ENVIRONMENTAL ASSESSMENT

Table Rock Unit Oil and Gas Development

WY-040-EA11-175

November 2011

BLM

Rock Springs and Rawlins Field Offices, Wyoming

The BLM's multiple-use mission is to sustain the health and productivity of the public lands for the use and enjoyment of present and future generations. The Bureau accomplishes this by managing such activities as outdoor recreation, livestock grazing, mineral development, and energy production, and by conserving natural, historical, cultural, and other resources on public lands.

BLM/WY/PL-12/004+1310

WY-040-EA11-175

List of Acronyms and Abbreviations

°F	degrees Fahrenheit
µeq/l	micro equivalents per liter
µg/m^3	micrograms per cubic meter
O_3	ozone
AAQS	Ambient Air Quality Standards
ACM	applicant-committed measure
amsl	above mean sea level
ANC	acid neutralizing capacity
APD	Application for Permit to Drill
APE	area of potential effect
APLIC	Avian Power Line Interaction Committee
AQRVs	Air Quality Related Values
AUM	animal unit months
BACT	Best Available Control Technology
BEA	U.S. Bureau of Economic Analysis
BLM	Bureau of Land Management
BTU	British Thermal unit
CAA	Clean Air Act
CCS	Center for Climate Strategies
CDA	Concentrated Development Area
CD-C	Continental Divide-Creston
CEQ	Council on Environmental Quality
CESA	cumulative effects study area
CFR	Code of Federal Regulations
CH_4	methane
Chevron	Chevron U.S.A., Inc.
CO	carbon monoxide
CO_2	carbon dioxide
CO_2(e)	carbon dioxide equivalent
COAs	Conditions of Approval
CR	County Road
CSU	controlled surface use
CWA	Clean Water Act of 1972
D	distance from a Class I area (related to AQRVs)
dBA	decibels on the A-weighted scale
EA	Environmental Assessment
EIS	Environmental Impact Statement
EO	Executive Order
EOR	Enhanced Oil Recovery
ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency
FLAG	Federal Land Manager's Air Quality Related Values Workgroup

FLM	Federal Land Managers
FLPMA	Federal Land Policy and Management Act
FR	Federal Register
bgs	below ground surface
GHG	greenhouse gas
GIS	Geographic Information System
gpm	gallons per minute
GRRMP	Green River Resource Management Plan
H_2S	hydrogen sulfide
H_2SO_4	sulfuric acid
HAP	hazardous air pollutant
I-80	Interstate 80
ID Team	Interdisciplinary Team
IPCC	Intergovernmental Panel on Climate Change
kg/ha-yr	kilograms per hectare per year
km	kilometer
kV	kilovolts
MACT	Maximum Achievable Control Technology
MBTA	Migratory Bird Treaty Act
mg/l	milligrams per liter
MLRA	Major Land Resource Area
Mm^{-1}	Inverse megameter
MOU	Memorandum of Understanding
mph	miles per hour
N	Nitrogen
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NHD	National Hydrography Dataset
NHPA	National Historic Preservation Act of 1966, as amended
NO_2	nitrogen dioxide
NO_X	oxides of nitrogen
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NSO	no surface occupancy
NSPS	New Source Performance Standards
NW	northwest
NWI	National Wetland Inventory
OHV	off-highway vehicle
P&A	Plugged and Abandoned
PFYC	Potential Fossil Yield Classification
PM	particulate matter
PM_{10}	particulate matter with an aerodynamic diameter of 10 microns or less
$PM_{2.5}$	particulate matter with an aerodynamic diameter of 10 microns or less

