The mitigation could include any or all of the following: data recovery, testing, interpretation of cultural resources for the public via websites, public museum displays, or written materials such as brochures or signage (see Appendix J).

Single Access Alternative

Impacts to cultural resources under the Single Access Alternative would be similar to those described above under the Proposed Action.

B Road Alternative

The B Road alternative is one-quarter mile longer than the C Road route. A separate cultural survey of 118 acres along the B Road alternative was conducted in 2013 and 2014 (Lindland and Landt, 2014; Mueller, 2014). Twenty-two acres (1 mile) were not surveyed due to either private landowner denials or because there was no response from the landowner and include the following parcels: 2943-263-00-113, 2943-264-00-044, 2943-352-00-039, 2943-352-00-068, 2943-352-00-069, 2943-352-00-070, and 2943-352-01-020.

Three sites were recorded along the B Road Alternative (Table 3.4-4). Five isolated finds recorded along the B Road Alternative were evaluated in the field as not eligible for listing on the NRHP and are not further discussed in this EA. One cultural resource site determined to be eligible to the NRHP (5ME.4926), a historic ditch on private land, was identified adjacent to proposed areas of disturbance. Table 3.4-5 summarizes NHRP-eligible or potentially eligible sites located near proposed areas of disturbance. The remainder of the sites within the B Road Alternative is not eligible for the NRHP and require no further work. Project-related impacts to cultural resources under the B Road Alternative would be similar to those described above under the Proposed Action.

Table 3.4-4
Previously and Newly Recorded Sites Located within the B Road Alternative APE

5ME.4926	Historic Ditch	Officially Eligible
5ME.17047.1	Old Road	Field Not Eligible
5ME.19796	Historic Artifact Scatter	Field Not Eligible

Table 3.4-5
Potential Impacts and Mitigation Measures
for NRHP-Eligible and Potentially Eligible Sites within the APE

Proposed Well Pad	Sites Along the B Road Alternative Access[1]
02-02-2-1	5ME.3832, 5ME.3833, 5ME.4926, 5ME.6715, 5ME.6721[2], 5ME.18185, 5ME.18511,
12-97-30-1	NA
12-98-24-2	NA
13-97-8-2	NA
13-98-12-2	NA
12-97-7-1	NA
01-02-15-1	5ME.3827, 5ME.4926, 5ME.18185, 5ME.18511
01-02-16-1	5ME.3827, 5ME.4926, 5ME.18185, 5ME.18511
01-02-22-1	5ME.3827, 5ME.4926, 5ME.18185, 5ME.18511
01-02-25-2	5ME.3827, 5ME.4926, 5ME.16144, 5ME.18185, 5ME.18511
01-02-26-2	5ME.3827, 5ME.4926, 5ME.18185, 5ME.18511
01-02-33-1	5ME.4926

[1] Unless otherwise noted, the preferred mitigation is avoidance or data recovery, with monitoring. Site-specific mitigation measures are being developed in consultation between the BLM, the proponent, tribes, and the SHPO.

[2] Further testing is recommended, though specific mitigation measures are being developed in consultation between the BLM, the proponent, tribes, and the SHPO.

No Action Alternative

Under this alternative, there would be no Project-related impacts to cultural resources on BLM-administered lands from construction of any of the action alternatives.

3.4.2 Paleontological Resources

3.4.2.1 Current Conditions

Paleontological resources include the remains or traces of any prehistoric organism preserved by natural processes in the earth's crust. The BLM manages paleontological resources for their scientific, educational and recreational values in compliance with the Antiquities Act of 1906 and the Paleontological Resources Preservation Act (PRPA) of 2009. The PRPA affirms the authority for many policies the BLM already has in place for the management of paleontological resources, such as issuing permits for collection and curation of vertebrate paleontological resources and requiring confidentiality of locality data. The law also defines prohibited acts, such as damaging or defacing paleontological resources, and establishes both criminal and civil penalties for those acts.

The BLM classifies geologic formations to indicate the likelihood of scientifically significant fossil occurrence (usually vertebrate fossils of scientific interest) according to the Potential Fossil Yield Classification System (PFYC) for Paleontological Resources on Public Lands (BLM, 2007c). These classifications determine the procedures to be followed prior to the granting of a paleontological clearance to proceed with a project.

Surficial geology indicates that the Project Area is underlain by Mancos Shale, alluvium and terrace gravels and colluvial deposits (see Map 3.2-5). For these geologic strata, the BLM assigns PFYC Class 2 or 3, which means there is a moderate or unknown probability of fossil occurrence. No known fossil localities occur in the Project Area. The BLM GJFO does not require paleontological surveys prior to surface disturbance in areas underlain by Mancos Shale and gravel and alluviums (Gerwe, 2010).

3.4.2.2 Environmental Consequences

Proposed Action Alternative

Construction is not expected to affect any known paleontological resources; however, surface disturbing activities and increased human access can result in unexpected discoveries and potential resource damage. Direct impacts would include damage or destruction of scientifically significant fossils, with subsequent loss of information. Indirect impacts would include fossil damage or destruction by erosion due to surface disturbance. Because of the surficial geology in the Project Area and the known scarcity of resources there, direct and/or indirect impacts to paleontological resources are not anticipated. However, if paleontological resources are discovered during construction, all activities would be suspended in accordance with the BLM GJFO Standard COAs until written authorization to proceed was issued by the BLM AO.

Protective/Mitigation Measures

In addition to the Project Design Features listed in Chapter 2 and the BLM GJFO Standard COAs in Appendix C, the BLM would require the following measures to further reduce impacts to paleontological resources:

- If bedrock exposure is present, a BLM-approved on-site monitor (licensed paleontologist) should be present during construction.

Single Access Alternative

Impacts to paleontological resources under the Single Access Alternative would be similar to those described above under the Proposed Action.

B Road Alternative

Impacts to paleontological resources under the B Road Alternative would be similar to those described above under the Proposed Action.

No Action Alternative
No surface disturbing activities would take place under the No Action Alternative and therefore no paleontological resources would be impacted.

3.4.3 Tribal and Native American Religious Concerns

3.4.3.1 Current Conditions

American Indian religious concerns are legislatively considered under several acts and Executive Orders, namely the American Indian Religious Freedom Act of 1978 (PL 95-341), the Native American Graves Protection and Repatriation Act of 1990 (PL 101-601), and Executive Order 13007 (1996; Indian Sacred Sites). In summary, these require, in concert with other provisions such as those found in the National Historic Preservation Act and Archeological Resources Protection Act, that the federal government carefully and proactively take into consideration traditional and religious Native American culture and life and ensure, to the degree possible, that access to sacred sites, the treatment of human remains, the possession of sacred items, the conduct of traditional religious practices, and the preservation of important cultural properties are considered and not unduly infringed upon. In some cases, these concerns are directly related to "historic properties" and "archaeological resources". In some cases elements of the landscape without archaeological or other human material remains may be involved. Identification of these concerns is normally completed during the land use planning efforts, reference to existing studies, or via direct consultation. There may also be other unidentified culturally sensitive or significant locations in the area that have not been identified by the Ute tribes. The proximity of Native American sites to planned development within the study areas may result in indirect impacts that reduce the significance of resources by changing their setting, location and association.

A total of 77 cultural resources were located during the field inventory and some of the types of sites found suggest that the Project Area may holds special significance for Native Americans for traditional or religious purposes and the Project would not alter or limit any access if there were traditional uses that are not known to the agency. Accordingly, Native American Indian consultation has occurred since 2013 and is currently ongoing for the proposed undertaking with the Ute Indian Tribe of the Uintah and Ouray Reservation, the Southern Ute Indian Tribe, and the Ute Mountain Ute Tribe for this Proposed Action.

3.4.3.2 Environmental Consequences

Proposed Action Alternative
Under the Proposed Action alternative, the development of the Project has the potential to have direct, indirect and cumulative impacts to Tribes. Implementing the Project would contribute to cumulative impacts from past, present, and reasonably foreseeable actions by changing the landscape from that known by Traditional Utes. Even if there are no specific sites of concern identified by tribes in the Project Area, the broader continued change that modern culture brings to the landscape could have impacts.

Protective/Mitigation Measures

The Proposed Action is not currently known to physically threaten the integrity of any Traditional Cultural Properties, prevent access to sacred sites, prevent the possession of sacred objects, or interfere or otherwise hinder the performance of traditional ceremonies and rituals pursuant to AIRFA or EO 13007. There are currently no known threats to remains that fall within the purview of Native American Graves Protection Act Archeological Resources Protection Act. Although none have been identified, any heretofore unidentified effect of the proposed action to Native American Religious Concerns is expected to be negligible in both the short and long term. The Ute have a generalized concept of spiritual significance that is not easily transferred to Western

models or definitions. As such, the BLM recognizes that they have identified sites that are of concern because of their association with Ute occupation of the area as part of their traditional lands. Tribal representatives have consulted with the BLM GJFO on previous projects in this area and provided instructions for the protection of culturally sensitive sites, should any be discovered during construction. Specific consultation on the Project has occurred since 2013 and is currently ongoing. In addition to the stipulations for the protection of Cultural Resources if new information is brought forward during consultation, site-specific Native American mitigation measures suggested during previous notification/consultation would be considered during the implementation of the Proposed Action. If new information is provided by Native Americans during the EA process, additional or edited terms and conditions for mitigation may have to be negotiated or enforced to protect resource values.

Single Access Alternative

Impacts to Tribal and Native American Religious Concerns under the Single Access Alternative would be similar to those described above under the Proposed Action Alternative.

B Road Alternative

Impacts to Tribal and Native American Religious Concerns under the B Road Alternative would be similar to those described above under the Proposed Action Alternative.

No Action Alternative

Under this alternative, no Project-related impacts would occur to Tribal and Native American Religious Concerns on BLM-administered lands from any of the action alternatives.

3.4.4 Visual Resources

3.4.4.1 Current Conditions

Visual resources on BLM-administered land are managed within the context of the visual resource management (VRM) system as described in BLM Manual 8400 – Visual Resource Management. The system includes an inventory of scenic values based on the following three primary criteria: (1) diversity of landscape features that define and characterize landscapes in a given planning area (scenic quality), (2) public concern for the landscapes that make up a planning area (public sensitivity), and (3) landscape visibility from public viewing locations such as primary travel ways and special areas (distance zones) (BLM, 2007d). These factors are collectively described as the visual resource inventory and are referred to as the VRI. Combined, these three factors form the backbone of the analysis that determines VRI classes, which indicate existing scenic values of BLM-administered lands in order to inform their management. During the RMP process, VRI ratings are considered in terms of balance with other resource values and management themes in order to determine the final VRM objectives for a planning area (BLM, 2007d). In an RMP, or other applicable BLM planning document, VRM classes are designed to express those management objectives in terms of allowable levels of visual change, disturbance or visual contrasts. In addition to the Grand Junction RMP, another GJFO planning document, the Grand Mesa Slopes Special Management Area (SMA) Management Plan (BLM, 1993), was developed specifically to describe and administer the area's unique and valued characteristics. According to the Grand Mesa Slopes plan, "Grand Mesa Slopes would be managed to provide a generally natural undeveloped "greenbelt" from Whitewater Hill to Powderhorn Ski Area. This large open space adjacent to Grand Junction should continue to provide important outdoor recreation opportunities and scenic values with a long term perspective" (BLM, 1993). A visual resource inventory of the GJFO was also conducted in 2009 (Otak, 2009), but does not constitute a planning document.

Compliance with BLM planning objectives is assessed and analyzed both for large-scale planning (e.g., RMP) and for and project-level actions such as the Whitewater MDP. Such analyses may show that expected Project impacts require development of mitigations to remain

in conformance with planning objectives. The Grand Junction Resource Area RMP and the Grand Mesa Slopes SMA Management Plan comprise the BLM planning documents that direct the visual resource management in the area of the Project.

The basic design elements of Form, Line, Color and Texture are used to describe and evaluate landscapes with the aim of minimizing any potential contrasts that would result from proposed activities. Anticipating and describing modifications that could detract from the "harmony of their surroundings" (BLM, 2007d) is part of the visual analysis that considers the element of Contrast when measuring such impacts across landscape.

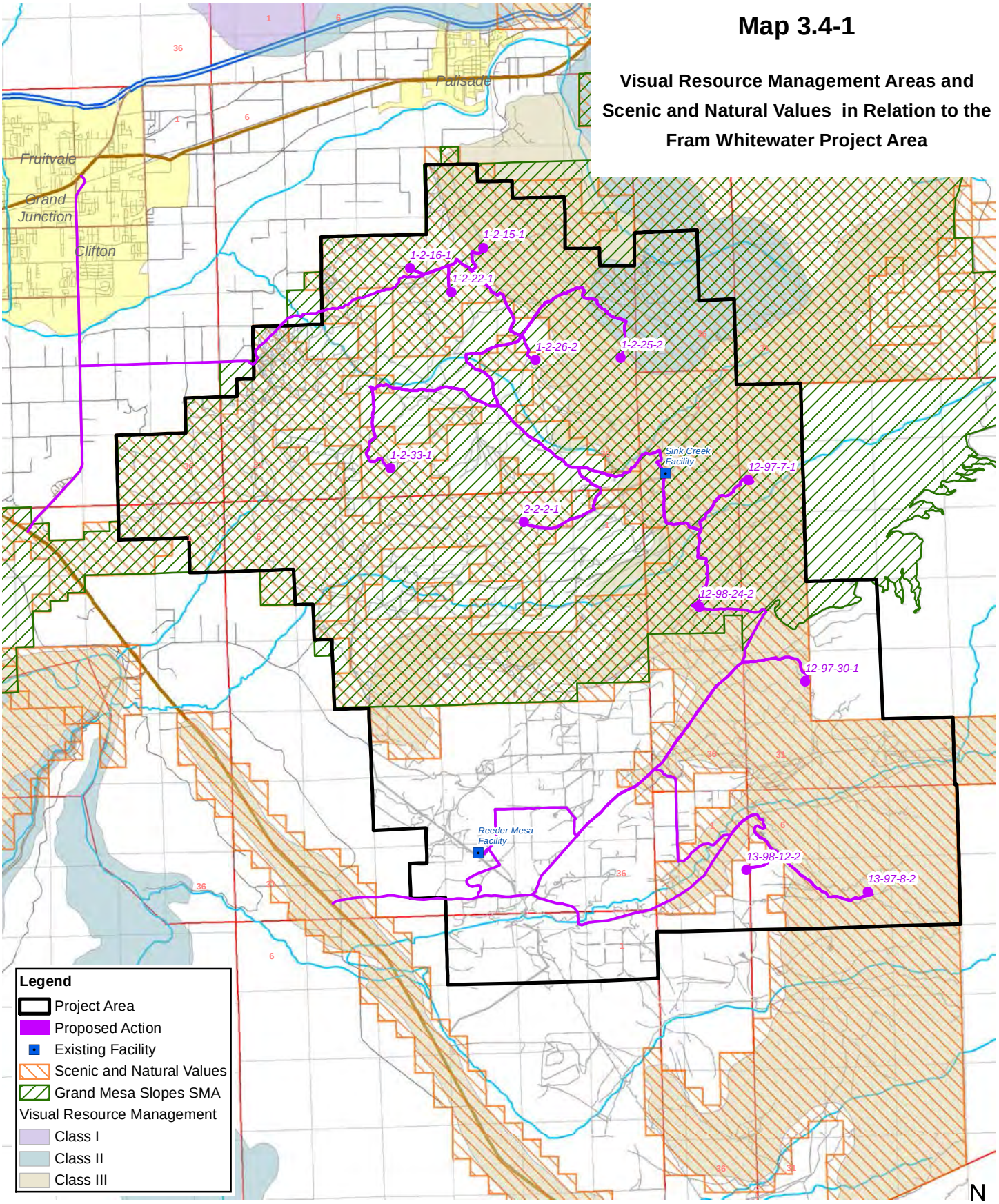
The Project Area lies at the base of the Grand Mesa near the eastern edge of the Colorado Plateaus physiographic province, and spans three VRI scenic quality rating units (SQRUs 31, 37 and 48) that were classified in 2009 as VRI Class III (SQRU 31) and Class IV (SQRUs 37 and 48) (Otak, 2009). The characteristic landscape is generally enclosed by the backdrop of the Grand Mesa and consists of sparsely vegetated irregular terrain, flat-topped, rounded and low pointed hills and deep drainages that quickly transition into the steep forested slopes and the exposed cliffs of the Grand Mesa. Depending on distance from it, the topography is largely dominated by the Grand Mesa's massive trapezoidal form with its diagonal and horizontal striated lines. Colors in the lower elevations (foreground) are predominantly tans and greys. The higher slopes consist of mottled shades from dark green to black created by pinyon-juniper and spruce-fir vegetation, along with patches of lighter shades of green, tan and grey. These textures range from smooth to medium across the landscape. Built elements are scattered, sometimes in groups, across several places in the Project Area and include power lines, fences, residential structures, livestock developments and oil and gas developments. The TransColorado Pipeline traverses the slopes of the Mesa, and its cleared corridor is conspicuous from many locations inside and outside the Project Area. The 2009 VRI analysis assigned a B (medium) scenic quality classification to SQRUs 31 (Grand Mesa Foothills) and 48 (Reeder Mesa), and a C (low) classification to SQRU 37 (Whitewater Creek.) Visual sensitivity levels were rated as low to medium for the subject SQRUs by the 2009 VRI. The area itself is primarily used by ranchers, City of Grand Junction water managers, oil and gas operators, recreationists and hunters who would generally constitute the typical casual observer located inside the Project Area. The area is also in the middle-ground to background distance zones for most viewers in the Grand Valley, including travelers along Interstate-70 and U.S. Highway 50. Notable observation points within and directly adjacent to the Project Area include the communities of East Orchard Mesa and Palisade, residences scattered across adjacent rural areas, existing travel routes within and adjacent to the Project Area, U.S. Highway 50 near the Town of Whitewater, and Interstate-70 between the Clifton exit (37) and the Palisade exit (42).

Under the current RMP, the Project Area lies within BLM-administered lands designated as VRM Class II and III, or that are unclassified. The VRM objective for Class II areas is to "retain the existing character of the landscape, and the level of change allowed is low. Activities may be visible, but should not attract attention." In Class III areas, the VRM objective is to partially retain the existing character of the landscape, with moderate change allowed "Activities may attract attention, but should not dominate the view of the casual observer." For all VRM classifications, "Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape." It has been the general practice of the BLM GJFO to manage unclassified areas with VRM Class III objectives (BLM, 1987).

VRM Class II lands in the Project Area include a rugged, canyon feature known as The Blowout as well as the steep, striped and groove walls of the Grand Mesa. Class III lands include Horse Mountain in the north of the Project Area, stretching south along the forested western slopes of the Grand Mesa (see Map 3.4-1), which are visible from the population centers of Palisade and East Orchard Mesa.

Map 3.4-1

Visual Resource Management Areas and Scenic and Natural Values in Relation to the Fram Whitewater Project Area



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

The Grand Mesa Slopes SMA Management Plan, incorporated into the current RMP in 1993, describes the area's landscape as "scenic, highly visible, and culturally important as an aesthetic resource related to community identity." It also states, "The massive, mile high rise of the slope of the Grand Mesa dominates the skyline east of Grand Junction, and any change to the landscape would be noticeable and of concern. There would be a high degree of concern for actions that would detract from the natural landscape character, particularly on the west-facing slope and foothills of the Grand Mesa. The overall public vision of Grand Mesa Slopes as a scenic open space with a few necessary visual intrusions (such as power lines, pipelines, fences, roads) would be continued" (BLM, 1993). Visual resource planning objectives of the Grand Mesa Slopes plan might be summarized as 'management that maintains the area's landscape as a scenic open space by minimizing impacts from actions that would detract from the natural landscape character, particularly on the west-facing slope and foothills of the Grand Mesa'.

3.4.4.2 Environmental Consequences

Proposed Action Alternative

Visual resources would be directly impacted by planned surface disturbance, which includes vegetation removal, trenching, soil stockpiles, staging locations, road and well pad construction, which would include building cut and filled slopes. Existing characteristics of topography, line, form, color, texture and contrast would be affected. During construction, drilling and well completions, short-term increases to visual contrasts would result not only from previously mentioned surface disturbance, but also from fugitive dust and the presence of construction and drilling equipment and personnel during construction, drilling and completion. Lighting for operational safety during drilling activities would be necessary throughout the nights and would likely be visible from many identified observation points. Construction of drilling pads, access roads and pipelines would initially create moderate to strong contrasts to forms in the landscape through vegetation removal and cut and fill procedures that would alter the existing landscape's topography. The proposed developments would introduce new visible linear features that also created contrasts with the line features of the characteristic landscape. Disturbance and exposure of soils and subsoils would also be likely to create moderate color contrasts in the landscape. The textures of the exposed soils, such as in cut and fill slopes, would add smoothness to the landscape, interrupting and creating contrast with the existing rougher textures of rocks and vegetation. Moving and upturning the black-brown basalt rocks that proliferate across and beneath the soils' surface would also create considerable areas of marked contrast, since the undersides of these rocks are coated with white calcium carbonate deposits. Such contrasts would likely draw the eye of casual viewers to varying degrees. All the aforementioned effects could affect viewers by drawing attention to new contrasts that could range from slight to moderate to strong. The amount of impact would be affected by the duration and stage of the disturbance; the impacts of new and sometimes larger disturbances (well pads) that occur at the beginning of a project are often softened by mitigation and time. Down-sizing disturbances (well pads) and reclamation of features, which can restore vegetation and otherwise lessen contrasts would likely lower contrast levels to low or moderate, based on the location and distance of the observer relative to the introduced elements at odds with the existing landscape.