ppb	parts per billion
ppm	parts per million
Project	Table Rock Unit Project
PRPA	Paleontological Resources Preservation Act
PSD	Prevention of Significant Deterioration
Q	annual emissions reaching a Class I area (related to AQRVs)
ReGAP	Regional Gap Analysis Project
RFFAs	reasonably foreseeable future action
RFO	Rawlins Field Office
RMP	Resource Management Plan
ROD	Record of Decision
ROS	Recreation Opportunity Spectrum
ROW	right-of-way
RRMP	Rawlins Resource Management Plan
RSFO	Rock Springs Field Office
RV	recreational vehicle
S	Section
SCEMA	Sweetwater County Emergency Management Agency
SHPO	State Historic Preservation Office
SIC	Standard Industrial Classification
SIP	State Implementation Plan
SO_2	sulfur dioxide
SWPPP	Storm Water Pollution Prevention Plan
TCPU	Transportation, Communication, and Public Utilities
TDS	Total Dissolved Solids
tpy	tons per year
TSS	total suspended sediment
U.S.	United States
UPLR	Union Pacific Land Resources
UPRR	Union Pacific Railroad
USC	United States Code
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VOC	volatile organic compound
VRM	Visual Resource Management
WDEQ	Wyoming Department of Environmental Quality
WGFD	Wyoming Game and Fish Department
WOGCC	Wyoming Oil and Gas Conservation Commission
WQD	Water Quality Division
WS	Wyoming Statute
WSEO	Wyoming State Engineer’s Office
WYCRIS	Wyoming Cultural Resources Information System

WYDOT	Wyoming Department of Transportation
WYNDD	Wyoming Natural Diversity Database

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1.0 Introduction

Chevron U.S.A., Inc. (Chevron) has notified the Bureau of Land Management (BLM) Rock Springs Field Office (RSFO) and Rawlins Field Office (RFO) that they propose to develop new oil and gas wells in the Table Rock field. The Table Rock field is located approximately 40 miles east of Rock Springs in Sweetwater County, Wyoming.

Chevron is requesting BLM approval to expand oil and gas drilling and production by drilling, completing, and operating up to 88 wells over 14 years, including the development and maintenance of the ancillary facilities necessary to operate the field. An environmental assessment (EA) will be completed under BLM guidance that meets the requirements of the National Environmental Policy Act (NEPA) of 1969. BLM prepared this EA to evaluate the impacts associated with construction, operation, and maintenance of the new development in the Table Rock Unit.

1.1 Background

The Table Rock Field was discovered in 1945 and since that time has produced from 9 different formations. All depths were unitized in July 1945, creating the Table Rock Unit, which is the project area under consideration. Chevron currently holds all leases and operates 100 wells and a gas processing plant in the Table Rock Unit.

The project area consists of approximately 13,633 acres on public, state, and private land, distributed in a checkerboard pattern. The surface and mineral ownership is summarized in **Table 1-1** and the project area location is shown on **Figure 1-1**.

Table 1-1 Project Area Surface and Mineral Ownership

Owner	Surface (acres)	Minerals (acres)
BLM	6,674	6,034
State of Wyoming	339	7,599
Private/Fee	6,620	
Project Area Total	**13,633**	**13,633**

1.2 Purpose and Need for the Proposed Action

Under NEPA, the purpose and need statement is intended to explain the reason that the proposed Project is needed by the lead agency (BLM in this case) and serves as the basis for developing alternatives for analysis.

The purpose of the action is to provide Chevron with access to develop its federal mineral leases and to allow the lessee to exercise its right to develop its leases subject to applicable federal and state laws and BLM policy. The need for the action is established by the BLM's responsibility under regulations including the Mineral Leasing Act of 1920, as amended, to review and approve the proposed plan of development and the Federal Land Policy and Management Act (FLPMA) of 1976 to prevent degradation of public lands.

1.3 Decision To Be Made

Following review of the analysis in this EA, the BLM will decide whether to allow implementation of the proposed oil and gas development, and if so, under what terms and conditions.

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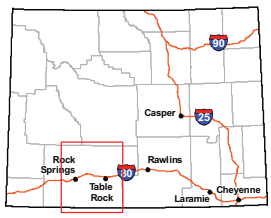

Legend

- City or Town
- Project Boundary
- Limited Access
- Highway
- Major Road
- BLM Field Office Boundary

Land Owner

- Bureau of Land Management
- Bureau of Reclamation
- Forest Service
- Private
- State

Figure 1-1

Project Area Location

0 2 4 6 8 10 20 Miles

1:800,000

N

1.4 Relationship to Statutes, Regulations, Plans or Other Environmental Analyses

The approved Record of Decision (ROD) (1997) for the Green River Resource Management Plan (GRRMP) is the document that directs management of federal lands within the BLM RSFO. The objective for management of oil and gas resources, as stated in the GRRMP, is to provide for leasing, exploration, and development of oil and gas while protecting other resource values. In addition, the GRRMP states that public lands within the checkerboard land pattern, which encompasses the project area, are open to mineral leasing and development in order to promote mineral recovery on behalf of the United States (U.S.), along with appropriate mitigation of disturbance on a case-by-case basis.