Over both short and long terms, various cylindrical and rectangular forms of proposed structures like drill rigs, storage tanks, and other facilities could contrast moderately with the existing landforms, colors and textures. For example, production facilities could introduce distinct vertical and horizontal lines into an existing rolling landscape. The textures created or interrupted by the addition of such built features to the landscape would also create contrast with the current

textures of the characteristic landscape, which are primarily influenced by the rolling, mottled landform and vegetation.

In accordance with the BLM GJFO's Standard COAs, Fram proposes as Project Design Features, to locate/place all pads, roads and pipelines in ways that reduce visual impacts, avoiding or minimizing visibility from travel corridors, residential areas and other sensitive observation points. Where possible, natural landscape features would screen operations from observers. All wellfield components would be designed in order to down-size disturbance areas, recontour cut/fill slopes and to revegetate. Where possible, existing vegetation would be preserved when clearing and grading and the edges of areas where trees were removed would be irregular (rather than straight), to create natural-looking lines, open areas and mosaic patterns. Fram would paint all on-site permanent aboveground facilities a flat non-reflective color to blend with the surrounding landscape and background. The BLM-recommended colors for facilities at well sites would be determined during on-site inspections prior to development of specific Project components, such as APDs. Construction and storm water techniques required by BLM Standard COAs would include salvage of topsoil that would typically be bermed to help screen operations and mitigate visual contrasts by interrupting lines of contrast from constructed pad and cut/fill slope edges. Topsoil would then be roughened and seeded, helping to stabilize soils and support revegetation. Soil texturing and vegetation would also provide new rough textures to help minimize contrasts. Salvage and use of rock and woody slash at pad perimeters and on fill slopes supports visual resources as well as storm water management and soil stabilization.

Interim reclamation of pad locations, especially if techniques like surface roughening, contour berming/grading, seeding at the time of disturbance to improve revegetation and other state-of-the-art desert reclamation techniques were employed, could also lessen visual contrasts and visibility of developments during the life of the Project, as would successful pipeline reclamation at the time of construction, as is proposed. Final reclamation of roads and well pads, likely toward the end of the Project's life, would further reduce long-term visual impacts. Due to the challenges of terrain, climate and the sensitivity of native soils and vegetation types, successful reclamation and revegetation would likely prove difficult and time consuming. However, if reclamation measures such as recontouring and revegetation following disturbance succeeded, visual evidence of the Project would be considerably less likely to dominate the view of the casual observer.

To further minimize visual impacts, where site specific conditions indicate, the BLM should also require shielded or down-directed lighting, low-profile production equipment, site-specific placement of features and specific methods of vegetation removal, e.g., slanting saw cuts away from observation. Other construction techniques like laying back cut slopes, contour berming/grading and application of fill slope colorant could also be required to help reduce impacts of the Project to visual resources. Across the Project Area, construction materials used on the surface should avoid high color and textural contrast with the native soil and rock, e.g., no river cobbles or pit run should be used. Instead, salvaged native rocks should be used. Where needed to dampen contrast, basalt rocks and boulders could be broken up, turned black side up, and/or buried in the cut slopes or used as road surface or erosion protection.

For proposed Well Pad Federal 1-2-25-2, about 5,800 feet of the existing access road proposed for use crosses a fluid mineral lease that includes a NSO stipulation to protect the "Scenic Book Cliffs," located to the north and northwest at distances of about 5.5 to 8.5 miles from the proposed pad and road. The stipulation states "No occupancy or other activity will be allowed on the following portions of this lease to protect the Scenic Book Cliffs." This stipulation may be

waived or reduced in scope if circumstances change, or if the lessee can demonstrate that operations can be conducted without causing unacceptable impacts on the concern(s) identified." The area where the stipulation applies is designated by the GJFO RMP as VRM Class II. The well pad and the remainder of the existing access road would be located in an area of VRM III classification, where the Grand Mesa Slopes Plan's protections for scenery also apply. About 5.11 acres of new disturbance associated with the well pad is proposed for road improvement and pipeline installation inside the VRM Class II area.

The objective for Class II areas is to "retain the existing character of the landscape; the level of change allowed is low. Activities may be visible, but should not attract attention." At the time of the on-site inspection, another nearby location was considered for the pad, but not for relocation of the existing, very rough road. Considering both pad alternatives, the BLM indicated that the original pad location was preferable to the alternate location (see Appendix G, On-site Inspection Notes).

As previously described, changes resulting from Project implementation would create contrasts in line, form, color and texture across the affected areas.

Based on on-site inspection of the road and pad sites, many of the new contrasts would be mitigated by distance to viewers, which ranges from about 3.5 miles to Interstate-70 and at least 5.5 miles to the Book Cliffs. Trees and topography would effectively screen most of this part of the Project, and visual impacts to viewers are anticipated to be relatively unnoticeable where this is the case. Book Cliff views and viewers would be unlikely to experience adverse effects. However, it is possible that construction of the proposed pipeline and upgrade of the road could be visible from some observation points and possibly affect viewers to a level inconsistent with the Grand Mesa Slopes Plan visual resource management objectives to maintain natural landscape character. A detailed, site-specific inventory and plan describing proposed visual mitigations to minimize contrasts would also help ensure minimization of project impacts. A steel surface line, for example, could be appropriate if the pipeline scar would prove to be of concern following further analysis.

Other Project leases include stipulations for Scenic and Natural Values which read as follows: "Special design and reclamation measures may include transplanting trees and shrubs, fertilization, mulching, special erosion control structures, irrigation, site recontouring to match the original contour, buried tanks and low profile equipment, and painting to minimize visual contrasts. Surface disturbing activities may be denied in sensitive areas, such as unique geologic features and rock formations, visually prominent areas, and high recreation use areas." Proposed Well Pad Federal 1-2-15-1 would be located on Horse Mountain, overlooking observation points in Palisade and East Orchard Mesa, including parts of the Fruit and Wine Byway, at viewing distances from 1 to 4 miles. Proposed Well Pad Federal 1-2-16-1 would be located on a mesa top overlooking East Orchard Mesa, at distances ranging from 0.5 mile to about 3 miles. Proposed Well Pad Federal 1-2-22-1 would be located on a mesa top overlooking East Orchard Mesa, at distances ranging from 0.5 mile to about 3 miles. Observation points of these three locations would include residences and businesses in the community and parts of the Fruit and Wine Byway. The Grand Mesa Slopes Plan and its management objectives for protecting visual resources apply here. The proposed roads and pads would be located in areas unclassified by the RMP or as Class III (see Table 3.4-6). Anticipated changes resulting from Project implementation at these three locations would be more likely to affect viewers at levels inconsistent with Grand Mesa Slopes planning objectives than at other locations due to their potential for being highly visible from the described observation points, where impacts could not be mitigated by vegetative or topographic

screening or by sufficient distance to allow them to blend into the background. At Well Pad Federal 1-2-15-1, contrasts resulting from construction and road use, as well as equipment and facilities, could be quite noticeable and detract from the natural landscape character. With adequate mitigation of such impacts, the pad and road could likely meet management objectives of the Grand Mesa Slopes Plan for maintaining scenic open space on the west-facing slope and foothills of the Grand Mesa. At all three locations, a detailed, site-specific inventory and plan describing proposed visual mitigations to sufficiently minimize contrasts should be required, to help ensure minimization of Project impacts. Such inventories and plans should include evaluations of Visual Contrast Rating, Sensitivity Rating, and Scenic Quality Rating and should be approved by the BLM before surface disturbance.

Table 3.4-6
Visual Resource Management Classification by Well Pad

Proposed Well Pad	VRM Class	Within Grand Mesa Slopes SMA	Scenic and Natural Values Lease Stipulation
Federal 1-2-25-2	III	yes	yes
Federal 1-2-15-1	III	yes	yes
Federal 1-2-16-1	unclassified	yes	yes
Federal 1-2-22-1	unclassified	yes	yes
Federal 2-2-2-1	unclassified	yes	yes
Federal 12-97-30-1	III	no	yes
Federal 12-98-24-2	III	yes	yes
Federal 13-97-8-2	III	no	no
Federal 13-98-12-2	III	no	yes
Federal 12-97-7-1	III	yes	yes
Federal 1-2-26-2	unclassified	yes	yes
Federal 1-2-33-1	unclassified	yes	yes

Requiring the following measures would help to avoid and/or minimize visual impacts at well pads Federal 1-2-25-2, Federal 1-2-15-1, Federal 1-2-16-1, and Federal 1-2-22-1:

- Preparation of a detailed, site-specific inventory and plan describing proposed visual mitigations to minimize contrasts for approval by the BLM before surface disturbance. Inventory and plan shall include evaluations of Visual Contrast Rating, Sensitivity Rating, and Scenic Quality Rating.
- Use of construction material that avoids high color and textural contrast with native soil;
- Construction of textured, seeded, and contoured berms around well pads;
- Use of colorant on berms; and
- Use of down-directed lighting.
- Installation of low-profile equipment (no taller than 12 feet).

The existing access road to well pad Federal 1-2-15-1, which is proposed for upgrading without rerouting, is steep and rocky. It is also very visible where it goes up the side of Horse Mountain. Visibility of the road disturbance from populated areas as well as safety and road stability are concerns. Erosion could be a problem due to the steepness of the road. Potential visual and surface impacts could be managed by implementation of an engineered plan for road upgrade including road stability and safety. An unnamed BLM road crosses a big drainage tributary to the Colorado River just before the proposed 1-2-15-1 access road starts up the hill. Including this road section in the plan would also minimize potential impacts.

Proposed Federal 12-98-24-2 is located immediately adjacent to the main BLM road through the Project Area. To minimize visual effects to road users, saw cuts to tree trunks should be slanted to face away from the road.

Observing the area on a broad scale, a considerable level of existing contrast exists across many parts of the Project Area. Contrasting development consists of roads, residences, livestock structure, fences, a transmission power line and existing oil and gas developments. If the proposed oil and gas developments are implemented as proposed, resultant visual modifications to the landscape would be less likely to dominate the landscape from most observation points such as adjacent communities, scattered rural residences and existing travel ways. In such case, the Proposed Action could meet or exceed objectives of the Grand Mesa Slopes Plan and the Grand Junction RMP.

Protective/Mitigation Measures
In addition to the Project Design Features listed in Chapter 2 and the BLM GJFO Standard COAs in Appendix C, the BLM would require the following measures to further reduce impacts to visual resources:

- For proposed well pads Federal 1-2-25-2, Federal 1-2-15-1, Federal 1-2-22-1, and Federal 1-2-16-1:
    - A Visual Contrast Rating evaluation and/or Sensitivity Rating evaluation should be conducted, based on BLM on-site inspections.
    - A detailed, site-specific inventory and plan describing proposed visual mitigations to minimize visual contrasts should be prepared and approved by the BLM.
    - Construction material used for armor and surfacing roads and pads should avoid high color and textural contrast with the native soil and rock components – e.g., no river cobbles or pit run.
    - Angular native rock that does not create textural or color contrasts, such as local basalt, should be used to minimize visual impacts of road improvements.
    - Contoured berms should be placed to reduce the visual impact of the pad. Berm and pad fill slopes should be roughly textured and seed at the time of construction.
    - Colorant may be required to be applied to berms or pad fill and on road cuts and fills.
    - Low-profile equipment (no taller than 12 feet) should be used and may be set in-ground to minimize visual dominance.

- To minimize upward light scattering/pollution, all drilling rig and well test facility lighting should be limited to that required to safely conduct operations taking place at the time. Where safety is not compromised, lighting should be down-directed and focused on work areas only. Permanent lighting should be shielded and/or down-directed, and/or directed in a manner that targets light specifically to the work area.
- For proposed Well Pad 1-2-15-1, before pre-construction on-site, detailed site-specific plans and drawings of planned road improvements should be provided to the BLM. Upon review, the BLM may require engineer's certification of plans. Plans should include the road crossing of the large tributary drainage at the bottom of the slope where the existing access road meets an existing BLM road and the steep grade of the access road itself. Site specific BMPs should also be included in the plans, but could be adjusted at the pre-construction inspection.

- Well pads and other project components should be designed in ways to reduce visual impacts. Construction and reclamation should utilize natural landscape features and other state-of-the art techniques to screen operations from observers or blend them with the landscape.
- The following measures should be required, to reduce visual contrasts in texture, color and form across the Project Area: soil roughening/texturing, seeding at the time of the disturbance to improve revegetation, contour berming, and other state-of-the art desert reclamation techniques.
- Where needed to dampen contrast, basalt rocks and boulders should be broken up, turned black side up, and/or buried in the cut slopes or used as road surface or erosion protection (armor for water crossings, etc.).

Single Access Alternative

Potential impacts to visual resources under the Single Access Alternative would be similar to those described above for the Proposed Action Alternative. Impacts resulting from construction of well pads and drilling and completion would occur over a longer period of time (7 years rather than 4 years).

B Road Alternative

Potential impacts to visual resources under the B Road Alternative would be similar to those described above for the Proposed Action. The B Road alignment of the access route would shift the visual impacts of the route, such as increased contrast created by upgraded roads and increased fugitive dust from vehicle traffic south to a different part of the landscape, which would affect a different set of observers. The B Road route would be proximate to fewer private residences than the C Road route and off the Fruit and Wine Byway, and therefore visible to fewer close observers. Higher hills and more prominent topography along the B Road alignment would also help to screen nearby residences from effects resulting from use of the route.

No Action Alternative

Under this alternative, no Project-related impacts to visual resources would occur on BLM-administered lands related to any of the action alternatives.

3.4.5 Socioeconomic

3.4.5.1 Current Conditions

The Project Area is located in Northwest Colorado. As defined by the Colorado Department of Local Affairs (CDOLA), Northwest Colorado includes Garfield, Mesa, Moffat, Rio Blanco and Routt counties. Led by an expanding energy industry, particularly natural gas and oil development, the economy of this mostly rural region of the state has expanded rapidly since 2000. Mesa County is the dominant population and economic center in Northwest Colorado. With a 2010 Census population of 58,566, Grand Junction is the largest city in western Colorado and a regional center for trade and government services.

The Project Area is located near the U.S. Highway 50 corridor in south central Mesa County, south of the Grand Valley, which includes Grand Junction and the communities of Clifton, Fruita, and Palisade. Orchards and vineyards in the Grand Valley contribute to Mesa County's agricultural history and character, which are dominated by cropland and livestock grazing.

Population. Between 1990 and 2000, the rate of population growth in Mesa County was slightly lower than statewide and regional growth rates. During this time, Colorado's population increased 31 percent, the population of Northwest Colorado increased 29 percent and Mesa County's population increased 25 percent (from 93,145 to 116,255). This trend reversed between 2000 and 2010 and the rate of population growth in Mesa County exceeded statewide

and regional averages. Over the decade, Colorado's population increased 17 percent, the population of Northwest Colorado increased 24 percent and Mesa County's population increased 26 percent (to 146,723) (Census Bureau, 1991; 2001 and 2011a).

The CDOLA projects moderate growth in Mesa County in coming years. Between 2010 and 2020, Colorado's population is projected to increase 19 percent, Northwest Colorado's population is projected to increase 22 percent and Mesa County's population is projected to increase 17 percent (to 171,581) (CDOLA, 2012a).

Income and Employment. Personal income measures the income that individuals receive through earnings, asset ownership and transfer receipts (*i.e.* income received for services not currently rendered). Earnings, which include proprietor, self-employment and wage income, typically comprise a large portion of personal income. In 2010 earnings contributed 69 percent to per-capita personal income in Colorado, 62 percent in Northwest Colorado and 59 percent in Mesa County. Investment income, or dividends, interest and rent, accounted for 18 percent of per-capita personal income in Colorado and 21 percent in Northwest Colorado and Mesa County. Transfer receipts, which include retirement and pension benefits, disability and unemployment insurance benefits, medical payments and veterans' benefits, accounted for 13 percent of per-capita personal income in Colorado, 16 percent in Northwest Colorado and 20 percent in Mesa County (Bureau of Economic Analysis - BEA, 2012).

Between 2000 and 2010, per-capita personal income grew more rapidly in Northwest Colorado and Mesa County than Colorado as a whole. During this time, per-capita personal income increased from $33,977 to $42,451 in Colorado (25 percent increase), from $27,110 to $36,582 in Northwest Colorado and from $25,565 to $34,281 (34 percent increase) in Mesa County (BEA, 2012).

Expanding oil and gas activities and related increases in regional service industries have influenced employment in Mesa County since 2000. More recently, the county's economy has reflected the national economic downturn. Between 2000 and 2008, employment in Mesa County increased nearly 30 percent, from 49,947 to 64,484 wage-paying jobs. Over 40 percent of the jobs created were in the Mining (2,590 new jobs) and Construction (2,212 new jobs) sectors. Impacted by the national recession, wage and salary employment in Mesa County fell 11 percent (6,779 lost jobs) between 2008 and 2011. The greatest job losses were in the Construction (2,626 lost jobs) and Retail Trade (868 lost jobs) sectors. Despite this turbulence, total wage and salary employment in Mesa County increased nearly 16 percent between 2000 and 2011. In 2011 total employment within the county included 57,705 jobs. The greatest job gains were in the Mining and Health Care & Social Assistance sectors (Colorado Department of Labor and Employment - CDLE, 2012).

In 2011, farming (including ranching) employed 2.5 percent of Mesa County's workforce (BEA, 2013). Fruit production and viticulture make a notable contribution to total sales by Mesa County farms. According to the 2012 Census of Agriculture, orchards and vineyards account for almost 17 percent of total sales revenue from the county's farms, despite covering less than one percent of the county's farmland (USDA, 2014).

In 2011, the largest employment sectors in Mesa County included Health Care & Social Assistance, Retail Trade, Accommodations & Food Services, Educational Services, Construction, Mining and Public Administration (*i.e.* federal, state and local governments). Annual wages in Mesa County averaged $39,187 in 2011 and were highest in the Management of Companies & Enterprises ($87,090) and Mining ($72,678) sectors and lowest in the

Accommodation & Food Services ($15,475) and Arts, Entertainment & Recreation ($13,814) sectors (CDLE, 2012).

During the 1990s, annual unemployment rates ranged between 4.2 percent and 7.5 percent across the United States, between 3.0 percent and 6.0 percent across Colorado, between 3.1 and 9.1 percent in Northwest Colorado and between 3.8 percent and 7.9 percent in Mesa County. Unemployment tended to be lower in all jurisdictions between 2000 and 2008, when unemployment rates ranged between 4.0 percent and 6.0 percent across the United States, between 2.8 percent and 5.3 percent across Colorado, between 2.9 percent and 5.3 percent in Northwest Colorado and between 3.1 percent and 5.6 percent in Mesa County. Due to the national economic contraction that began in 2008, unemployment rates increased in all jurisdictions. Between 2008 and 2011 the unemployment rate increased from 5.8 percent to 8.9 percent in the United States, from 4.8 percent to 8.6 percent in Colorado, from 3.6 percent to 9.2 percent in Northwest Colorado and from 3.9 percent to 9.9 percent in Mesa County (Bureau of Labor Statistics – BLS, 2012a).

Travel and recreation-based tourism also contribute to employment in Mesa County. The travel industry is not represented by a single industrial sector, but includes businesses in several industries, primarily the Accommodation and Food Services, Transportation and Retail sectors. According to a 2012 study commissioned by the Colorado Tourism Office, the total economic impacts of travel spending by overnight visitors to Mesa County increased from $143 million in 2000 to $252.6 million in 2011. The employment supported by this spending increased from 2,400 jobs in 2000 to 2,870 jobs in 2011. During this time, employment related to travel spending accounted for approximately 5 percent of Mesa County employment. In 2011 annual earnings in the travel industry averaged $19,268 in Mesa County (Dean Runyan Associates, 2012).

In 2007 (the latest year for which farm income data are available), approximately 4 percent of the farms in Mesa County offered some form of agritourism or recreational services. Across the county, farm income from these activities totaled nearly $297.000. This represents 7 percent of the total income from farm-related sources in Mesa County (USDA, 2007).

Oil and Gas Production. Natural gas has fueled growth in Northwest Colorado's energy industry in recent years. The region's production of natural gas increased from 142.4 trillion cubic feet in 2001 to 841.1 trillion cubic feet in 2012 – a 500 percent increase. During this time, oil production in Northwest Colorado increased 18 percent; from 6.9 million barrels in 2001 to 8.1 million barrels in 2012. Most of this production is north of Mesa County. Between 2001 and 2012, Garfield County accounted for 80 percent of the region's natural gas production and Rio Blanco County accounted for 75 percent of its oil production. During this time, Mesa County accounted for approximately 5 percent of the natural gas production and 1 percent of the oil production in Northwest Colorado (COGCC, 2013b).

Fiscal Conditions. Property tax, sales and use tax and intergovernmental transfers are major sources of revenue to Mesa County government. Intergovernmental transfers, which include distributions of severance tax and federal mineral leases paid on mineral extraction, accounted for an average of 27 percent of annual county revenues between 2006 and 2011. During this time, sales and use tax accounted for an average of 20 percent and property taxes accounted for an average of 17 percent of annual county revenues. Total revenues to Mesa County government increased from $141 million in 2006 to $177.3 million in 2010. Due to contracting economic conditions, county revenues fell to $150 million in 2011. In recent years, increases in

property tax and intergovernmental revenues have offset losses in sales tax and other revenue sources (Mesa County, 2012).

Oil production affects a county's fiscal status largely through its impact on the property, or ad valorem, tax base. The total assessed valuation on taxable property in Mesa County more than doubled between 2000 and 2011, increasing from $807.1 million to over $2.0 billion. Oil and natural gas activities accounted for nearly 20 percent of this increase. Between 2000 and 2011, the assessed value of oil and natural gas in Mesa County increased from $9.4 million to $243.9 million. In 2011, oil and gas accounted for 12 percent of Mesa County's assessed valuation (CDOLA, 2012b).

Housing. According to a 2009 housing study commissioned by Mesa County, most of the workers in the oil and gas industry who reside in Northwest Colorado live in Mesa County. Stimulated by job growth in the region's oil and gas industry, the housing market in Mesa County expanded between 2001 and 2008, with median residential sale prices in the Grand Junction area increasing from $119,900 in 2001 to $222,400 in 2008 (Leland Consulting Group, 2009). The county's housing market was impacted by the financial crisis of 2008 and subsequent economic recession, and falling natural gas prices, and began to contract in 2009. The median residential sale price in the Grand Junction area fell to $164,700 in the fourth quarter of 2011 (Grand Junction Economic Partnership, 2011). Although the county's housing market has begun to recover, the median home sale price of $172,200 in the fourth quarter of 2012 was comparable to the median home sale price of $171,600 in 2005 (Grand Junction Economic Partnership, 2012; Leland Consulting Group, 2009).

Most of the county's rental units are in Grand Junction, where, in the third quarter of 2012, the average apartment vacancy rate was 3.8 percent and the average rent was $639 per month (Throupe and Von Stroh, 2012). The nearby town of Palisade and unincorporated communities of Clifton and Orchard Mesa provide additional housing opportunities for workers in the Project Area, particularly those who choose to rent. Most of the housing stock in these communities consists of single-family and mobile homes. Short-term housing accommodations closest to the Project Area are in Grand Junction. Over 40 hotels and motels are located in Grand Junction, with close to 3,000 rooms.

Public Safety. Physicians and other medical practitioners in the Grand Junction area provide emergency and routine medical services to residents and workers in the Project Area. The nearest hospitals are in Grand Junction. St. Mary's Hospital and Regional Medical Center has 318 beds and is a regional center for cardiovascular and orthopedic services, trauma care and surgery. Grand Junction's Community Hospital is an acute care facility with 78 beds.

The Lands End Fire Protection District (FPD) provides first response fire and emergency services in the southern part of the Project Area (south of A Road). Headquartered in Whitewater, the Lands End FPD covers 200 square miles and has 17 volunteer firefighters, 12 of whom are also emergency medical technicians. The district has one 1,200 gallon fire engine, one 2,200 gallon tender, one 500 gallon brush truck, one rescue truck and one fully equipped ambulance.

The BLM and Mesa County wildland firefighting units provide first response fire services in the northern portion of the Project Area (north of A Road). Based in Grand Junction, the BLM's Unaweep Wildland Fire Module includes seven dedicated personnel and additional state-wide resources. Also based in Grand Junction, Mesa County's Wildland Firefighting Unit is composed of Sheriff's Department employees and other Mesa County personnel. The county typically responds to fires on BLM-administered lands upon mutual aid request from the BLM wildland

team (Hill, 2012). Upon request, the Grand Junction Fire Department, Central Orchard Mesa FPD, Clifton FPD, Palisade FPD and Palisade Rural FPD also dispatch additional fire-fighting personnel to assist the Sheriff's Department and Lands End FPD (Midgley, 2012; Hill, 2012). The Central Orchard Mesa and Lands End ambulance service areas cover the Project Area.

The Mesa County Sheriff's Office provides first-call police services in the Project Area, which is in the sheriff's Orchard Mesa and Edwards districts. Because the Sheriff's Office has seven deputies to cover all of Mesa County, response times in rural areas tend to be slow. Most of the offenses in the Project Area reported to the Sheriff's Office are related to trespass, theft and burglary and domestic complaints (Stratton, 2012).

3.4.5.2 Environmental Consequences

Proposed Action Alternative

Most socioeconomic impacts including those related to population, employment, government revenues, housing and safety and emergency services would occur in Mesa County, and would relate to the size of the Proposed Action workforce and the length of time construction and production activities would continue in the Project Area. Workforce requirements would be greatest during the construction phase including drilling and completion; consequently, local socioeconomic impacts would also be greatest during this phase. Although the production phase would have lower impacts on employment and income than the construction phase, the Proposed Action's fiscal impacts would continue through production.

Population. Fram expects that local workers would comprise approximately 50 percent of the construction workforce and all of the operational workforce. Oilfield workforces are transitory because drilling and completion crews tend travel where there is oil and gas activity. Consequently, the construction workforce for the Proposed Action would not be expected to impact regional population trends. Due to its small size, the production workforce for the Proposed Action would not impact regional or local populations.

Income and Employment. Direct employment benefits of the Proposed Action include 44 construction jobs and 21 year-round production jobs. Although wages for the Proposed Action have not been determined, wages are likely to be comparable to current wage rates in Mesa County. In 2011, annual wages earned in Mesa County in industries supporting the drilling of oil and gas wells averaged $83,401, annual wages earned in industries supporting oil and gas operations averaged $70,374 and annual wages earned by freight truck drivers averaged $54,288 (BLS, 2012b).

The Proposed Action would also generate indirect economic benefits to local and regional businesses through the purchase of goods and services. The demand for goods and services would be further stimulated by the Proposed Action's workforce and by workers employed by businesses that support the Proposed Action and its workforce. Most of these regional benefits would be likely to occur in Grand Junction, where most local oil and gas service businesses are located. Because of the limited duration of the Project's construction phase, the Proposed Action would not be expected to impact recreation-based tourism or travel-related employment in the Project Area.

Recent studies have explored the trade-off between energy extraction and amenities, which include activities associated with the natural attractiveness of an area, including wilderness and other designated areas, outdoor recreation and agricultural activities (Yonk and Simmons, 2013; Yonk et al., 2011; McGranahan et al., 2011; Rasker, 2006; Lorah and Southwick, 2003). These studies have found that energy and amenity development are not incompatible, and that the

development of either sector does not inherently limit growth in the other sector. Counties that pursue a balanced approach toward developing energy and amenities tend to be better off in terms of employment and income than counties that develop either energy or amenities at the expense of the other. Energy- and amenity-related employment tend to be cyclical; energy-related employment varies as market prices fluctuate and reservoirs are depleted, while amenity-related jobs vary due to seasonal recreation activities and economic cycles. Counties that develop both resources can be more resilient to cyclical downturns in either type of development. Further, energy development can promote the amenity sector by providing counties with the funding necessary to develop and market available amenities.

Fiscal Conditions. Oil production in the Project Area would provide economic benefits to federal, state and local governments through the generation of federal mineral lease (FML) royalties, severance tax and property (ad valorem) tax on oil production. Fram estimates average well production of approximately 80,150 barrels of oil over a well's expected 14 year productive life. Oil production rates are typically highest when a well is drilled and decline rapidly thereafter. For simplicity, the analysis of fiscal impacts assumes an annual production level of 5,726 barrels of oil per well (80,150 barrels/14 years). This estimate is an annual average and does not imply that any single well would produce at this level each year. Based on monthly prices of Colorado crude oil reported by the Energy Information Administration (EIA), the tax estimates below assume a price of $87.71 per barrel of oil (EIA, 2012).

At the anticipated drilling rate of 25 wells per year, tax revenues associated with field-wide production would increase relatively rapidly during the first four years of the Proposed Action, as per-well productivity remains high and new wells are brought on-line. Tax revenues would peak in Year 4 and begin to decline thereafter due to the end of drilling and decreasing well productivity.

FML Royalties. Wells in the Project Area are located on federal mineral leases and subject to a FML royalty rate of 12.5 percent on the net revenues (gross revenues less transportation and processing costs and administrative charges) from extracted oil. Under the assumptions noted above, each well would generate approximately $52,730 in annual FML royalties. Of this total, approximately $26,890 (51 percent) would be distributed to the federal government and approximately $25,840 (49 percent) would be distributed to the State of Colorado. Nearly half of Colorado's portion of FML royalties would be used to fund public education and the remainder would be used to assist communities impacted by the mineral extraction industry and to fund water storage projects.

Severance Tax Revenue. Severance tax on oil production varies between 2 and 5 percent of gross annual income. Exemptions including transportation, manufacturing and processing costs; and royalty and property tax liabilities reduce the effective severance tax rate to between 1 and 2 percent of total production value (Colorado Governor's Office of State Planning and Budgeting, 2007). Assuming an effective severance tax rate of 1.5 percent, each well would generate approximately $6,740 in annual severance tax revenues. Severance tax revenues would be used to fund programs administered by the Colorado Geological Survey, Division of Minerals and Geology, Water Conservation Board, Department of Parks and Wildlife and local governments in areas impacted by the mineral extraction industry.

Property Tax Revenue. The Project Area is in Mesa County Tax District 13104. Based on 2011 mill levies, a well would generate approximately $21,750 in annual property taxes to Mesa County. The primary recipients of these property tax revenues would include Mesa County

Valley School District #51, Mesa County General Fund, the Lands End FPD and Mesa County Library District.

Sales and Use Tax Revenue. The Proposed Action would generate sales and use tax revenue to Mesa County through the sales of ta
xable goods either purchased in the county or purchased elsewhere and imported into the county. Most sales and use tax revenue would result from retail expenditures by direct employees, contractors and individuals whose jobs would be supported by the Proposed Action. Sales and use tax receipts would be highest during the construction phase.

Housing. The Proposed Action is not expected to have a discernible impact Mesa County or Grand Junction's housing market. Potential impacts on property values near the Project Area and access routes due to traffic and activities associated with Project construction would be expected to be short-term. The nearest residence is approximately 0.6 mile from the closest well pad (Well Pad Federal 1-2-16-1 in the northern portion of the Project Area) and Project operations are not expected to have a long-term impact on property values in the surrounding area.

The construction workforce is not likely to have a noticeable impact on the short-term housing market in the Grand Junction area. Fram would provide on-site housing for drilling crews. Therefore, the demand for short-term housing would peak with approximately 21 non-local workers during the Project's four-year construction phase. The influx of new production workers and their families into the region would be minimal and within the absorptive capacity of regional communities such as Grand Junction, Clifton and Palisade.

Public Safety. The Proposed Action is not expected to have a substantial impact on medical service providers in the Grand Junction area or on the Lands End FPD. Many rural communities near areas with active oil and gas development have experienced, or are concerned about, increased crime along with an influx of non-resident temporary workers (BBC Research and Consulting, 2011; Blankenship Consulting/Sammons Dutton, 2006). Rig activity is a good indicator of non-resident populations associated with oil and gas development, as well as potential increases in non-violent crimes (Jacquet, 2005). Because no more than one drilling rig would be active in the Project Area at any given time, the Proposed Action is not expected to increase response demands on the Mesa County Sheriff's Department. Accommodating drilling workers in on-site housing would further minimize demands on the Sheriff's Department and other local law enforcement agencies.

Protective/Mitigation Measures

No protective/mitigation measures have been identified by the BLM for potential socioeconomic impacts.

Single Access Alternative

Under the Single Access Alternative, potential impacts to population, employment, housing and public safety services would be similar to those described above for the Proposed Action. The stimulus to local businesses from spending by Fram, its contractors and employees during Project construction would occur seasonally (May 1 through November 30) for 7 years instead of year-round for 4 years. Although the fiscal impacts associated with production from a single well would be unchanged, at the anticipated drilling rate of 15 wells per year, tax revenues associated with field-wide production would ramp up more slowly; peaking in Year 7 and declining thereafter due to the cessation of drilling activities and decreasing well productivity.

B Road Alternative
Potential impacts to socioeconomic resources under the B Road Alternative would be the same as those described above for the Proposed Action.

No Action Alternative
Under the No Action Alternative, there would be no short-term employment gains due to Project construction or long-term employment gains due to Project operations resulting from implementation of any of the action alternatives. There would be no royalty or severance tax revenues to the State of Colorado and no property tax revenues to Mesa County.

3.4.6 Environmental Justice

3.4.6.1 Current Conditions

Executive Order 12898 requires federal agencies to identify and address disproportionately high and adverse human health or environmental effects of their programs, policies and activities on minority populations and low-income populations (defined as those living below the poverty level). In 2010, minorities including persons of African American, American Indian, Asian, Pacific Islander, or Hispanic descent, comprised 30 percent of the population in Colorado, 19 percent of the population in Northwest Colorado and 17 percent of the population in Mesa County (Census Bureau, 2011a). In 2010, low-income populations comprised 13 percent of Colorado's population, 12 percent of Northwest Colorado's population and 14 percent of Mesa County's population (Census Bureau, 2011b).

3.4.6.2 Environmental Consequences

Proposed Action Alternative
Overall, Mesa County contains a lower portion of minority populations and a comparable portion of low-income populations as compared to statewide and regional minority and low-income populations. Because of the lack of substantial differences between minority and low-income populations in the Project Area as compared to the region and state, the Proposed Action would not result in disproportionately high and adverse human health or environmental impacts on minority or low-income populations.

Protective/Mitigation Measures
No protective/mitigation measures have been identified by the BLM for environmental justice impacts.

Single Access Alternative
Under the Single Access Alternative, potential impacts on minority and low-income population would be similar to those described above for the Proposed Action.

B Road Alternative
Under the B Road Alternative, potential impacts on minority and low-income population would be the same as those described above for the Proposed Action.

No Action Alternative
Under the No Action Alternative, no impacts to minority and low-income populations related to any of the action alternatives would occur.

3.4.7 Transportation/Access

3.4.7.1 Current Conditions

Primary (southern) access to the Project Area would be via the Interstate-70 Business Loop (Exit 37), SH 141 and U.S. Highway 50. The primary access route would enter the southern

portion of the Project Area from the intersection of U.S. Highway 50 and Kannah Creek Road. A secondary (northern) access route leading off Mesa County C Road would be used in winter months (December 1 to April 30) to access northern portions of the Project Area. Access to the Project Area is described above in Chapter 2 and detailed in the Transportation Plan (Appendix D).

Table 3.4-7 shows 2011 annual average daily traffic volumes for all vehicles and for trucks on highway segments in the vicinity of the Project Area.

Table 3.4-7
Annual Average Daily Traffic in the Vicinity of the Project Area, 2011[1]

	Segment Milepost		2011	
Road Segment	**Start**	**End**	**All Vehicles**	**Trucks**
State Highway 141				
SW of US-50 junction to NE of US-50 junction in Whitewater	153.767	158.931	5,600	220
NE of US-50 junction to B-1/2 Road	158.931	159.000	8,400	340
B-1/2 Road to C Road	159.000	159.452	9,300	360
C Road to D Road in Clifton	159.452	160.442	10,000	370
D Road to Colorado Avenue (D-1/4 Road) in Clifton	160.442	160.953	16,000	340
Colorado Avenue to D-1/2 Road in Clifton	160.953	161.482	18,000	360
D-1/2 Road to E Road in Clifton	161.482	161.940	18,000	340
E Road to Interstate 70 Business Route in Clifton	161.940	162.297	22,000	420
U.S. Highway 50				
I-70 Business Route exit to Ute Avenue in Grand Junction	31.760	32.092	14,000	500
Ute Avenue to Pitkin Avenue in Grand Junction	32.092	32.338	21,000	750
Pitkin Avenue to Nolan Avenue in Grand Junction	32.338	32.945	32,000	1160
Nolan Avenue to Unaweep Avenue in Grand Junction	32.945	33.785	29,000	1220
Unaweep Ave to NW of B-½ Road in Grand Junction	33.785	34.100	21,000	1400
NW of B-½ Road to SE of B-½ Road in Grand Junction	34.100	36.042	17,000	940
SE of B-½ Road to 29 Road in Orchard Mesa	36.042	37.142	13,000	800
29 Rd to NW of SH 141 &32 Rd junction, north of Whitewater	37.142	38.504	10,000	680
NW of SH 141 & 32 Rd jct to SE of SH 141 & 32 Rd jct	38.504	41.137	13,000	970
SE of SH 141 & 32 Rd jct to NW of SH 141 South junction	41.137	41.886	11,000	940
SH 141 South junction to Kannah Creek Road	41.886	45.000	9,800	720
Kannah Creek Road to Delta	45.000	59.328	8,300	670

[1] CDOT, 2012.

Table 3.4-8 shows average daily traffic volumes on Mesa County roads in the Project Area. Traffic counts are not available for Mesa County B Road (Frazier, 2013). Traffic on B Road is permitted by the CDOT to include 300 trips per day (CDOT, 2006).

Table 3.4-8
Traffic Volumes on Mesa County Roads near the Project Area[1]

Road	Segment	Year	Average Daily Traffic
Mesa County C Road	East of Highway 141	2012[2]	1,089
Kannah Creek Road	473 feet west of Blair Road	2009	818
Lands End Road	3300 feet southwest of Divide Road	2009	280

[1] White, 2012; Frazier, 2012.
[2] Traffic count measured in October of 2012.

A portion of the access route would use the same roads as the Palisade Fruit and Wine Byway. The Fruit and Wine Byway includes 37 miles that travel through the town of Palisade and pass orchards, vineyards and wineries along the Colorado River and on the East Orchard Mesa. The Byway is used for commercial, residential and recreational purposes such as road biking and

driving to and visiting wineries and orchards. The primary access route would overlap with the Fruit and Wine Byway for one mile on 32 Road (SH 141) between D Road and C Road. The northern access route would overlap with the Fruit & Wine Byway for another 1.75 miles on C Road.

CDOT maintains Interstate-70 and U.S. Highway 50. Mesa County maintains C Road, B Road, Kannah Creek Road, Lands End Road and Whitewater Creek Road. All of these roads are paved except Whitewater Creek Road, which has a gravel surface with magnesium chloride. All of these roads are primary snow plow routes (Darnell, 2012). Road maintenance is described in detail in the Transportation Plan (Appendix D).

3.4.7.2 Environmental Consequences

Proposed Action Alternative

The Proposed Action could have direct impacts on transportation in the vicinity of and within the Project Area by increasing traffic volumes resulting in increasing opportunities for vehicle collisions with wildlife and other vehicles, and contributing to roadway deterioration and dust creation on unpaved roads. The majority of these impacts would occur during the first four years, when Project-related traffic would include the most construction, drilling and operational vehicles.

The Transportation Plan (Appendix D) describes elements of the Proposed Action designed to mitigate potential impacts to transportation and access. Installation of oil and produced water gathering pipelines and use of remote telemetry during operations would reduce Project-related truck traffic, once they were put in place. Based on the assumptions and traffic estimates described in the Transportation Plan, Project-related traffic on the southern access route (Kannah Creek Road) would peak at 48 vehicle round-trips per day in Year 2. This peak traffic level would occur in the summer (May 1 to November 30). During the winter (December 1 to April 30), peak Project-related traffic on the southern access route could include 4 vehicle round-trips per day and peak Project-related traffic on the northern access route could include 31 vehicle round trips per day.

Peak Project-related traffic would result in less than a 2 percent increase in traffic along affected segments of U.S. Highway 50 and SH 141 compared to 2011 traffic levels. On the southern access route, peak Project-related traffic could result in a 12 percent increase in traffic on Kannah Creek Road and a 34 percent increase in traffic on Lands End Road, compared to 2009 traffic levels. These peak traffic levels would occur in the summer. Peak Project-related traffic on the northern access route would occur in the winter and could result in 5 percent increase in traffic on C Road compared to 2012 traffic levels.