The ROD and Approved Rawlins Resource Management Plan (RRMP), published in December 2008, directs management of public lands within the BLM RFO. All visual resources are currently managed by the 1990 Great Divide Basin Plan. The RRMP states that existing oil and gas mineral rights will be honored, subject to lease stipulations, legal restrictions, and reasonable limitations to oil and gas development in order to minimize impacts to other resources and resource users. It also states that surface disturbing activities will be "intensively managed" and subject to specified reclamation practices.

Most of the Table Rock Unit is encompassed by the project area to be analyzed in the Continental Divide-Creston (CD-C) Natural Gas Project Environmental Impact Statement (EIS). The Draft EIS has not yet been made public, but it is anticipated to be available before the Table Rock Unit EA is completed. The draft 2008 Baseline Modeling report for air quality modeling (ENVIRON 2011) is currently available and will be utilized where applicable for this EA.

BLM Onshore Oil and Gas Orders, Conditions of Approval (COAs), and general requirements constitute the range of standard operating procedures and environmental protection measures that are applied to individual operators and projects, as applicable, authorized by 43 Code of Federal Regulations (CFR) 3160. The exploration and production of domestic oil and gas reserves is in accordance with the President's National Energy Policy, set forth in Executive Order 13212 (2001), and with the Energy Policy Act of 2005 (42 United States Code [USC] 15801).

State agencies have authority over various aspects of oil and gas development, including the Wyoming Department of Environmental Quality (WDEQ), which has jurisdiction over air and water quality, and the Wyoming Oil and Gas Conservation Commission (WOGCC) that has regulations and standards affecting well spacing, permits, and safety.

The proposed Project would comply with all applicable federal, state, and local laws, plans, and permits required for this activity. In addition to compliance with the GRRMP and RRMP, **Table 1-2** summarizes other relevant authorities, guidance, and permits.

1.5 Scoping, Public Involvement, and Issues

A Scoping Notice and project area map were posted to the BLM website by the RSFO to announce the 30-day public scoping period from May 6 through June 6, 2011. In response to the Scoping Notice, four comment letters were received from a local landowner, the Rock Springs Grazing Association, Wyoming Game and Fish Department (WGFD), and the Sweetwater County Commissioners. Internal scoping was conducted with the BLM Interdisciplinary Team (ID Team) to identify resources to be analyzed in the EA.

Issues for analysis identified during scoping include:

- Wildlife populations and habitats;
- Riparian areas and seeps;
- Visual resources;
- Soils and vegetation due to surface disturbance and the potential for erosion;
- Spread of invasive plants;
- Weed (noxious and non-natives) management;

- Reclamation of disturbed areas; and
- Management of vehicular traffic and transportation planning.

Many comments called for BLM to evaluate past field development activities and to enforce clean-up of problem areas and unsuccessful reclamation sites. While the current conditions in the field are summarized in Chapter 3.0, Affected Environment, of this EA, evaluation of past reclamation efforts and field-wide clean-up is outside the scope of this NEPA document. However, these activities fall within the regulatory authority of BLM and the comments have been noted.