Upon completion of drilling in Year 5, Project-related traffic would consist of operational vehicles only (pick-ups and water/oil trucks) and would average 15 vehicle round trips per day between Year 6 and Year 20. During the summer, all vehicles would use the southern access route. This average traffic level represents a 4 percent increase in traffic on Kannah Creek Road and an 11 percent increase in traffic on Lands End Road, compared to 2009 traffic levels. During the winter, post-construction traffic would average 11 vehicle round trips per day on the northern access route and four vehicle round trips per day on the southern access route. These average traffic levels represent a 3 percent increase in traffic on Kannah Creek Road and an 8 percent increase in traffic on Lands End Road compared to 2009 traffic levels, and a 1 percent increase in traffic on C Road compared to 2012 traffic levels.

Protective/Mitigation Measures
The BLM has not identified protective/mitigation measures related to transportation and access in addition to the Project Design Features listed in Chapter 2, the BLM GJFO Standard COAs in Appendix C and the measures listed under Air Quality to reduce speed limits.

Single Access Alternative
Under the Single Access Alternative, the southern access route (Kannah Creek Road) would be the sole means of access into the Project Area. The northern access route (C Road) would not be used and most construction activities would occur between May 1 and November 30. Project-related traffic levels would peak in Year 2 with a total of 43 vehicle round-trips per day. During construction (Years 1 through 8), peak Project-related traffic would range from 34 to 43 vehicle round trips per day. These traffic levels represent an 8 percent to 11 percent increase in traffic on Kannah Creek Road and a 24 percent to 31 percent increase in traffic on Lands End Road compared to 2009 traffic levels.

Upon completion of drilling in Year 8, Project-related traffic would include operational vehicles only and would average nine vehicle round trips per day. This represents a 2 percent increase in traffic on Kannah Creek Road and a 6 percent increase in traffic on Lands End Road compared to 2009 traffic levels.

B Road Alternative
Under the B Road Alternative, estimated Project-related traffic levels on the northern and southern access routes would be the same as those described above for the Proposed Action. However, Mesa County B Road, rather than Mesa County C Road, would be used to provide secondary (northern) access during the winter. Because traffic counts are not available for B Road, Project-related increases in traffic cannot be compared to background traffic levels along this route.

Under this alternative, both the northern and southern access routes would coincide with the Fruit & Wine Byway for one mile along 32 Road (SH 141). Mesa County B Road is not part of the Fruit & Wine Byway.

Should the B Road Alternative be selected by the BLM, the Transportation Plan would be updated to reflect B Road route rather than C Road.

No Action Alternative
Under the No Action alternative, there would be no Project-related impacts to transportation from construction and operation of any of the action alternatives.

3.4.8 Wastes, Hazardous or Solid

3.4.8.1 Current Conditions

No known hazardous or other solid wastes exist on the lands included in the Proposed Action. However, hazardous and solid wastes could be introduced into the environment as a result of implementation of the Proposed Action, Single Access Alternative or B Road Alternative.

3.4.8.2 Environmental Consequences

Proposed Action Alternative
BLM Instruction Memoranda numbers WO-93-344 and CO-97-023 require that all NEPA documents list and describe any hazardous and/or extremely hazardous materials that would be produced, used, stored, transported, or disposed of as a result of a proposed project.

A variety of wastes would be generated during drilling, well completion and post-completion operations. Hazardous materials would also be used on site. These wastes and hazardous materials are described below.

Drill Cuttings

During drilling operations, drill cuttings from the well bore (mainly shale, sand and miscellaneous rock minerals) and drilling fluids ("mud") would be generated. Drilling muds may contain small concentrations of a variety of contaminants, including mercury, cadmium, arsenic and hydrocarbons, which could adversely affect soil and water resources if released to the environment.

Hazardous Materials

A variety of materials typical of oil and gas development could be at the site during construction and operations, including lubricants, diesel fuel, gasoline, solvents and hydraulic fluids. Hazardous materials which may be found at the site may include drilling mud and cementing products, which are primarily inhalation hazards. Other hazardous materials that may be necessary for well completion/stimulation activities include flammable or combustible substances and acids/gels (corrosives). Hazardous materials stored on-site could adversely affect soil and water resources if released to the environment.

Other Solid Wastes

Other solid wastes associated with drilling and well completion would include human waste and trash. Portable, self-contained chemical toilets are proposed for human waste disposal. All garbage and non-flammable waste material will be disposed of at an approved, off-site facility. Other solid waste could adversely affect soil and water resources if released to the environment.

Condensate and Produced Water

A separator unit is typically used to remove oil, condensate, and any other liquid hydrocarbons from the natural gas stream. Aboveground tanks are used to contain the liquid hydrocarbons and for produced water. Produced water is typically high in salinity and generally contains some petroleum hydrocarbons as well as BTEX (benzene, toluene, ethylbenzene and xylene) constituents. The above ground tanks would remain on-site for the life of the well(s). Long-term, undetected leaks from tank batteries are a potential source of groundwater contamination. Corrosion of steel tanks over the long term is quite likely. The high salt content of the produced water could very likely contribute to this process.

Liquid hydrocarbons would be transported to market by tanker trucks. Produced water could be recycled for use in drilling and completion at other nearby wells or trucked off-site to approved disposal facilities. Potential releases of produced water and liquid hydrocarbons, whether accidental or due to equipment failure, could occur during tanking, piping, load-out and truck transport. Spills of these substances would be covered under federal and state statutes and regulations as well as local and regional hazardous materials response plans.

Surface waters could be negatively impacted by spills of oil or other hydrocarbons, produced water or hazardous materials stored at the well pad. In cases where petroleum hydrocarbons or BTEX concentrations in contaminated soil are above regulatory limits, soil removal is indicated. Perhaps of greater consequence in these accidents is the potential for diesel fuel spills from ruptured fuel tanks. Diesel spills generally require removal of contaminated soils. Prompt response is necessary in the case of diesel or produced water spills in order to minimize negative impacts to surface/groundwater, plant and wildlife resources. With prompt and effective response, direct, indirect and cumulative impacts could be expected to be minimal.

The possibility exists that regulated hazardous materials unrelated to the gas production process could be introduced to the produced water and disposed of, illegally, along with the water. While there is no evidence to suggest this is a common occurrence, it could result in the subsurface contamination with regulated substances. It also could result in the contamination of groundwater resources, should there be a spill or leak at the tank battery.

Protective/Mitigation Measures
In addition to the Project Design Features listed in Chapter 2 and the BLM GJFO Standard COAs in Appendix C, the BLM would require the following measures to further reduce impacts resulting from wastes:

- Emergency spill response equipment should be stored and staged at strategic and clearly identified Spill Station locations, to expedite effective spill response.
- Produced water pipelines should be constructed from materials that would not corrode.

Single Access Alternative
Potential impacts resulting from management of wastes under the Single Access Alternative would be the same as those under the Proposed Action Alternative.

B Road Alternative
Potential impacts resulting from management of wastes under the B Road Alternative would be the same as those under the Proposed Action Alternative.

No Action Alternative
Under this alternative, there would be no Project-related impacts resulting from management of wastes from any of the action alternatives.

3.5 LAND RESOURCES

3.5.1 Recreation

3.5.1.1 Current Conditions

The Project Area is located on private and BLM-administered lands in an area of rugged, scenic terrain just west of the Grand Mesa. The area is not designated as a Special Recreation Management Area or Extensive Recreation Management Area, but is within the Grand Mesa Slopes SMA. The Grand Mesa Slopes SMA Management Plan describes the area as “an open space recreation area with low to moderate levels of dispersed public use” (BLM, 1993) According to the Grand Mesa Slopes plan, “Grand Mesa Slopes would be managed to provide a generally natural undeveloped “greenbelt” from Whitewater Hill to Powderhorn Ski Area. This large open space adjacent to Grand Junction should continue to provide important outdoor recreation opportunities and scenic values with a long term perspective” (BLM, 1993). No developed BLM recreational facilities, such as campgrounds or picnic areas, occur within the Project Area. BLM-administered lands in the area between the Grand Mesa and U.S. Highway 50 currently receive moderate use for a variety of recreation activities, including mountain biking, hunting, horseback riding, hiking, scenic driving and OHV use. The Project Area is adjacent to the Whitewater Hill OHV area (500 acres) designated for intense OHV use. Recreationists also use the Lands End Road to access Wild Rose Picnic Grounds and Coal Creek Trailhead located on the Grand Mesa National Forest.

Hunting, recreational target shooting, OHV use and mountain biking are the primary recreational uses. Several areas on the Grand Mesa Slopes and along the upper drainages at the base of Grand Mesa offer solitude and highly scenic settings that are ideal for dispersed camping. The

public lands in the vicinity of the east end of C Road are intensively used for recreational target shooting and OHV recreation.

The Fruit and Wine Byway includes 37 miles that travel through the town of Palisade and pass orchards, vineyards and wineries along the Colorado River and on the East Orchard Mesa. The Byway is used for commercial, residential and recreational purposes. The primary access route would overlap with the Fruit & Wine Byway for one mile on 32 Road (SH 141) between D Road and C Road. The northern access route would overlap with the Fruit and Wine Byway for another 1.75 miles on C Road.

The Grand Mesa Grind portion of the Palisade Classic Mountain Bike Race, a BLM-permitted event, passes through portions of the Project Area west of Horse Mountain, along Hall's Basin and near Sink Creek. The course uses sections of two-track roads in this area. The race takes place annually, usually in late May or early June, with about 100-150 racers competing.

The GJFO administers one Special Recreation Permit (SRP) authorizing commercial big game hunting by Broken Spoke Outfitters in the Project Area, and five SRPs authorizing mountain lion hunting by Alameno Outfitters, Backcountry Outfitters, Biggerstaff Outfitters, Cat Track Outfitters and Mark Davies Outfitters.

The Project Area is located in GMU 41, which extends from the Montrose County line north to the Colorado River and from U.S. Highway 50 east to SH 65. Deer and elk hunting are the most prevalent big game hunted in the GMU. In 2011, 1,366 deer hunters spent a total of 4,741 recreation days harvesting 491 deer. Another 1,677 hunters spent 8,923 recreation days harvesting 308 elk in GMU 41. A total of seven bear and two mountain lions were harvested in GMU 41 in 2011.

In 2012, the archery season for deer and elk ran from August 25 through September 23, the muzzle-loading rifle season was from September 8 to 16 and from October 21 to 29. Multiple rifle combined deer/elk seasons ran from October 13 through November 18. All black bear harvest is restricted to September. The season dates for mountain lion in GMU 41 usually run from late November through March 31.

3.5.1.2 Environmental Consequences

Proposed Action Alternative

Direct impacts to recreation opportunities, experiences and setting characteristics would result from increased vehicle traffic on area roads, human activity, noise, dust and structures associated with construction, drilling and production. These impacts would diminish scenic qualities, decrease naturalness and further limit opportunities for solitude. Any displacement of game species resulting from drilling and production would alter hunting opportunities in the area.

Over the life of the Project, the Proposed Action would alter the social and physical settings important to the area's recreation opportunities and outcomes. However, well pads and oil and gas related activities are currently active in the area. Industrial activity would concentrate around well pads, roads and other facilities. Disturbance attributed to well pads would be reduced somewhat by interim reclamation, but the character of the area would generally remain less desirable for at least the life of the Project. This would affect dispersed recreation uses like biking, hunting, camping, or wildlife viewing, where relative quiet and separation from other human activity is sought as essential to the experience.

Road improvements and pipeline placements would take place on approximately 4.5 miles of roads that coincide with the annual Palisade Classic Mountain Bike Race course. Improved roads could change the challenges of the race course, depending on existing site-specific conditions. Mountain bike racing on improved gravel roads generally can be easier than on

sections of primitive two-track or dirt roads. Depending on the timing of well pad, road and pipeline construction/operations, race participants could be confronted with vehicles, equipment and/or course alterations (if the most recent race course continues to be used).

Permitted hunting operations could be adversely impacted if game species are displaced from areas historically used by these outfitters.

Protective/Mitigation Measures
In addition to the Project Design Features listed in Chapter 2 and the BLM GJFO Standard COAs in Appendix C and the measure in air quality to reduce speed limits, the BLM would require the following measures to further reduce impacts to recreation:

- As appropriate, construction timing should be coordinated with permitted area outfitters and landowners to avoid conflicts with users of dispersed recreation sites.
- As needed, Fram should coordinate with the BLM recreation staff, mountain bike race organizers and local bike groups to plan for race course adjustments and avoidance of user conflicts.
- Fram should coordinate with the BLM, CPW and private landowners to schedule construction to avoid known prime hunting areas/seasons.

Single Access Alternative
Impacts to recreational users under the Single Access Alternative would be similar to those described above for the Proposed Action Alternative. However, there would be no construction traffic in the northern portion of the Project Area in the winter (December 1 through April 30) without the northern access route. This would extend the period of direct impacts from construction from 4 years to 7 years. Operational traffic would continue year-round. This alternative would have fewer direct impacts on recreational target shooters in the C Road area because there would be no northern route traversing the popular shooting area.

B Road Alternative
The B Road access route would pass directly through an area that is used extensively for recreational target shooting and OHV use. This area, commonly referred to as the 34 and C Road area, is not currently part of a designated recreation management area and is not actively managed for specific recreation management objectives. Alternative management strategies for this area are under consideration as part of the ongoing revision of the GJFO Resource Management Plan. Most recreational target shooting in the immediate vicinity of the B Road access route takes place immediately south of the route, and the line of fire is away from the road to the south. However, shooting does take place north of the route, and occasionally across the route, and could result in projectiles crossing the route. This is a common hazard across much of the GJFO and on many roads on other public lands where recreational target shooting is allowed. The risk posed by this activity to personal safety or property is generally very low.

No Action Alternative
No surface disturbing activities would take place under the No Action Alternative and no impacts to recreation resources would be expected.

3.5.2 Special Designations (ACECs, SMAs, NCAs, etc.)

3.5.2.1 Current Conditions

The Proposed Action coincides with the mid-section of the Grand Mesa Slopes SMA (Map 3.5-1). The Grand Mesa Slopes Management Plan (1993) was developed in conjunction with the BLM, the City of Grand Junction, the Grand Mesa Slopes Advisory Group and other stakeholders. The Plan aims to: protect municipal watersheds; manage critical wildlife habitat; protect open space, scenic and rangeland values; preserve public access; and provide recreation use management. The Plan identifies areas above 7,500 feet amsl as sensitive municipal watershed water collection areas. In 1995, The BLM GJFO amended their 1987 RMP to incorporate the Grand Mesa Slopes Management Plan. The Grand Mesa Slopes Plan does not preclude oil and gas leasing, exploration or development.

In 1999, the BLM placed a temporary moratorium on leasing in the area, which lasted until the Grand Mesa Slopes Steering Committee developed stipulations to be added to future leases. Specifically, these are designed to protect watersheds, scenic and natural values, wildlife habitat, streams and other natural values.

The Dominguez-Escalante National Conservation Area (NCA) is located adjacent to the Project Area on the west side of Highway 50. The 209,610-acre area features petroglyphs, waterfalls, and red sandstone canyons and cliffs. It also encompasses a 66,280-acre wilderness area. The NCA boundary is approximately 2.14 miles southwest of the Proposed Action's nearest disturbance area. The Dominguez Canyon Wilderness Area is about 5.79 miles south of the nearest disturbance area.

Forest Service lands just east of the Project Area include the Kannah Creek roadless area inventory unit. The area is over 34,600 acres and contains the Kannah Creek headwaters and several recreational trails.

3.5.2.2 Environmental Consequences

Proposed Action Alternative
With adherence to lease stipulations where they apply, the Proposed Action would not result in any environmental consequences to areas of special designation (Grand Mesa Slopes) in the region. No part of the Dominguez-Escalante NCA or wilderness area would be impacted by the Proposed Action.

Protective/Mitigation Measures
The BLM has not identified any additional protective/mitigation measures to further reduce impacts to areas with special designations.

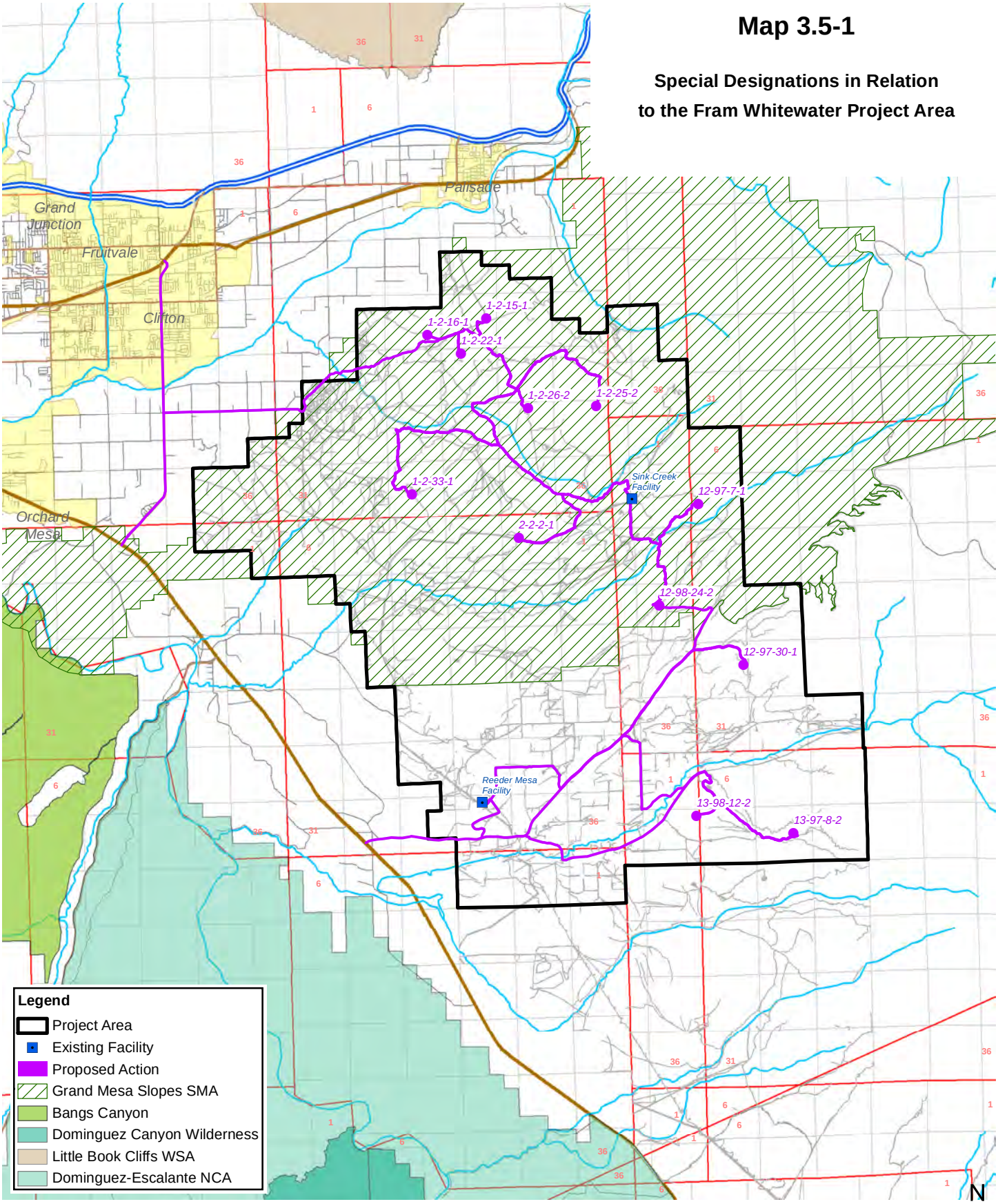
Single Access Alternative
Impacts to areas with special designations under the Single Access Alternative would be similar to those described above for the Proposed Action Alternative. However, there would be no construction traffic in the northern portion of the Project Area in the winter (December 1 through April 30) without the northern access route. This would extend the period of direct impacts from construction from 4 years to 7 years.

B Road Alternative
Impacts to areas with special designations under the B Road Alternative would be similar to those under the Proposed Action.

No Action Alternative
Under the No Action Alternative, there would be no impacts to areas with special designations.

Map 3.5-1

Special Designations in Relation to the Fram Whitewater Project Area



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

3.5.3 Range Management

3.5.3.1 Current Conditions

The Project Area coincides with four livestock grazing allotments managed by the BLM GJFO, as shown on Map 3.5-2. These include Whitewater Common, North Fork Kannah Creek, Davis AMP and Kannah Creek Common. Cattle are grazed and/or trailed on the four allotments. The grazing allotments total 74,731 acres (including private land), of which approximately 30,315 acres are public lands administered by the BLM GJFO in the Project Area. A total of 3,045 active animal unit months (AUMs) are currently permitted for the allotments. Table 3.5-1 summarizes the use, AUMs and size of each of the allotments. Typically, the BLM grazing allotments encompass both public and private lands, but only public lands are used to determine active AUMs.

Table 3.5-1
BLM Grazing Allotments Coinciding with the Project Area

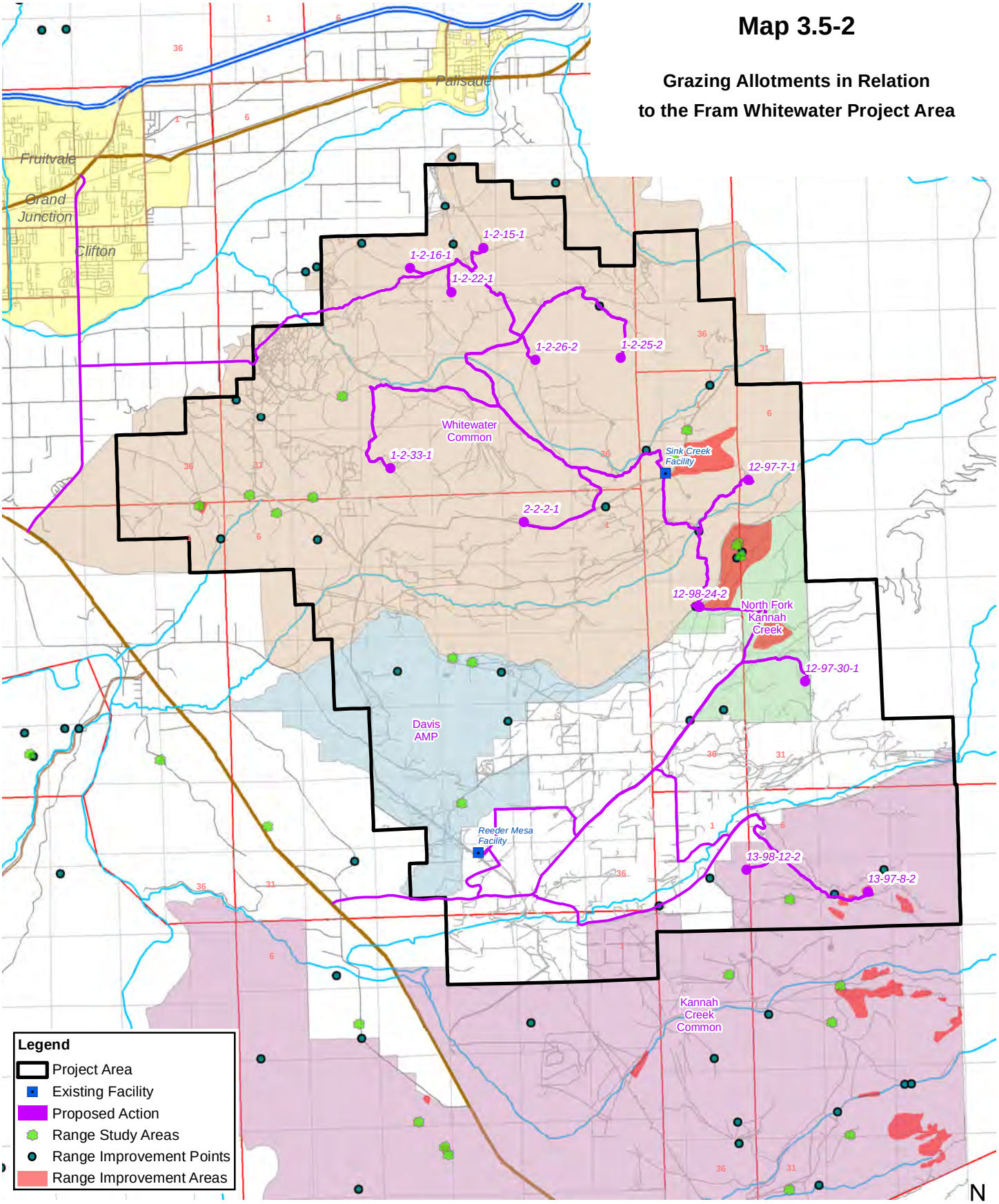
Allotment	Total Allotment Acreage	Allotment BLM Acreage within Project Area	Total Active AUMs	Number of Livestock	Period of Use
Whitewater Common (16203)	32,948	20,192	691	208	4/20 – 06/01
				202	12/01 – 1/15
				88	4/20—5/20
				64	12/04—1/24
North Fork Kannah Creek (6209)	2,366	2,123	125	70	11/1—11/30
				67	5/20—6/19
Davis AMP (6201)	5,314	4,097	290	131	4/15—5/20
				100	12/4—1/13
Kannah Creek Common (16202)	34,103	3,903	1,939	344	5/15—6/30
				344	10/1—11/30
				98	10/1—11/30
				98	5/15—6/30
				103	10/1—11/30
				104	5/15—6/30
Total	**74,731**	**30,315**	**3,045**	**2,021**	**—**

Source: (BLM, 2011b).

Approximately 432.4 acres of surface disturbance currently exist on BLM-administered lands across the four grazing allotments. This disturbance stems from roads, pipelines, well pads and transmission facilities. About 170.8 acres of disturbance exist on other lands within the Project Area grazing allotments.

Map 3.5-2

Grazing Allotments in Relation to the Fram Whitewater Project Area



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

3.5.3.2 Environmental Consequences

Proposed Action Alternative

Impacts to grazing resources would occur mostly in the form of forage removal due to surface disturbance. Cattle grazing would continue throughout the duration of the Project. Over the life of the Project, approximately 140 acres would be disturbed within three of the grazing allotments, resulting in a long-term loss of potential forage (Table 3.5-2).

Table 3.5-2
Surface Disturbance on BLM Grazing Allotments in the Project Area

Allotment	Total Allotment Surface Disturbance (acres)
Whitewater Common (16203)	107.82
North Fork Kannah Creek (6209)	14.54
Kannah Creek Common (16202)	18.06
Total	**140.42**

Nearly all proposed disturbance associated with pipelines and roads would be in areas where those two Project components are co-located and would expand existing road improvements. If reclamation succeeded in these difficult to reclaim areas, grasses and forbs could begin to provide vegetative cover and forage, possibly as soon as three years after reclamation, if reclamation was protected from livestock grazing. The total disturbed acreage within grazing allotments (140.42 acres) represents approximately 0.5 percent of the total public allotment acres within the Project Area.

In addition to the loss of forage, increased vehicle traffic would raise the risk of injury or death to grazing cattle in the Project Area. Cattle could also be injured if trenches are left open during construction without adequate escape routes. An increase in vehicle traffic and other human activity could disturb cattle and cause them to move away from productive allotment areas. In accordance with the BLM GJFO's Standard COAs, Fram would avoid damage to range improvements; if damaged, they would be repaired immediately. All of these measures would reduce potential impacts to range management. The Proposed Action includes several measures to reduce vehicular traffic, which would also reduce impacts to range management.

Protective/Mitigation Measures

In addition to the Project Design Features listed in Chapter 2 and the BLM GJFO Standard COAs in Appendix C, the BLM would require the following measures to further reduce impacts to range management:

- Planned activities should be coordinated with affected grazing permit holders.
- Suitable fencing should be installed (in consultation with BLM wildlife and range staff) to avoid over-grazing and to support successful reclamation.
- Construction and operation should be coordinated with affected permittees.
- Gates should be left as they are found unless signs are posted on them directing that they be open or closed.
- Construction trenches should not be left open without adequate escape ramps.

Single Access Alternative

Impacts to grazing under the Single Access Alternative would be similar to those described above under the Proposed Action Alternative.

B Road Alternative

Impacts to grazing under the B Road Alternative would be similar to those described above under the Proposed Action Alternative. Under the B Road Alternative, an additional 7.91 acres of disturbance would occur within the Whitewater Common Allotment.

No Action Alternative

Under the No Action Alternative, impacts to grazing would not occur from construction and operation of any of the action alternatives.

3.5.4 Forest Management

3.5.4.1 Current Conditions

The Project Area contains forest lands on higher elevation bluffs, draws and ridgelines. Pinyon-juniper is the major forest type represented in the area, with many stands at or approaching maturity. Willow and cottonwood are also present along some drainages. Forest management in the GJFO is divided into Pinyon-Juniper Woodlands and Forest Land. Forest lands are managed to maintain stand productivity and to sustainably meet fuelwood and sawtimber demands (BLM, 1987). Pinyon-Juniper Woodlands consist of lands dominated by pinyon-juniper and can provide fuelwood harvest cordage.

3.5.4.2 Environmental Consequences

Proposed Action Alternative

Approximately 34.12 acres of Pinyon-juniper woodlands would be removed under the Proposed Action. These acres include both the Pinyon-juniper woodland type and Juniper woodland type described above in the Vegetation section. Pinyon-juniper accounts for about 7.47 acres, while the Juniper type would be 24.65 acres.

The forest resources in the Project Area vary in age, density and composition and are not considered suitable for commercial use. Private use for firewood and Christmas tree gathering is relatively low for the area. Impacts to Forest Management are expected to be slight. Implementation of the protective/mitigation measures described below would help ensure that resource abuse did not result from implementation of the Proposed Action.

Protective/Mitigation Measures

In addition to the Project Design Features listed in Chapter 2 and the BLM GJFO Standard COAs in Appendix C, the BLM would require the following measures to further reduce impacts to forest management:

- Fram should purchase a wood-cutting permit at $10 per cord from the BLM prior to clearing trees. No removal of trees or brush may occur without a BLM permit including during surveying operations. This area has an average of 10 cords of usable fuel wood and/or post and poles per acre. This would require a cost reimbursement of approximately $3,400.
- Fram should avoid removal of and damage to old-growth trees and stands within the pinyon-juniper forest type, when practical and safe. Such trees should be identified at the time of on-site or pre-construction inspection.

- When not shredded and salvaged with topsoil for later use in reclamation, all material 4 inches and greater in diameter should be cut into sections not to exceed 4 feet in length and placed in piles along Project Area roads, to be removed by Fram or left to be removed by other parties.

Single Access Alternative
Impacts to forest resources under the Single Access Alternative would be similar to those described above for the Proposed Action Alternative.

B Road Alternative
Impacts to forest resources under the B Road Alternative would be similar to those described above for the Proposed Action Alternative.

No Action Alternative
Under the No Action Alternative, no Project-related impacts to forest resources would occur from construction of any of the action alternatives.

3.5.5 Fire and Fuels

3.5.5.1 Current Conditions

The GJFO manages wildland fire using a multidisciplinary approach under the guidelines found in two sets of interagency frameworks: the broader and more directive Guidance for Implementation of Federal Wildland Fire Management Policy (Fire Executive Council, 2009) and the regional GJFO/Colorado National Monument Interagency Fire Management Plan (IFMP) (BLM, 2008b). The Upper Colorado River Interagency Fire Management Unit (FMU) also provides a full range of fire management services to the participating jurisdictions in the area. GJFO wildland fire and fuels management reflects consideration of fire history, land status, public concerns and issues and other resource objectives (BLM, 2008b).

According to recent BLM GIS data, several large fires ranging from approximately 25 to 1,400 acres have burned either in or in the vicinity of the Project Area since 1973. Dozens of smaller fires, most of them naturally caused, have been contained in the Project Area over the past few decades. Currently, approximately 902.8 acres of previously disturbed lands occur within the two fire management units in the Project Area. This surface disturbance includes roads, well pads, pipelines, transmission towers and reclaimed areas.

The Whitewater Desert FMU consists of a Category A management prescription and the Palisade/Upper Kannah Creek FMU is Category B. Category A units are areas where fire is not desired at all. These units are further described as “areas where mitigation and suppression is required to prevent direct threats to life or property.” It includes areas where fire did not play a large role in the development and maintenance of the ecosystem; or because of human development, fire can no longer be tolerated without substantial loss (BLM, 2008b). Fire mitigation in Category A areas focuses on prevention, detection, hazardous fuel reduction and rapid and aggressive suppression response. Non-fire fuel treatments are employed and prescribed fires are not used. Category B units are areas where unplanned wildland fire is not desired because of current conditions. Fire plays a natural role in the function of the ecosystem, but these are areas where an unplanned fire could have negative effects unless some form of mitigation is applied to the landscape. Fire suppression tactics are usually aggressive.

3.5.5.2 Environmental Consequences

Proposed Action Alternative
Surface disturbance would impact Whitewater Desert FMU A and Palisade/Upper Kannah Creek FMU B. Improvement, use and maintenance of roads, gathering pipelines and well pads

would be the main sources of disturbance. Approximately 109.28 acres of new disturbance would be expected across the Whitewater Desert FMU (including private lands), resulting in a total of 905.4 acres of disturbance in the unit. In the Palisade/Upper Kannah Creek FMU, about 53.83 acres of new disturbance is proposed. This would put the unit total disturbance at 161.4 acres.

During initial surface disturbance and subsequent operation, ignition threats from heavy equipment and workers would pose the greatest risk to increasing the number of fires on the public lands, especially in dry conditions during summer months.

Protective/Mitigation Measures
In addition to the Project Design Features listed in Chapter 2 and the BLM GJFO Standard COAs in Appendix C, the BLM would require the following measures to further reduce impacts to fire and fuels:

- Fram should prepare a Fire Management Plan to assist in preventing and/or containing Project-related accidental ignitions. Copies should be required to be on locations during construction, drilling, work-overs and facility installation and should be maintained at locations with noted wildfire hazards, such as fine continuous fuels like cheatgrass.
- Fram should develop an Emergency Response Plan that defines measures to be taken by employees and contractors in case a wildfire moves toward an active pad or facility and provides guidance on actions if a fire is accidentally started. Copies should be required to be on locations during construction, drilling, work-overs and facility installation and should be maintained at locations with noted wildfire hazards, such as fine continuous fuels like cheatgrass.
- Fire suppression equipment and an emergency water tank should be maintained at each site. Personnel should be trained in their use to only suppress or try to suppress fires at the smallest size when they start.
- All fires or explosions that cause damage to property or equipment, loss of oil or gas, or injuries to personnel should immediately be reported to the BLM Grand Junction Field Office at 970-244-3000.
- Any welding, acetylene or other torch with open flame, should be operated in an area barren or cleared of all flammable materials and vegetation for at least 10 feet on all sides from equipment. Wind strength and direction should be considered during safety decisions relative to open flames.
- Vehicles should be parked only in designated areas, away from vegetated places that are likely to contain cured fuels such as cheatgrass.
- Heat-producing facilities should be placed at distances of at least 2 to 3 times the height of adjacent fuels. In such areas, as determined on a site-specific basis, trees should be removed for a distance of 2-3 times their height, from heat-producing facilities. For example, 20 foot tall trees should be removed within a minimum distance of 40-60 feet from production facilities.
- Site-specific adaptive measures such as bare mineral soil buffers could be required by the BLM, and should be determined on a site-specific basis.
- Internal combustion engines should be equipped with approved spark arrestors.

Single Access Alternative
Impact to fire and fuels under the Single Access Alternative would be similar to those described above for the Proposed Action Alternative.

B Road Alternative
Impact to fire and fuels under the Single Access Alternative would be similar to those described above for the Proposed Action Alternative.

No Action Alternative
Under this alternative, there would be no Project-related impacts as described above for any of the action alternatives.

3.5.6 Land Tenure, Rights of Way and other Uses

3.5.6.1 Current Conditions

The Proposed Action would be located on both private and federal lands administered by the BLM GJFO. Table 3.5-3 lists right-of-way authorizations within the Project Area that could be directly or indirectly affected by the Proposed Action.

Table 3.5-3
Authorized and Pending Rights-of-Way in the Project Area

Case Number	Grant Holder	Row type
COC030010	UTE Water Conservation District	Water facility
COC055806	FAA NM Mtn. REG ACQ MGT BR	Communication site, federal facility
COC056593	Grand Valley Rural Power	Power transmission line
COC0061164	Grand Valley Rural Power	Power facility
COC029423	Public Service Company of CO & Tri-State Gen & Tran	Power transmission line
COC038521A	Public Service Company of CO	Power transmission line
COC050899	Qwest Corporation	Telephone lines
COC055806	FAA NM Mtn. REG ACQ MGT BR	Communication site, federal facility
COC060628	Public Service Company of CO	Power transmission line
COC061051	Rolling Creek Trust	Access road for water line
COC063427	Tri-State Gen & Tran	Fiber optic facilities
COC064711	Public Service Company of CO	Oil and Gas Pipeline
COC065702	Fram Operating LLC	Road
COC066829	Horse Mountain LLC	Road
COC068620	Qwest Corp.	Telephone lines
COC055993	Public Service Company of CO	Power facility
COC059414	Public Service Company of CO	Power transmission line
COC061163	Tri-State Gen & Tran	Power facility
COC0102696	Ute Water Conservation District	Water facility
COC120005	E. G. Hills	Buckeye Reservoir Feed Ditch - Exist Prior to FLPMA
COM005724	A.D. Guild	Irrigation facility - Guild Reservoir and ditch
COC011879	City of Grand Junction	Irrigation Facility – water supply line
COM006676	City of Grand Junction	Irrigation facility – Kannah Creek pipeline

Case Number	Grant Holder	Row type
COC040225	Grand Valley Rural Power	Power transmission line
COC051280	TransColorado Gas Trans Co	Oil and gas pipeline
COC055425	Hidden Valley Water	Water facility
COC068621	Rocky Mountain Natural Gas Co	Oil and gas facility site
COC068622	SourceGas Distribution LLC	Oil and gas pipeline
COC68960	City of Grand Junction	Water facility – pipeline to storage facility
COC002579	CenturyTel of Eagle	Telephone/fiber optic facilities
COC011879	City of Grand Junction	Irrigation facility
COD035770	Agnes Barton & James Doucet	Irrigation facility
COGS026801	Frank Fanning, Hiram Palmer, Charles Schoening	Irrigation facility – Laurent Ditch lateral
COM008014	George Lander	Irrigation facility – Lander Ditch #2
COC040223	Grand Valley Rural Power	Power transmission line
COC066618	Fram Operating LLC	Oil and gas pipelines
COC030221	City of Grand Junction	Irrigation facility - ditch
COC040224	Grand Valley Rural Power	Power transmission line
COC043117	City of Grand Junction	Parking area
COC053862	Qwest Corp	Telephone lines
COC065702	Fram Operating LLC	Roads
COC0122586	FS Rocky Mtn. Region	Trail – Lands End Truck Trail Grand Mesa NF
COD0036042	Bolen Anderson & Jacob	Irrigation Facility – ditch and reservoirs
COM016237	John Ternahan	Irrigation facility – Juanita Reservoir supply ditch
COC069185	South Oil	Access road to wells
COC009397	FS Rocky Mountain Region	Indian point trail – Grand Mesa
COC043080	City of Grand Junction	Water facility – water pipeline to Purdy Mesa Reservoir
COC049001	CenturyTel of Eagle	Telephone lines
Source: BLM, 2012a.		

3.5.6.2 Environmental Consequences

Proposed Action Alternative

Separate right-of-way grants and temporary use permits would not be required under the Proposed Action Alternative except for a small portion of the northern access route which is located outside of the Whitewater Unit. In accordance with the BLM GJFO's Standard COAs, Fram would obtain agreements allowing construction and maintenance with all existing right-of-way holders, authorized users and pipeline operators prior to surface disturbance or construction of locations or access across or adjacent to any existing or approved rights-of-way or pipelines. Adherence to this condition would minimize potential impacts to existing right-of-way holders.

Protective/Mitigation Measures

The BLM has not identified protective/mitigation measures in addition to the Project Design Features listed in Chapter 2 and the BLM GJFO Standard COAs in Appendix C to further reduce impacts to land tenure, rights-of-way, and other uses.

Single Access Alternative

Under the Single Access Alternative, impacts to existing right-of-way holders would be similar to those described above for the Proposed Action Alternative. No potential impacts to three existing rights-of-ways (COC038521A, COC060628 and COC102696) would occur because these are associated with the northern access route.

B Road Alternative

Under the B Road Alternative, impacts to existing right-of-way holders would be similar to those described above for the Proposed Action Alternative. Potential impacts to two existing rights-of-ways (COC038521A and COC060628) would not occur because they are associated with C Road access.

No Action Alternative

Under the No Action Alternative, existing rights-of-way and land use authorizations would not be affected.

CHAPTER 4 – CUMULATIVE EFFECTS

4.1 INTRODUCTION

Cumulative effects are defined in the CEQ regulations (40 CFR § 1508.7) as ".the impact on the environment that results from the incremental impact of the action when added to other past, present and reasonably foreseeable actions regardless of what agency (federal or non-federal) or person undertakes such other actions." Cumulative effects analysis typically encompasses broader areal and time frames than analysis of direct and indirect effects. The actions and effects selected for analysis depend on access to reasonably available data.

4.2 ACTIONS ANALYZED

Generally, past and ongoing activities (natural and man-made) that have affected and are affecting the Project Area and surrounding areas include:

- mining;
- oil and gas exploration and development;
- rights-of-way or other land uses (power lines, pipelines, roads);
- wildland fire;
- drought;
- wildlife utilization;
- climate change;
- livestock grazing;
- dispersed recreation (i.e., hunting, camping, etc.); and
- off-highway vehicle (OHV) use.