Table 1-2 Major Federal and State Law, Regulations and Permits that May Apply

Issuing Agency	Permit Name: *Purpose of Approval or Action*	Authority
BLM	Permit to Drill, Deepen or Plug Back (Application for Permit to Drill [APD] Process): *Controls drilling for oil and gas on federal onshore lands*	Mineral Leasing Act of 1920 (30 USC 181 *et seq*.): 43 CFR §3162
	Right-of-Way (ROW) grants and temporary use permits: *Issue right-of-way grants on BLM-managed lands*	Mineral Leasing Act of 1920 (30 USC 185); 43 CFR §2880 & §2800; FLPMA (43 USC 1761-1771)
	Antiquities, Cultural, and Historic Resource Permits: *Issue antiquities and cultural resources use permits to inventory, excavate or remove cultural or historic resources from BLM-managed lands*	Antiquities Act of 1906 (16 USC 431- 433); Archaeological Resources Public Protection Act of 1979 (16 USC 470aa – 470ll); Preservation of American Antiquities (43 CFR §3); National Historic Preservation Act (NHPA) Section 106 (36 CFR 800)
	Approval to Dispose of Produced Water: *Controls disposal of produced water from federal leases*	Mineral Leasing Act of 1920 (30 USC181 *et seq*.); 43 CFR §3164; Onshore Oil and Gas Order No. 7
U.S. Army Corps of Engineers (USACE)	Section 404 Permit (Nationwide and Individual): *Controls discharge of dredged or fill materials into waters of the United States*	Section 404 of the Clean Water Act of 1972 (CWA)
U.S. Fish and Wildlife Service (USFWS)	*Protects federally listed threatened and endangered species through coordination and consultation process*	Section 7 of the Endangered Species Act (ESA) of 1973, as amended (Public Law [P.L.] 93-205)
	Determine compliance through internal review or external review with the USFWS	Migratory Bird Treaty Act (MBTA) of 1918, as amended; Bald and Golden Eagle Protection Act of 1940
Wyoming Department of Agriculture	*Controls introduction and spread of weeds and pests*	Wyoming Weed and Pest Control Act (Wyoming Statute [WS] 11-5-102)

Table 1-2 Major Federal and State Law, Regulations and Permits that May Apply

Issuing Agency	Permit Name: *Purpose of Approval or Action*	Authority
WDEQ – Air Quality Division	Permits to construct and operate certain emissions sources	Clean Air Act (CAA) of 1990 and implementing regulations in 40 CFR §70; Wyoming Environmental Quality Act (WS 35-11-201 through 35-11-21
WDEQ – Water Quality Division	National Pollutant Discharge Elimination System (NPDES) Construction General Permit: *Controls offsite storm water runoff from construction activities resulting in 1 acre or more of disturbance*	Wyoming Environmental Quality Act; Section 405 of the CWA (40 CFR §122, 123, and 124); WDEQ Water Quality Rules and Regulations, Chapters 1, 2, and18
WOGCC	Permit to drill, deepen, or plug back (APD process): *Regulates drilling of oil and gas wells in the state.*	WOGCC Regulations Chapter 3, Section 8. WS 30-5-104 (d)(i)(C). WS 30-5-115
	Well location (part of the APD process): *Regulates downhole well location of all oil and gas wells by reservoir or pool*	WOGCC Rule: Chapter 3 Section 2, WS 30-5-109
	Protection of surface waters and productive formations (part of APD process): *Provides general drilling, casing, and cementing rules for oil and gas wells*	WOGCC Rule: Chapter 3, Section 22
	Well control (part of APD process): *Provides requirements for blowout preventers*	WOGCC Rule: Chapter 3, Section 23
	Authorization approving drilling and spacing units: *Regulates well spacing and pooling of interests by reservoir or pool*	WS 30-5-104(d)(ii)(F)(iv). WS 30-5-109(a),(b),(c) and (f)
	Permit to drill to a nonstandard Location: *Provides for well relocation while maintaining existing well spacing*	WOGCC Rule: Chapter 3, Section 3, WS 30-5-109
	Permit to directionally drill: *Provides the notification requirements for controlled directional drilling*	WOGCC Rule: Chapter 3, Section 25
	Plugging and abandonment of a well (applies to non-federal lands): *Provides procedures and regulates the plugging and abandonment of oil and gas wells*	WOGCC Rule: Chapter 3, Section 18, Chapter 4, Section 2. WS 30-5-104 d)(vi)(B)
	Measurement of oil and gas production: *Regulates the measurement and reporting of oil and gas production*	WOGCC Rule: Chapter 3, Section 30 and 31, WS 30-5-104 (d)(vi)(B)
	Permit to complete a well in multiple zones or pools (commingling): *Regulates the production of oil and gas from more than one pool in one well*	WOGCC Rule: Chapter 3, Section 35