Table 4.2-1 lists the past, present and reasonably foreseeable future actions within the area that might be affected by the Proposed Action. The geographic scope used for analysis varies for each cumulative effects issue. For this analysis, foreseeable actions are considered to be limited to those for which some formal notice or permit application has been made and does not include potential developments which are speculative. Those foreseeable actions analyzed in the Draft RMP were reviewed and included in this analysis, where applicable. Disturbance from the Proposed Action is included in foreseeable actions.

Table 4.2-1
Past, Present and Reasonably Foreseeable Actions

Impact Sources	Analysis Rationale
Analyzed Impact Sources	
Minerals Industry	
Oil & Gas Wells	Public data are available from COGCC and NEPA documents (federal wells) for analysis of existing and foreseeable disturbance.
Pipelines	The BLM GJFO maintains some GIS files on locations of existing pipeline ROWs, but not on dates of construction. Buried pipelines are generally reclaimed immediately after installation, although completion of successful reclamation may take 3-5 years or longer. Disturbance is estimated for the long-term inspection corridor, but is generally stabilized. Foreseeable pipelines estimated from NEPA and FERC filings. Well pad gathering line disturbance has been included under

Impact Sources	Analysis Rationale
	oil and gas well estimates.
Mining	Public data are available from CGS (dated) regarding active and permitted mines; the BLM and NEPA documents for existing and some foreseeable mine projects.
Utilities	
Electric Power Lines	The BLM GJFO maintains some GIS files on power line ROW locations and also filings from utility companies. Disturbance is estimated for the long-term inspection corridor, but is generally stabilized. Power line ROWs are listed on the master title plats, which are available electronically and are georeferenced and available in GIS. This is true of all FLPMA ROWs and some pre-FLPMA ROWs.
Roads	
Federal & State Highways	Public data are available from CDOT. Data regarding some foreseeable roads is available from NEPA documents.
County Main Roads	
County Local Roads	
Other	
Hazardous Fuels Reductions	The BLM GJFO maintains files on past and proposed projects.
Canals and Ditches	The BLM GJFO maintains files on past and proposed projects. Canals and ditches are common in the vicinity of the proposed Project.
Non-analyzed Impact Sources	
Minerals Industry	
Gas Plants & Facilities	Public data are not currently available from COGCC for existing facilities other than pits, which are included in well pad estimates. Other sources for gas plants not identified.
Other	
Grazing	Grazing represents a long-term and historical use of the land and the levels of acceptable grazing loads have typically been determined based on prior usage. In most cases, these levels are expected to be continued into the future with minor variations.

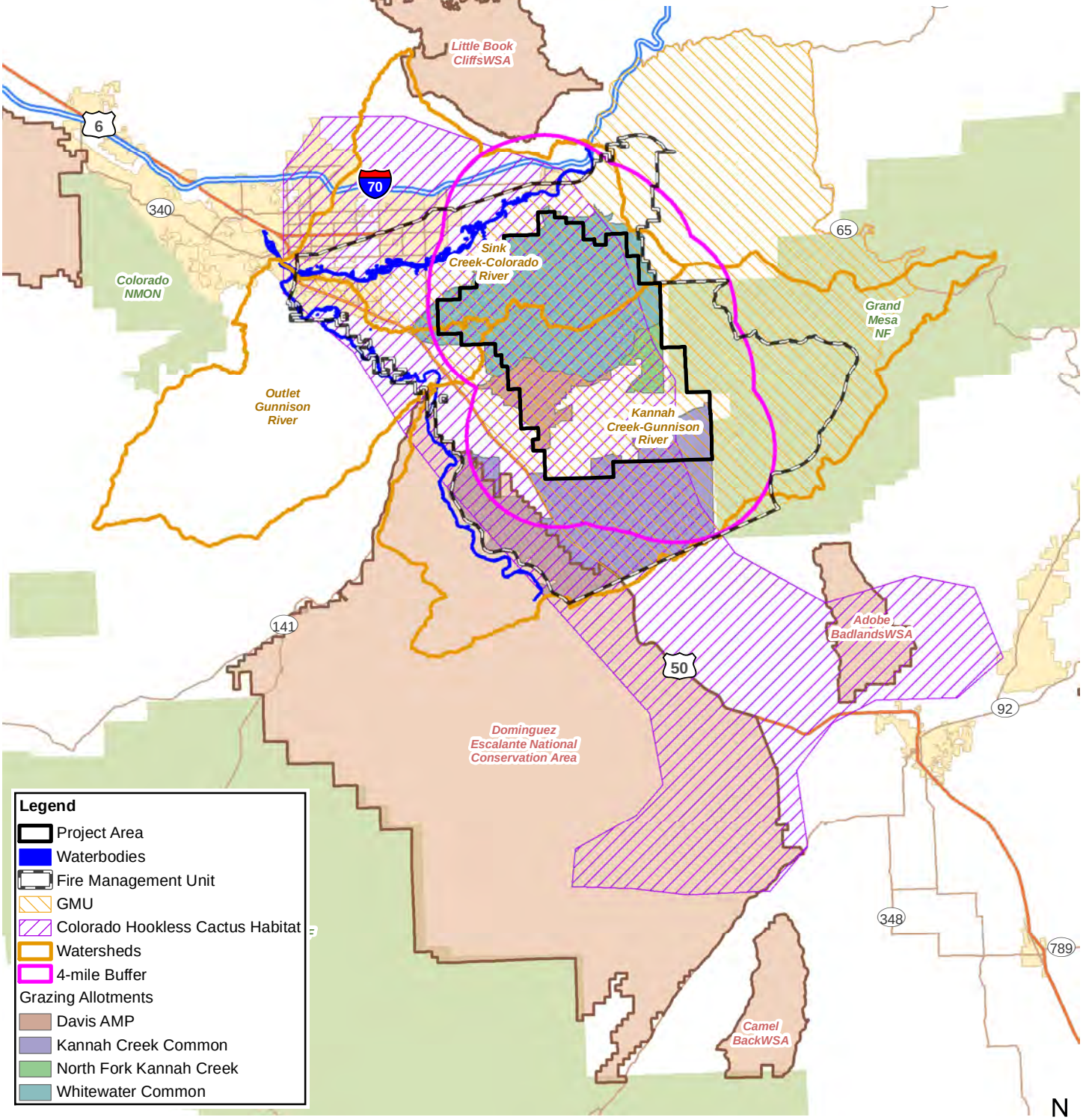
The levels of surface disturbance associated with the analyzed impact types indicated in Table 4.2-1 are used as a best estimate for total impacts to the human environment. The rationale is that levels of surface disturbance are among the most comprehensive and readily determined impacts and because disturbance to the surface results in direct and indirect effects to many analyzed resources.

4.3 CUMULATIVE EFFECTS AREAS ANALYZED

The areas to be analyzed for cumulative effects have been selected based on several criteria. Because of the complexity of analyzing impacts to multiple resources from multiple sources, common analysis areas have been used for different resources, where such use is logically defensible. The analysis areas selected for each analyzed resource and the rationale for their selections, are indicated in Table 4.3-1. Map 4.3-1 shows the Cumulative Effects Analysis Areas (CEAAs).

Map 4.3-1

BLM Grand Junction Field Office
Surface Disturbance Cumulative Effects
Analysis Area



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

Table 4.3-1
Cumulative Effects Analysis Area Rationale by Resource

Resource	Cumulative Effects Analysis Area	CEAA Area (Acres)	Rationale
PHYSICAL RESOURCES			
Air Quality	Domain extending 100 km from Project Area including all of the GJFO	N/A	Direct impacts from the Proposed Action would not cause an exceedance of any ambient air quality standard and would not exceed the Prevention of Significant Deterioration Increments within the modeling domain. In addition direct Project impacts to AQRVs (visibility, atmospheric deposition and potential sensitive lake acidification) would be below threshold values at all Class I and sensitive Class II areas with the domain.
Mineral Resources	Sink Creek-Colorado River, Gunnison River Outlet and Kannah Creek-Gunnison River 5th-level Watersheds [1]	294,547	The CEAA contains the entire Project disturbance, encompasses all of the local oil and gas development under control of the GFJO and contains local exploitable mineral deposits in the vicinity of the Project Area.
Soil Resources*	Sink Creek-Colorado River, Gunnison River Outlet and Kannah Creek-Gunnison River 5th-level Watersheds[1]	294,547	All Project disturbance would occur within portions of these watersheds. Soil transport would be downstream within the watersheds.
Surface and Ground Water Quality*	Sink Creek-Colorado River, Gunnison River Outlet and Kannah Creek-Gunnison River 5th-level Watersheds[1]	294,547	All Project surface water flow would be within these watersheds. The watersheds also contain the local water wells, which are largely developed in alluvial aquifers.
BIOLOGICAL RESOURCES			
Invasive, Non-native Species	Sink Creek-Colorado River, Gunnison River Outlet and Kannah Creek-Gunnison River 5th-level Watersheds[1]	294,547	Dispersal of invasive seeds from the Project and transport into the Project Area would be contained within the watersheds.
Threatened, Endangered, Candidate, and Sensitive Animal Species	Sink Creek-Colorado River, Gunnison River Outlet and Kannah Creek-Gunnison River 5th level Watersheds	294,547	The CEAA encompasses all Project disturbance as well as local reaches of streams potentially containing representatives of the federally listed Colorado River fish species. It is of sufficient size to represent habitats of non-listed local sensitive species.
Threatened, Endangered,	Southern population of *S. glaucus* [3]	259,152	The CEAA encompasses all known populations and likely habitat for the federally listed plant species which may occur within the vicinity of the Project

Resource	Cumulative Effects Analysis Area	CEAA Area (Acres)	Rationale
Candidate and Sensitive Plant Species			and is of sufficient size to represent habitats of non-listed local sensitive species.
Migratory Birds	Sink Creek-Colorado River, Gunnison River Outlet and Kannah Creek-Gunnison River 5th level watersheds	294,547	The CEAA is that used for vegetation, which includes the various habitats for local migratory bird populations.
Vegetation and Forestry	Sink Creek-Colorado River, Gunnison River Outlet and Kannah Creek-Gunnison River 5th-level Watersheds[1]	294,547	The combined watershed is of sufficient size to contain most local cumulative impacts to vegetation subject to GJFO jurisdiction and the CEAA matches that used for analysis of soils impacts.
Wetlands and Riparian Zones	Approximate riparian within affected 5th-level watersheds [6]	4,700	The CEAA encompasses the approximations of riparian habitat within defined affected 5th-level watersheds.
Wildlife	CPW GMU 41 [2]	209,983	The CEAA includes the range of local big game species and encompasses the local range of smaller, less mobile, species.
HERITAGE RESOURCES AND HUMAN ENVIRONMENT			
Cultural or Historical Resources	Project Area	NA	Effects to cultural resources would be avoided or minimized through implementation of a Treatment Plan and MOAs. Therefore, the Project Area boundary is sufficient for cumulative effects analysis.
Paleontological Resources	NOT SELECTED [4]	NA	All Project disturbance would occur in Mancos Formation or rocks of Quaternary age, neither of which are evaluated as likely to contain vertebrate fossils or invertebrate fossils of scientific importance. As there would be no direct or indirect effects, neither would there be cumulative effects to paleontological resources.
Tribal and American Indian Religious Concerns	Project Area	NA	Sites of Native American concern would be avoided and effects would be limited to those associated with the intrusion of modern culture into the landscape. Therefore, the Project Area boundary is sufficient for cumulative analysis.
Visual Resources	Project disturbance area buffered 4 miles	128,494	Approximate limit of visibility of Project disturbance and facilities.
Socioeconomics	Mesa County	2,140,818	The CEAA for socioeconomics is the same as that analyzed under direct and indirect impacts. No additional cumulative impacts.
Environmental Justice	Mesa County	2,140,818	The CEAA for environmental justice is the same as that analyzed under direct and indirect impacts. No additional cumulative impacts.
Transportation and Access	Mesa County	2,140,818	The CEAA for transportation and access includes substantially all of the road network which would be used to access the Project.

Resource	Cumulative Effects Analysis Area	CEAA Area (Acres)	Rationale
Wastes, Hazardous or Solid	Sink Creek-Colorado River, Gunnison River Outlet and Kannah Creek-Gunnison River 5th-level Watersheds[1]	294,547	The CEAA would include all sources of waste generated by the project, would be of sufficient size to include other localized waste sources and would contain local stream transport of potential spills.
LAND RESOURCES			
Recreation	CPW GMU 41 [2]	209,983	The CEAA includes the local big game management unit affecting hunting recreation, as well as portions of National Forest land on the Grand Mesa suitable for camping or similar dispersed recreational activities.
Special Designations (ACEC, SMAs, etc.)	CPW GMU 41	209,983	The CEAA includes the Grand Mesa Slopes Special Management Area, portions of which coincide with the northern half of the Project Area.
Wilderness	Project disturbance area buffered 4 miles	128,494	Approximate limit of visibility of Project disturbance and facilities.
Fire and Fuels	Combined BLM Whitewater Desert, BLM Palisade and Upper Kannah Creek and adjoining GFJO portion of FS Slopes of Mesa Fire Management Units. [7]	165,491	The CEAA encompasses all of the proposed Project and all of the local large historic fires.
Range Management	Grazing allotments potentially affected by Project surface-disturbing activities [5]	74,830	The CEAA contains all surface disturbance and ongoing operations activities associated with the proposed Project.
Land Tenure, ROW and Other Uses	CPW GMU 41 [2]	209,983	ROWs in the vicinity of the proposed Project are rarely associated with oil and gas development. The CEAA encompasses the bulk of GJFO GIS referenced ROWs data within the area delineated by the Colorado River to the north, the Gunnison River to the southwest, the GJFO boundary to the southeast and oil and gas development to the northeast.

[1] Fifth order watersheds determined from the USGS National Hydrographic Dataset
[2] Game management unit boundaries from Colorado Parks and Wildlife GIS datasets
[3] Area of southern *S. glaucus* population from McGlaughlin and Ramp-Neale 2012 genetic study.
[4] Geologic mapping from digital geologic map of SW Colorado, USGS OFR 99-427.
[5] Includes Kannah Creek Common, North Kannah Creek, Davis AMP and Whitewater Common allotments.
[6] USGS NHD 100k water bodies layer buffered 200 ft. minus the water bodies layer.

4.4 CUMULATIVE EFFECTS

Past and present oil and gas well pads in the Project Area and vicinity were determined to have an average disturbance of approximately 4.0 and 1.1 acres for multi-well and single well pads, respectively, based on review of 2011 National Agriculture Imagery Program (NAIP) imagery. Based on the total well count and estimated numbers of multiple and single well pads, total disturbance on a per-well basis is estimated to be approximately 2.3 acres including associated access roads and pipelines. Estimates were based upon data from the BLM GJFO and calculations made by the BLM Vernal Field Office and published in that office's Cumulative Effects Analysis Technical Support Document (BLM, 2012d). Because the geologic horizons and drilling technologies are similar between the two BLM resource areas, it is assumed that disturbance values would also be similar, in the absence of more detailed, publicly-available data. For foreseeable wells, which are those for which an APD has been issued by COGCC, or NEPA notification made, but for which no operations have been conducted, the average disturbance per well is estimated to be 1.3 acres. This average is somewhat misleading, because about half of the identified foreseeable wells would be drilled on existing well pads containing multiple (often 20 or more) wells.

Except for recent installations, and because available data does not include installation dates, pipeline and power line disturbances are assumed to be reclaimed, for purposes of analysis, although this is unlikely, notably in the Project Area. Remaining widths for pipelines and power lines are estimated to be 10 feet (likely maintained for inspection). Mining disturbance was estimated from the value for affected surface area indicated in the permitted mines GIS data from the Colorado Division of Reclamation Mining and Safety. Some mines are indicated that are not active and show no surface disturbance.

Power line information was obtained from the BLM GJFO based on data from the Master Title Plats, Excel Energy and Grand Valley Power utilities. The GIS data from Grand Valley Power included both transmission lines and local distribution networks within urban areas. Disturbance from the local networks was not included in the cumulative disturbance estimates.

Existing road disturbance was taken from CDOT GIS data. Disturbance estimates for past and present roads were made using estimates for average width of different road types based upon review of NAIP imagery. Disturbance estimates from past and present hazardous fuels reduction projects were obtained from the BLM GJFO GIS data.

Surface disturbance estimates for different types of projects for the different CEAAs are summarized in Table 4.4-1.

Table 4.4-1
Surface Disturbance by Cumulative Effects Analysis Areas

Facility Type and Cumulative Effects Analysis Area (CEAA)	Count or Miles	Facility Dist. (acres) or ROW (ft.)	Total Dist. (acres)	Count or Miles	Facility Dist. (acres) or ROW (ft.)	Total Dist. (acres)	Total Project Dist. (acres)	Total Cumulative Dist. (acres) (% of CEAA)
	Past and Present Activities			Reasonably Foreseeable Activities				
Affected 5th-order Watersheds (294,547 acres)			18,179			174	163	18,516 (6%)
Industry – Total			2,822			172		
Oil & Gas Wells, Access, & Facilities	24	2.3	55	18	1.3	101		
Mining	78	Variable	2,554	0	Variable	0		
Pipelines	21.3	10	26	33.2	Variable	71		
Electric Power Lines	153.9	10	187	0	10	0		
Roads – Total			2,440			2		
Highways	62.7	60	456	0	60	0		
County Roads	111.2	40	539	0.5	40	2		
Local Roads	397.2	30	1,444	0	30	0		
Other – Total			12,918			0		
Hazardous Fuels Reduction	53	Variable	12,842	0	Variable	0		
Canals and Ditches	34.9	18	76	0	18	0		
CPW GMU 41 (209,983 acres)			17,016			181	163	17,360 (8%)
Industry – Total			2,496			181		
Oil & Gas Wells, Access, & Facilities	32	2.3	74	25	1.3	110		
Mining	35	Variable	2,267	0	Variable	0		
Pipelines	29.0	10	35	33.2	Variable	71		
Electric Power Lines	99.4	10	120	0	10	0		
Roads – Total			1,180			0		
Highways	51.0	60	371	0	60	0		
County Roads	54.0	40	262	0	40	0		
Local Roads	150.4	30	547	0	30	0		
Other – Total			13,340			0		
Hazardous Fuels Reduction	61	Variable	13,281	0	Variable	0		
Canals and Ditches	27.1	18	59	0	18	0		
Southern *S. glaucus* Population Habitat (259,152 acres)			7,259			183	163	7,605 (3%)

Facility Type and Cumulative Effects Analysis Area (CEAA)	Count or Miles	Facility Dist. (acres) or ROW (ft.)	Total Dist. (acres)	Count or Miles	Facility Dist. (acres) or ROW (ft.)	Total Dist. (acres)	Total Project Dist. (acres)	Total Cumulative Dist. (acres) (% of CEAA)
	Past and Present Activities			Reasonably Foreseeable Activities				
Industry – Total			2,820			181		
Oil & Gas Wells, Access, & Facilities	21	2.3	48	25	1.3	110		
Mining	75	Variable	2,587	0	Variable	0		
Pipelines	21.2	10	26	33.2	Variable	71		
Electric Power Lines	130.7	10	158	0	10	0		
Roads – Total			2,948			2		
Highways	77.7	60	565	0	60	0		
County Roads	129.7	40	629	0.5	40	2		
Local Roads	482.5	30	1,755	0	30	0		
Other – Total			1,491			0		
Hazardous Fuels Reduction	10	Variable	1,426	0	Variable	0		
Canals and Ditches	29.6	18	65	0	18	0		
Project Disturbance 4-mile Buffer (128,494 acres)			3,372			181	163	3,716 (3%)
Industry – Total			929			181		
Oil & Gas Wells, Access, & Facilities	25	2.3	58	25	1.3	110		
Mining	29	Variable	778	0	Variable	0		
Pipelines	11.8	10	14	33.2	Variable	71		
Electric Power Lines	65.4	10	79	0	10	0		
Roads – Total			879			0		
Highways	27.5	60	201	0	60	0		
County Roads	56.8	40	275	0	40	0		
Local Roads	110.7	30	403	0	30	0		
Other – Total			1,564			0		
Hazardous Fuels Reduction	12	Variable	1,521	0	Variable	0		
Canals and Ditches	19.8	18	43	0	18	0		
Mesa County (2,140,818 acres)			9,598			0	163	9,761 (0.5%)
Roads – Total			9,598			0		
Highways	263.3	60	1,915	NA	60	0		
County Roads	456.8	40	2,215	NA	40	0		
Local Roads	1,503.8	30	5,468	NA	30	0		

Facility Type and Cumulative Effects Analysis Area (CEAA)	Count or Miles	Facility Dist. (acres) or ROW (ft.)	Total Dist. (acres)	Count or Miles	Facility Dist. (acres) or ROW (ft.)	Total Dist. (acres)	Total Project Dist. (acres)	Total Cumulative Dist. (acres) (% of CEAA)
	Past and Present Activities			Reasonably Foreseeable Activities				
Affected Fire Management Units (165,491 acres)			15,002			172	163	15,337 (9%)
Industry – Total			2,232			172		
Oil & Gas Wells, Access, & Facilities	24	2.3	55	18	1.3	101		
Mining	66	Variable	1,972	0	Variable	0		
Pipelines	24.9	10	30	33.2	Variable	71		
Electric Power Lines	143.7	10	174	0	10	0		
Roads – Total			1,345			0		
Highways	36.5	60	265	0	60	0		
County Roads	68.6	40	333	0	40	0		
Local Roads	205.5	30	747	0	30	0		
Other – Total			11,425			0		
Hazardous Fuels Reduction	42	Variable	11,354	0	Variable	0		
Canals and Ditches	32.4	18	71	0	18	0		
Affected BLM Grazing Allotments (74,830 acres)			1,425			161	140	1,726 (2%)
Industry – Total			297			161		
Oil & Gas Wells, Access, & Facilities	8	2.3	18	16	1.3	90		
Mining	11	Variable	203	0	Variable	0		
Pipelines	14.5	10	18	33.2	Variable	71		
Electric Power Lines	47.5	10	58	0	10	0		
Roads – Total			159			0		
Highways	8.3	60	60	0	60	0		
County Roads	9.0	40	44	0	40	0		
Local Roads	15.0	30	55	0	30	0		
Other – Total			970			0		
Hazardous Fuels Reduction	9	Variable	917	0	Variable	0		
Canals and Ditches	24.1	18	53	0	18	0		
Approximate Riparian Habitat (4,700 acres)			352			0	1	353 (8%)
Industry – Total			318			0		

Facility Type and Cumulative Effects Analysis Area (CEAA)	Count or Miles	Facility Dist. (acres) or ROW (ft.)	Total Dist. (acres)	Count or Miles	Facility Dist. (acres) or ROW (ft.)	Total Dist. (acres)	Total Project Dist. (acres)	Total Cumulative Dist. (acres) (% of CEAA)
	Past and Present Activities			Reasonably Foreseeable Activities				
Oil & Gas Wells, Access, & Facilities	0	2.3	0	0	1.3	0		
Mining	11	Variable	304	0	Variable	0		
Pipelines	0.0	10	0	0.0	Variable	0		
Electric Power Lines	11.5	10	14	0	10	0		
Roads – Total			35			0		
Highways	2.3	60	17	0	60	0		
County Roads	2.4	40	12	0	40	0		
Local Roads	1.7	30	6	0	30	0		
Other – Total			0			0		
Hazardous Fuels Reduction	0	Variable	0	0	Variable	0		
Canals and Ditches	0.0	18	0	0	18	0		

4.4.1 Air and Climate

A cumulative air quality impact assessment was carried out to quantify potential air quality impacts to both ambient air concentrations and AQRVs from air pollutant emissions of NO_x, SO_2, PM_{10}, and $PM_{2.5}$ expected to result from the Proposed Action and other nearby reasonably foreseeable development (RFD) emissions. The emissions included in the cumulative analysis are shown in Table 4.4-2. Cumulative ambient air quality impacts of NO_2, SO_2, PM_{10}, and $PM_{2.5}$, and AQRVs were analyzed at far-field federal Class I and sensitive Class II areas located within 100 km of the Fram Whitewater Unit Project Area. These include the Class I Black Canyon of the Gunnison Wilderness, Flat Tops Wilderness, Maroon Bells-Snowmass Wilderness, West Elk Wilderness, and Arches National Park, and Class II Raggeds Wilderness Area and Colorado National Monument. In addition, nine lakes that are designated as acid sensitive and are located within the Flat Tops Wilderness area (Ned Wilson Lake, Upper Ned Wilson Lake, Lower Packtrail Pothole, and Upper Packtrail Pothole), Maroon Bells-Snowmass Wilderness area (Avalanche Lake, Capitol Lake, and Moon Lake), Raggeds Wilderness area (Deep Creek Lake), and West Elk Wilderness area (South Golden Lake) were assessed for potential lake acidification from atmospheric deposition impacts.

The far-field analysis also included an assessment of PM_{10} and $PM_{2.5}$ impacts at nearby monitoring location sites operated by the CDPHE. These include the Grand Junction PM_{10} and $PM_{2.5}$ monitoring site, the Clifton PM_{10} site and the Delta PM_{10} monitoring location. For each of these monitoring site locations both PM_{10} and $PM_{2.5}$ concentrations were modeled.

The far-field analyses used the EPA-approved version of the CALPUFF modeling system (Version 5.8) along with a windfield developed for year 2008 using the MMIF Version 2.1 (ENVIRON, 2012) and the 2008 WRF meteorological model output that was produced as part of the WRAP West-wide Jump Start Air Quality Modeling Study (WestJumpAQMS) (ENVIRON et al., 2012).

Table 4.4-2
Fram Whitewater Unit and Reasonably Foreseeable Development Source Emissions (tpy)

Activity	PM_{10}	$PM_{2.5}$	NO_x	SO_2
Fram Whitewater Unit	109.2	13.2	182.4	3.0
Black Hills DeBeque Exploratory Proposal	118.2	13.7	190.5	2.3
Bull Mountain Unit MDP	60.4	7.2	107.4	29.0
Gunnison Energy	14.4	5.9	151.7	2.0
Meeker Gas Plant Expansion	28.1	28.1	95.2	87.1
Total Emissions	330.2	68.1	727.2	123.4

Monitoring Site PM_{10} and $PM_{2.5}$ Impacts. Table 4.4-3 presents the maximum modeled PM_{10}, and $PM_{2.5}$ concentrations at the nearby CDPHE monitoring site locations in Grand Junction, Clifton, and Delta. As shown in Table 4.4-3, at these locations, the predicted PM_{10} and $PM_{2.5}$ impacts from field-wide Project sources combined with regional source emissions are minimal. When maximum modeled concentrations are added to representative background concentrations, it is demonstrated that the total ambient air concentrations are well below the applicable NAAQS and CAAQS. In addition, direct modeled concentrations are below the applicable PSD Class II increments.

Table 4.4-3
Maximum Modeled PM_{10} and $PM_{2.5}$ Pollutant Concentration Impacts (µg/m^3) at Monitoring Site Locations

Site	Pollutant	Averaging Period	Direct Modeled	PSD Class II Increment[1]	Background	Total Predicted	NAAQS	CAAQS
Grand Junction	PM_{10}	24-hour	0.28	30	30.0	30.28	150	150
		Annual	0.04	17	--	--	--	--
	$PM_{2.5}$	24-hour	0.14	9	12.0	12.14	35	35
		Annual	0.01	4	5.0	5.01	12	12
Clifton	PM_{10}	24-hour	0.40	30	30.0	30.40	150	150
		Annual	0.06	17	--	--	--	--
	$PM_{2.5}$	24-hour	0.22	9	12.0	12.22	35	35
		Annual	0.02	4	5.0	5.02	12	12
Delta	PM_{10}	24-hour	0.31	30	30.0	30.31	150	150
		Annual	0.03	17	--	--	--	--
	$PM_{2.5}$	24-hour	0.17	9	12.0	12.17	35	35
		Annual	0.01	4	5.0	5.01	12	12

[1] The PSD demonstrations serve informational purposes only and do not constitute a regulatory PSD increment consumption analysis.

Class I and Sensitive Class II Area PSD Increment Comparison. The direct modeled cumulative concentrations of NO_2, SO_2, PM_{10}, and $PM_{2.5}$ at Class I and sensitive Class II areas are provided in Table 4.4-4 for comparison to applicable PSD Class I and Class II increments. As shown in Table 4.4-4, these values are well below the PSD Class I and Class II increments.

Table 4.4-4
Cumulative Pollutant Concentrations at PSD Class I and Sensitive Class II Areas (µg/m^3)

Location	Pollutant	Averaging Time	Direct Modeled	PSD Increment
Arches National Park	NO_2	Annual	0.001	2.5
	SO_2	3-hour	0.001	25
		24-hour	0.0004	5
		Annual	0.00005	2
	PM_{10}	24-hour	0.056	8
		Annual	0.003	4
	$PM_{2.5}$	24-hour	0.027	2
		Annual	0.001	1
Black Canyon of the Gunnison Wilderness Area	NO_2	Annual	0.001	2.5
	SO_2	3-hour	0.001	25
		24-hour	0.0005	5
		Annual	0.0003	2
	PM_{10}	24-hour	0.056	8
		Annual	0.004	4
	$PM_{2.5}$	24-hour	0.029	2
		Annual	0.002	1
Flat Tops Wilderness Area	NO_2	Annual	0.0005	2.5
	SO_2	3-hour	0.0005	25
		24-hour	0.0002	5
		Annual	0.00002	2
	PM_{10}	24-hour	0.053	8
		Annual	0.004	4
	$PM_{2.5}$	24-hour	0.022	2
		Annual	0.001	1
Maroon Bells - Snowmass Wilderness Area	NO_2	Annual	0.0004	2.5
	SO_2	3-hour	0.0003	25

Location	Pollutant	Averaging Time	Direct Modeled	PSD Increment
		24-hour	0.0001	5
		Annual	0.00002	2
	PM_{10}	24-hour	0.046	8
		Annual	0.003	4
	$PM_{2.5}$	24-hour	0.019	2
		Annual	0.001	1
West Elk Wilderness Area	NO_2	Annual	0.0003	2.5
	SO_2	3-hour	0.0006	25
		24-hour	0.0002	5
		Annual	0.00002	2
	PM_{10}	24-hour	0.029	8
		Annual	0.002	4
	$PM_{2.5}$	24-hour	0.013	2
		Annual	0.001	1
Raggeds Wilderness Area	NO_2	Annual	0.0003	25
	SO_2	3-hour	0.0005	512
		24-hour	0.0001	91
		Annual	0.00002	20
	PM_{10}	24-hour	0.039	30
		Annual	0.003	17
	$PM_{2.5}$	24-hour	0.016	9
		Annual	0.001	4
Colorado National Monument	NO_2	Annual	0.009	25
	SO_2	3-hour	0.007	512
		24-hour	0.002	91
		Annual	0.0003	20
	PM_{10}	24-hour	0.16	30
		Annual	0.023	17
	$PM_{2.5}$	24-hour	0.059	9
		Annual	0.006	4

*GHG Impacts***.** Continued field development, operation of well site equipment, and associated vehicle traffic would result in minor cumulative contributions to atmospheric GHGs. Oil produced under the Proposed Action would be refined to produce a wide range of fuel products for consumer or commercial use. The combustion of these fuels would generate GHGs, which would be controlled through applicable GHG emission control regulations (emissions standards) or by applicable air permit requirements.

Other industrial operations in the area would also contribute to GHG emissions through the use of carbon fuels (natural gas, LPG, diesel), and through the use of electricity produced using carbon fuels. Other anthropogenic activities such as residential wood and open burning, as well as biogenic sources, also contribute GHGs to the atmosphere. These would be more dispersed, but also more sustained, than the emissions from this oil and gas development which has a finite lifespan.

While significance levels exist to determine PSD applicability and emissions control requirements for GHGs, policies regulating specific GHG concentration levels and their potential for significance with respect to regional or global impacts have not been established for GHGs. As stated in Section 3.2.1.2, the maximum GHG emissions resulting from the Proposed Action

are estimated at 63,949 metric tons per year [0.06 terragrams (tg)/yr] of CO_2e. To place the Project GHG emissions in context, the GHG emissions from the top five emitting coal-fired power plants in Colorado range from 3.5 to 9.8 tg/year (EPA, 2012c). In addition, 0.06 tg/yr is approximately equivalent to 0.0009 percent of total 2011 U.S. CO_2e emissions. Given the state of the science, it is not possible to associate specific actions with the specific global impacts such as potential climate effects. Because there are no tools available to quantify incremental climate changes associated with these GHG emissions, the analysis cannot reach conclusions as to the extent or significance of the emissions on global climate. The potential impacts of climate change represent the cumulative aggregation of all worldwide GHG emissions.

AQRV Impacts.

Visibility Impacts. Cumulative source visibility impacts were estimated following FLAG 2010 (FLAG, 2010) at Class I and sensitive Class II areas and are shown in Table 4.4-5. The visibility analysis indicated that there are no days predicted to be above the 1.0 Δdv threshold at any of the analyzed Class I and sensitive Class II areas. There is a maximum of one day predicted above the 0.5 Δdv threshold at the Raggeds Class II Wilderness area, and zero days above the 0.5 dv threshold at any of the other Class I and sensitive Class II areas. The maximum predicted visibility impact at the Raggeds Wilderness was 0.0.61 Δdv.

Table 4.4-5
Cumulative Visibility Impacts at Class I and Sensitive Class II Areas

Location	Maximum Impact (Δdv)	Number of Days > 0.5 Δdv
Arches National Park	0.24	0
Black Canyon of the Gunnison Wilderness Area	0.29	0
Flat Tops Wilderness Area	0.16	0
Maroon Bells - Snowmass Wilderness Area	0.41	0
West Elk Wilderness Area	0.22	0
Raggeds Wilderness Area	0.61	1
Colorado National Monument	0.46	0

Deposition Impacts. Potential cumulative atmospheric deposition impacts within Class I and PSD Class II sensitive areas were also calculated. At all Class I and sensitive Class II areas, the maximum N and S deposition impacts are predicted to be below the BLM thresholds of 3 kg/ha-yr for S and 1.5 kg/ha-yr for N. The predicted cumulative deposition values at each sensitive area are all below the DAT of 0.005 kg/ha-yr, except at the Maroon Bells-Snowmass and Raggeds Wilderness areas, where both N and S deposition are predicted to be above the DAT, and at Colorado National Monument, where predicted N deposition is above the DAT. Predicted cumulative N and S deposition impacts are shown in Table 4.4-6.

Table 4.4-6
Cumulative N and S Deposition Impacts at Class I and Sensitive Class II Areas

Location	Maximum N Deposition (kg/ha/yr)	Maximum S Deposition (kg/ha/yr)
Arches National Park	0.0007	0.0003
Black Canyon of the Gunnison Wilderness Area	0.0021	0.0006
Flat Tops Wilderness Area	0.0022	0.0019
Maroon Bells - Snowmass Wilderness Area	0.0115	0.0052
West Elk Wilderness Area	0.0038	0.0011
Raggeds Wilderness Area	0.0221	0.0062
Colorado National Monument	0.0056	0.0010

In addition, potential changes in ANC, resulting from potential cumulative N and S deposition were calculated for nine sensitive lakes within the Flat Tops, Maroon Bells–Snowmass, Raggeds, and West Elk Wilderness areas. For all lakes the estimated changes in ANC are predicted to be less than the significance thresholds. The estimated change in ANC was 0.028 percent at Avalanche Lake, 0.029 percent at Capitol Lake, 0.12 percent at Moon Lake, 0.23 percent at Deep Creek Lake, 0.095 percent at Lower Packtrail Pothole, 0.058 percent at Upper Packtrail Pothole, 0.072 percent at Ned Wilson Lake, and 0.029 percent at South Golden Lake (compared to the 10 percent threshold), and a 0.028 µeq/l change at the more sensitive Upper Ned Wilson Lake (compared to a 1.0 µeq/l threshold for sensitive lakes).

Regional Air Quality Impacts

The Project field-wide emissions along with regional emissions for the GJFO planning area are shown in Table 4.4-7. These emissions include year 2011 point source emissions from EPA's 2011 National Emissions Inventory (EPA, 2013b), and the GJFO Draft RMP/EIS, Alternative A, Project year 10 emissions (BLM, 2012e). The GJFO RMP emissions represent the No Action Alternative emissions for year 2018, which are the projected emissions resulting from sources on private (fee) lands throughout the planning area.

Table 4.4-7
Fram Whitewater Unit and Grand Junction Field Office Planning Area Source Emissions (tpy)

Activity	CO	NO_x	PM_{10}	$PM_{2.5}$	SO_2	VOC	HAPs
2011 NEI – GRFO Planning Area[1]	3,330	5,421	358	207	94	10,833	2,054
GJFO Draft RMP/EIS – Alt A - Year 10[2]	1,835	1,513	2,790	485	55	1,054	99
Total GJFO Emissions	**5,165**	**6,934**	**3,148**	**692**	**149**	**11,887**	**2,153**
Fram Whitewater Unit	53.7	182.4	109.2	13.2	3.0	9.2	1.4
Total GJFO Emissions including Fram Emissions	**5,219**	**7,116**	**3257**	**705**	**152**	**11,896**	**2,154**
Fram Contribution to Total Emissions	**1.0%**	**2.6%**	**3.5%**	**1.9%**	**2.0%**	**0.1%**	**0.1%**

[1] Data from EPA, 2013b.
[2] Data provided from BLM, 2012e.

As is indicated in Table 4.4-7 the Fram project's potential contribution to overall regional emissions in the GJFO planning area is minimal and therefore would not be expected to significantly contribute to any adverse air quality conditions in the region, including any increase in regional ozone formation. This comparison provides a conservative estimate of Fram's potential contribution to regional emissions considering that there are other emission source categories that are not shown in the above table since these estimates were not available at the time of this analysis (e.g., biogenic, on-road, non-road, and non-point sources).

As part of the adaptive management strategy for managing air resources within the BLM GJFO planning area, the BLM will be conducting a regional air modeling study to evaluate potential impacts on air quality from future mineral development in western Colorado. The CARMMS modeling study will assess predicted impacts on air quality from projected increases in oil and gas development. The CARMMS will include potential impacts using projections of oil and gas development up to a maximum of ten years in the future to reflect realistic estimations of development projections and technology improvements. The CARMMS results will include the predicted impacts from projected BLM oil and gas authorizations within the GJFO as well as cumulative impacts from all projected oil and gas development within the region. This study will analyze criteria pollutant impacts including ozone and AQRV impacts.

4.4.2 Mineral Resources

The CEAA for mineral resources is taken as the fifth-order watersheds affected by Project disturbance, for the reasons indicated in Table 4.3-1, an area comprising approximately 294,547 acres. Past and present surface disturbance from analyzed activities within the CEAA is approximately 18,179 acres. Additional surface disturbance resulting from analyzed foreseeable activities is estimated to be approximately 174 acres. When added to the proposed project disturbance, the total cumulative surface disturbance is estimated to be 18,516 or 6 percent of the CEAA. Because there are no identified conflicts with development of other mineral resources within the Project Area, effects to mineral resources would be minimal; therefore cumulative effects would be minimal.

4.4.3 Soils

The CEAA for soil resources is taken as the fifth-order watersheds affected by Project disturbance, for the reasons indicated in Table 4.3-1, an area comprising approximately 294,547 acres. Past and present surface disturbance from analyzed activities within the CEAA is approximately 18,179 acres. Additional surface disturbance resulting from analyzed foreseeable activities is estimated to be approximately 174 acres. When added to the proposed Project disturbance, the total cumulative surface disturbance is estimated to be 18,516 or 6 percent of the CEAA.

Other past, present and foreseeable developments and uses in the Project Area with impacts to soils include but are not limited to natural gas development, grazing fences, access roads, highways, trails, pipelines, wildland fires, vegetation treatments and right-of-way facilities. Some of these actions, such as fires and vegetation treatments, have resulted in short-term increases in sedimentation and erosion but long-term reductions in these impacts. Other impacts such as those associated with roads and long-term facilities have increased impacts to soils. Under the Proposed Action, which would include reclamation, cumulative effects to soils would be similar to historic levels if the protective/mitigation measures described in Chapter 3 are implemented.

4.4.4 Water (Surface and Groundwater)

The CEAA for water resources is taken as the fifth-order watersheds affected by Project disturbance, for the reasons indicated in Table 4.3-1, an area comprising approximately 294,547 acres. Past and present surface disturbance from analyzed activities within the CEAA is approximately 18,179 acres. Additional surface disturbance resulting from analyzed foreseeable activities is estimated to be approximately 174 acres. When added to the proposed Project disturbance, the total cumulative surface disturbance is estimated to be 18,516 or 6 percent of the CEAA.As outlined in the environmental consequences portion of the document, increased surface disturbance may elevate sediment production from the Project Area. These impacts would be greatest initially during construction of well pads, pipelines, and access roads. Furthermore, development of fluid minerals poses a risk of contamination through leaks, spills, or improper drilling practices. However, Project Design Features would mitigate long-term measurable impacts to water resources within or downstream of the Project Area. Likewise, no cumulative impacts to groundwater quality or quantity are anticipated given the geologic setting and successful implementation of the Project Design Features.

Other past, present and foreseeable developments and uses in the Project Area with impacts to water quality include but are not limited to natural gas development, grazing fences, access roads, highways, trails, pipelines, wildland fires, vegetation treatments and right-of-way facilities. Some of these actions, such as fires and vegetation treatments, have resulted in short-term increases in sedimentation and erosion but long-term reductions in these impacts. Other impacts such as those associated with roads and long-term facilities have increased impacts to

water quality. Under the Proposed Action, which would include BMPs for sedimentation and reclamation, cumulative effects to water quality would be similar to historic levels if the protective/mitigation measures described in Chapter 3 are implemented.

4.4.5 Noise

Most of the area including the Proposed Action has noise levels consistent with sound at outdoor rural residential locations. The single consistent producer of anthropogenic noise is traffic on U.S. Highway 50.

Within the affected 5th-field watersheds there are 571 miles of highways, county, and local roads. With existing levels of vehicular traffic, natural resource development, and ranching activities in the area, average noise increases are expected to be related to individual vehicles. Noise associated with 24 oil and gas wells has increased noise during construction, similar to analysis provided here, and has led to some increased noise during the production phase. Within the reasonably foreseeable future, construction and production of 108 additional wells that have been proposed will add to cumulative noise levels in the region.

In no instance would noise at any residence or property exceed the COGCC rule allowing noise from a drilling rig, completion rig, or work-over rig is subject to the maximum permissible noise levels for industrial zones (80 dBA day, 75 dBA night). Therefore, cumulative effects from noise would be minimal.

4.4.6 Invasive, Non-native Species

The CEAA for invasive, non-native species is taken as the fifth-order watersheds affected by Project disturbance, for the reasons indicated in Table 4.3-1, an area comprising approximately 294,547 acres. Past and present surface disturbance from analyzed activities within the CEAA is approximately 18,179 acres. Additional surface disturbance resulting from analyzed foreseeable activities is estimated to be approximately 174 acres. When added to the proposed Project disturbance, the total cumulative surface disturbance is estimated to be 18,516 or 6 percent of the CEAA.

Other past, present, and foreseeable developments and uses in the Project Area which can increase and/or spread invasive, non-native species include but are not limited to natural gas development, grazing fences, access roads, highways, trails, pipelines, wildland fires, and right-of-way facilities. By adhering to protective/mitigation measures described in Chapter 3, cumulative impacts should be minimal.

4.4.7 Vegetation and Forestry

The CEAA for vegetation and forestry is taken as the fifth-order watersheds affected by Project disturbance, for the reasons indicated in Table 4.3-1, an area comprising approximately 294,547 acres. Past and present surface disturbance from analyzed activities within the CEAA is approximately 18,179 acres. Additional surface disturbance resulting from analyzed foreseeable activities is estimated to be approximately 174 acres. When added to the proposed Project disturbance, the total cumulative surface disturbance is estimated to be 18,516 or 6 percent of the CEAA.

Other past, present, and foreseeable developments and uses in the Project Area with impacts to vegetation include but are not limited to natural gas development, grazing fences, access roads, highways, trails, pipelines, wildland fires, vegetation treatments and right-of-way facilities. Some of these actions, such as fires and vegetation treatments, have resulted in short-term increases

in sedimentation and erosion but long-term reductions in these impacts. Other impacts such as those associated with roads and long-term facilities have increased impacts to vegetation. Under the Proposed Action, which would include reclamation, cumulative effects to vegetation would be similar to historic levels if the protective/mitigation measures described in Chapter 3 are implemented.

4.4.8 Wetlands and Riparian Zones

The CEAA for wetlands and riparian zones is taken as the approximate extent of riparian habitat within fifth-order watersheds affected by Project disturbance, for the reasons indicated in Table 4.3-1, an area comprising approximately 4,700 acres. Based on NAIP imagery, the average extent of riparian habitat was approximated by buffering parts of an existing water bodies GIS layer by 200 feet. Past and present surface disturbance from analyzed activities within the CEAA is approximately 352 acres. Additional surface disturbance resulting from analyzed foreseeable activities is estimated to be 0 acres. When added to the proposed Project disturbance of approximately 1 acre, the total cumulative surface disturbance is estimated to be 353 acres or 8 percent of the CEAA.

Other past, present, and foreseeable developments and uses in the Project Area with impacts to wetlands/riparian zones include but are not limited to natural gas development, grazing fences, access roads, highways, trails, pipelines, wildland fires, vegetation treatments and right-of-way facilities. Some of these actions, such as fires and vegetation treatments, have resulted in short-term increases in sedimentation and erosion but long-term reductions in these impacts. Other impacts such as those associated with roads and long-term facilities have increased impacts. Under the Proposed Action, which would include reclamation, cumulative effects to wetlands/riparian zones would be similar to historic levels if the protective/mitigation measures described in Chapter 3 are implemented.

4.4.9 Threatened, Endangered, Candidate and Sensitive Animal Species

The CEAA for special status animal species is taken as the fifth-order watersheds affected by Project disturbance, for the reasons indicated in Table 4.3-1, an area comprising approximately 294,547 acres. Past and present surface disturbance from analyzed activities within the CEAA is approximately 18,179 acres. Additional surface disturbance resulting from analyzed foreseeable activities is estimated to be approximately 174 acres. When added to the proposed Project disturbance, the total cumulative surface disturbance is estimated to be 18,516 or 6 percent of the CEAA.

Other past, present, and foreseeable developments and uses in the Project Area with impacts to special status animal species include but are not limited to natural gas development, grazing fences, access roads, highways, trails, pipelines, wildland fires, vegetation treatments and right-of-way facilities. Under the Proposed Action, which would include reclamation, cumulative effects to special status animal species would be similar to or better than historic levels if the protective/mitigation measures described in Chapter 3 are implemented. Cumulative effects would be the same as those described in Section 4.4.12 for Wildlife.

In terms of reasonably foreseeable actions, it should be noted that special status species are generally protected and/or avoided for any activities on public land but may not be protected for actions on private land.

4.4.10 Threatened, Endangered, Candidate and Sensitive Plant Species

The CEAA for threatened or endangered plant species is taken as the habitat of the southern population of *Sclerocactus glaucus,* for the reasons indicated in Table 4.3-1, an area comprising approximately 259,152 acres. Past and present surface disturbance from analyzed activities

within the CEAA is approximately 7,259 acres. Additional surface disturbance resulting from analyzed foreseeable activities is estimated to be approximately 183 acres. When added to the proposed Project disturbance, the total cumulative surface disturbance is estimated to be 7,605 or 3 percent of the CEAA.

Other past, present, and foreseeable developments and uses in the Project Area with impacts to special status plant species include but are not limited to natural gas development, grazing fences, access roads, highways, trails, pipelines, wildland fires, vegetation treatments and right-of-way facilities. Some of these actions, such as fires and vegetation treatments, have resulted in short-term increases in sedimentation and erosion but long-term reductions in these impacts. Other impacts such as those associated with roads and long-term facilities have increased impacts. Under the Proposed Action, which would include reclamation, cumulative effects to special status plant species would be similar to or better than historic levels if the protective/mitigation measures described in Chapter 3 are implemented.

4.4.11 Migratory Birds

The CEAA for migratory birds is taken as the fifth-order watersheds affected by Project disturbance, for the reasons indicated in Table 4.3-1, an area comprising approximately 294,547 acres. Past and present surface disturbance from analyzed activities within the CEAA is approximately 18,179 acres. Additional surface disturbance resulting from analyzed foreseeable activities is estimated to be approximately 174 acres. When added to the proposed Project disturbance, the total cumulative surface disturbance is estimated to be 18,516 or 6 percent of the CEAA.

Other past, present, and foreseeable developments and uses in the Project Area with impacts to migratory birds include but are not limited to natural gas development, grazing fences, access roads, highways, trails, pipelines, wildland fires, vegetation treatments and right-of-way facilities. Under the Proposed Action, which would include reclamation, cumulative effects to migratory birds would be similar to or better than historic levels if the protective/mitigation measures described in Chapter 3 are implemented. Cumulative effects would be the same as those described in Section 4.4.12 for Wildlife.

In terms of reasonably foreseeable actions, it should be noted that migratory birds are generally protected and/or avoided for any activities on public land but may not be protected for actions on private land.

4.4.12 Wildlife

The CEAA for wildlife is taken as CPW Game Management Unit 41, for the reasons indicated in Table 4.3-1, an area comprising approximately 209,983 acres. Past and present surface disturbance from analyzed activities within the CEAA is approximately 17,016 acres. Additional surface disturbance resulting from analyzed foreseeable activities is estimated to be approximately 181 acres. When added to the proposed Project disturbance, the total cumulative surface disturbance is estimated to be 17,360 or 8 percent of the CEAA.

Cumulative effects to wildlife would be directly related to habitat loss, habitat fragmentation, animal displacement, and direct mortalities. Following completion of the Project, the reclaimed areas would be capable of supporting wildlife use. Cumulative impacts from past and present actions and reasonably actions within the CEAA could include:

Reduction of suitable habitat/habitat fragmentation. While surface disturbance generally corresponds to associated wildlife habitat loss, accurate calculations of cumulative wildlife habitat loss cannot be determined because the direct impacts of habitat disturbance are species-specific and dependent upon: 1) the status and condition of the population(s) or

individual animals being affected; 2) seasonal timing of the disturbances; 3) value or quality of functional habitat the disturbed sites; 4) physical parameters of the affected and nearby habitats (e.g., extent of topographical relief and vegetative cover); 5) value or quality of functional habitats in adjacent areas; 6) the type of surface disturbance; and 7) other variables that are difficult to quantify (e.g., increased noise and human presence). Historic, current, and future developments in the CEAA have resulted, or would result, in the reduction of carrying capacities as characterized by the amount of available cover, forage, and breeding areas for wildlife species. Current or previous surface disturbance in the CEAA primarily results from natural gas development, grazing fences, access roads, highways, trails, pipelines, wildland fires, vegetation treatments and right-of-way facilities.

Animal displacement. Displaced individuals of any species could be forced into less suitable habitats, possibly resulting in subsequent effects of deteriorated physical condition, reproductive failure, mortality, and general stress as important habitat is reduced and animals are subjected to density-dependent effects. Loss of habitat/forage consequently could result in increased competition between and among species for available resources, increased transmission and susceptibility to disease, increased predation opportunities, and emigration. Some wildlife species, such as raptors, would be susceptible to these cumulative impacts since encroaching human activities in the CEAA have resulted, or would result, in animal displacement in areas that may currently be at their relative carrying capacity for these resident species. Many of the local wildlife populations (e.g., small game, migratory birds) that occur in the CEAA likely would continue to occupy their respective ranges and breed successfully, although population numbers may decrease relative to the amount of cumulative habitat loss and disturbance from incremental development.

Decreased reproduction success. A decrease in reproductive success and physical condition from increased energy expenditure due to physical responses to disturbance could lead to declining population growth.

Increased vehicle/wildlife collisions. An increase in traffic levels on roadways has the potential to increase vehicle/wildlife collisions and increased human utilization of resources through hunting and other recreational activities that would expose wildlife to potential human harassment, either inadvertent or purposeful.

Increased hunting pressure. An increase in human activity in the CEAA may provide the opportunity for additional hunting pressure on game species such as mule deer, pronghorn, and small game species due primarily to increased public access.

Increased illegal harvest. An increase in human activity in the CEAA may lead to poaching game species due to increased public presence and public access.

4.4.13 Visual Resources

The CEAA for visual resources is taken as a two-mile buffer area around proposed Project disturbance, for the reasons indicated in Table 4.3-1, an area comprising approximately 66,307 acres. Past and present surface disturbance from analyzed activities within the CEAA is approximately 3,372 acres. Additional surface disturbance resulting from analyzed foreseeable activities is estimated to be approximately 181 acres. When added to the proposed Project disturbance, the total cumulative surface disturbance is estimated to be 3,716 or 3 percent of the CEAA.

Other past, present, and foreseeable developments and uses in the Project Area with impacts to visual resources include but are not limited to natural gas development, grazing fences, access roads, highways, trails, pipelines, wildland fires, and right-of-way facilities. Under the Proposed

Action, which would include reclamation, cumulative effects to visual resources would be minimal if the protective/mitigation measures described in Chapter 3 are implemented.

4.4.14 Social and Economic

The CEAA for socioeconomics is taken as the area of Mesa County, for the reasons indicated in Table 4.3-1, an area comprising approximately 2,140,818 acres. Surface disturbing activities are not a reasonable measure of cumulative impacts for this resource. The CEAA is the same as that analyzed for direct and indirect effects, so there are no additional cumulative effects.

4.4.15 Environmental Justice

The CEAA for environmental justice is taken as the area of Mesa County, for the reasons indicated in Table 4.3-1, an area comprising approximately 2,140,818 acres. Surface disturbing activities are not a reasonable measure of cumulative impacts for this resource. The CEAA is the same as that analyzed for direct and indirect effects, so there are no additional cumulative effects.

4.4.16 Transportation/Access

The CEAA for socioeconomics is taken as the area of Mesa County, for the reasons indicated in Table 4.3-1, an area comprising approximately 2,140,818 acres. Analysis of this resource is limited to existing and foreseeable roads development. Past and present roads development within the CEAA is approximately 9,598 acres. There is currently no foreseeable roads disturbance (not including short industry access roads or existing road upgrades, which have been analyzed as part of oil and gas well disturbance).

4.4.17 Wastes, Hazardous or Solid

The CEAA for hazardous or solid wastes is taken as the fifth-order watersheds affected by Project disturbance, for the reasons indicated in Table 4.3-1, an area comprising approximately 294,547 acres. Past and present surface disturbance from analyzed activities within the CEAA is approximately 18,179 acres. Additional surface disturbance resulting from analyzed foreseeable activities is estimated to be approximately 174 acres. When added to the proposed Project disturbance, the total cumulative surface disturbance is estimated to be 18,516 or 6 percent of the CEAA. Under the Proposed Action cumulative effects from wastes would be prevented or minimal if the protective/mitigation measures described in Chapter 3 are implemented.

4.4.18 Recreation

The CEAA for recreation is taken as CPW Game Management Unit 41, for the reasons indicated in Table 4.3-1, an area comprising approximately 209,983 acres. Past and present surface disturbance from analyzed activities within the CEAA is approximately 17,016 acres. Additional surface disturbance resulting from analyzed foreseeable activities is estimated to be approximately 181 acres. When added to the proposed Project disturbance, the total cumulative surface disturbance is estimated to be 17,360 or 8 percent of the CEAA. Cumulative effects would be expected to be minimal. While hunting, mountain biking, and OHV use may be shifted from specific areas within the Project Area, they would continue within other parts of the Project Area and the CEAA.

4.4.19 Special Designations (ACECs, SMAs, etc.)

The CEAA for special designation areas is taken as CPW Game Management Unit 41, for the reasons indicated in Table 4.3-1, an area comprising approximately 209,983 acres. Past and present surface disturbance from analyzed activities within the CEAA is approximately 17,016

acres. Additional surface disturbance resulting from analyzed foreseeable activities is estimated to be approximately 181 acres. When added to the proposed Project disturbance, the total cumulative surface disturbance is estimated to be 17,360 or 8 percent of the CEAA. Effects from the Proposed Action to areas of special designation would not be expected; therefore, no cumulative effects would occur.

4.4.20 Range Management

The CEAA for range management is taken as the BLM grazing allotments affected by Project disturbance, for the reasons indicated in Table 4.3-1, an area comprising approximately 74,830 acres. Past and present surface disturbance from analyzed activities within the CEAA is approximately 1,425 acres. Additional surface disturbance resulting from analyzed foreseeable activities is estimated to be approximately 161 acres. When added to the proposed Project disturbance, the total cumulative surface disturbance is estimated to be 1,726 or 2 percent of the CEAA.

Other past, present, and foreseeable developments and uses in the Project Area with impacts to range resources include but are not limited to natural gas development, grazing fences, access roads, highways, trails, pipelines, wildland fires, vegetation treatments and right-of-way facilities. Some of these actions, such as fires and vegetation treatments, have resulted in short-term increases in sedimentation and erosion but long-term reductions in these impacts. Other impacts such as those associated with roads and long-term facilities have increased impacts. Under the Proposed Action, which would include reclamation, cumulative effects to range resources would be similar to historic levels if the protective/mitigation measures described in Chapter 3 are implemented.

4.4.21 Fire and Fuels

The CEAA for fire and fuels is taken as the affected BLM fire management units and adjoining portions of the Forest Service fire management units located within the management area of the GJFO, for the reasons indicated in Table 4.3-1, an area comprising approximately 165,491 acres. Past and present surface disturbance from analyzed activities within the CEAA is approximately 15,002 acres. Additional surface disturbance resulting from analyzed foreseeable activities is estimated to be approximately 172 acres. When added to the proposed Project disturbance, the total cumulative surface disturbance is estimated to be 15,337 or 9 percent of the CEAA. Under the Proposed Action, cumulative effects from unanticipated fire ignitions would be avoided or minimized if the protective/mitigation measures described in Chapter 3 are implemented.

4.4.22 Land Tenure, Rights-of-Way and Other Uses

The CEAA for sensitive species is taken as CPW Game Management Unit 41, for the reasons indicated in Table 4.3-1, an area comprising approximately 209,983 acres. Past and present surface disturbance from analyzed activities within the CEAA is approximately 17,016 acres. Additional surface disturbance resulting from analyzed foreseeable activities is estimated to be approximately 181 acres. When added to the proposed Project disturbance, the total cumulative surface disturbance is estimated to be 17,360 or 8 percent of the CEAA. Effects to existing right-of-way holders would not be expected under the Proposed Action; therefore, cumulative effects would not occur.

CHAPTER 5 - CONSULTATION AND COORDINATION

5.1 TRIBES, INDIVIDUALS, ORGANIZATIONS, OR AGENCIES CONTACTED

To be added

5.2 INTERDISCIPLINARY REVIEW

Edge Environmental, Inc., an environmental consulting firm, prepared this document with the guidance, participation and independent evaluation of the BLM. The BLM, in accordance with 40 CFR § 1506.5 (a) and (c), is in agreement with the findings of the analysis and approves and takes responsibility for the scope and content of this document.

Bureau of Land Management
Interdisciplinary Review

NAME	TITLE	AREA OF RESPONSIBILITY	Review Date
Julia Christiansen	Natural Resource Specialist Project Lead	Surface Management Oil and Gas Permitting	
Christina Stark	Planning and Environmental Coordinator	Environmental Justice, Prime & Unique Farmlands, Cumulative Impacts Riparian, Wetlands	
Alissa Leavitt-Reynolds and Natalie Clark	Archaeologists	Cultural Resources, Native American Religious Concerns	
Michelle Bailey Chris Pipkin	Outdoor Recreation Supervisor Outdoor Recreation Planner	Access, Transportation, Recreation, VRM, Wilderness, ACECs	CP 3/28/14
Scott Gerwe	Geologist	Paleontology	3/27/2014
Alan Kraus	Hazard Materials Specialist	Hazardous Materials	
Robin Lacy	Realty Specialist	Land Status/Reality Authorizations	
Heidi Plank John Toolen	Wildlife Biologist	Migratory Bird Treaty Act, T&E Species, Terrestrial & Aquatic Wildlife	3/27/14
Anna Lincoln	Ecologist	Range, Land Health Assessment, T&E Plant Species	3/27/14
Nate Dieterich	Hydrologist	Water Quality, Soils, Hydrology, Water Rights	ND 4//3/14
Jacob Martin	Range Management Specialist	Grazing, Range Health, Forestry	
Mark Taber	Range Management Specialist	Invasive, Non-Native Species (Weeds)	3/27/14
Lathan Johnson Jeff Phillips	Fire Ecologist Natural Resource Specialist	Fire Ecology, Fuels Management	JP 3/31/14
Bob Hartman	Petroleum Engineer	Drilling, Production	3/27/2014
Chad Meister	Air Quality Specialist Colorado State Office	Air Quality	

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Mary Bloomstran	Project Manager, Wastes, Hazardous or Solid
Carolyn Last	Document Control
Jim Zapert, Carter Lake Consulting Susan Connell, Carter Lake Consulting	Air Quality and Climate
Dan Duce	Soils, Prime or Unique Farmlands
Nikie Gagnon	Water Resources, Land Tenure, ROW, Other Uses, Mineral Resources, Soils
Rebecca Buseck	Invasive, Non-Native Species Vegetation Wetlands and Riparian Zones Special Status Plants
Archie Reeve	Migratory Birds Wildlife (Fish, Aquatic and Terrestrial) Special Status Animal Species
Josh Moro	Cultural Resources, Paleontological Resources, Visual Resources, Recreation, Special Designations, Wild and Scenic Rivers, Range Management, Forest Management, Fire and Fuels
Sandra Goodman	Socioeconomics Environmental Justice Transportation/Access
Joe Fetzer, Petros Environmental	Cumulative
Gabriele Walser, HydroGeo	Surface Water
Joe Frank, HydroGeo	Groundwater

CHAPTER 6 - REFERENCES

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