Table 1-2 Major Federal and State Law, Regulations and Permits that May Apply

Issuing Agency	Permit Name: *Purpose of Approval or Action*	Authority
	Authorization to flare or vent gas: *Regulates the safe venting or flaring of gas to prevent waste*	WOGCC Rule: Chapter 3, Section 40
	Permit to use an earthen pit (applies to nonfederal lands): *Regulates construction, use and closure of noncommercial reserve, production and emergency pits on drilling and producing locations*	WOGCC Rule: Chapter 4, Section 1, WS 30-5-104 (d)(vi)(A)
	Spills and fires: *Requires notification, with a prevention and cleanup plan, of accidental deaths, fires, or releases of 10 or more barrels of non-potable fluids that enter or threaten the waters of the State*	WOGCC Rule: Chapter 4, Section 3
	Workmanlike operations: *Regulates the safety and environmental protection of well production facilities*	WOGCC Chapter 4, Section 4
	Permit underground disposal of water: *Regulates the noncommercial underground disposal of non-potable water and oil field wastes*	WOGCC Chapter 4, Section 5, WS 30-5-104 (d)(vi)(B)
	Permit to close a natural gas processing facility: *Regulates closure of infield gas gathering and processing facilities*	WOGCC Rule: Chapter 4, Section 13 (b)
Wyoming State Engineer's Office (WSEO)	*Water well permit: Issue permit to appropriate groundwater*	WS 41-3-938
Wyoming State Lands and Investments Office	*ROWs and easements on state lands*	WS 36-9-118
Wyoming State Historic Preservation Office	*Cultural resource protection*	NHPA and Advisory Council Regulations (36 CFR §800)

2.0 Proposed Action and Alternatives

This chapter describes the components of the alternatives analyzed in detail. In compliance with NEPA guidance, the analysis must consider at least No Action and Proposed Action alternatives. As noted in Section 1.5, none of the scoping comments suggested a new alternative to be analyzed.

2.1 Alternative I – No Action Alternative

The No Action Alternative must be addressed under provisions of NEPA and serves as a basis for comparison of environmental impacts among alternatives. Under the No Action Alternative, the BLM would deny Chevron's proposal for development and would assume continuation of the present course of action and rate of development in the Table Rock Unit. Management of fluid mineral development would continue to be governed by current BLM policy and procedures with APDs approved on a case-by-case basis.

Because the minerals in the Table Rock Unit are already leased, Chevron must be allowed access to its valid existing lease rights. The No Action Alternative does not mean, therefore, that there would be no impacts to the lands in the project area. Current oil and gas operations and maintenance activities would continue. Currently, Chevron develops one well per year in the Table Rock Unit and plugs and abandons four wells per year. **Table 2-1** summarizes projected surface disturbance from oil and gas development within the 14-year time period proposed for development. It is assumed that half of the wells would target the shallow Almond Formation and half would be drilled to the deep gas formations, with one vertical well per each pad.

Table 2-1 Surface Disturbance Under No Action

Facility	Quantity	Initial Surface Disturbance (acre)	Long-term Disturbance[1] (acre)
Shallow Producers	7 pads	18	4
Deep Producers	7 pads	53	18
New Roads	1.8 miles	4	3
Pipelines [2]	1.8 miles	9	0
Totals[2]		75	25

[1] Long-term disturbed areas would be graveled on well pads, new roads, and pipelines, not left as bare ground.

[2] Pipeline disturbance would be located within road ROWs and existing disturbed areas where possible so acreage not added to total disturbance to avoid double-counting.

2.2 Alternative II – Proposed Action

2.2.1 Overview

The Proposed Action Alternative involves development of up to 88 wells over 14 years: 33 shallow oil wells, 20 deep gas wells, and up to 35 water injection wells. **Figure 2-1** displays the conceptual locations of the proposed new wells. The total well life would be approximately 40 to 55 years. Drilling operations would utilize a combination of vertical and directional techniques, as appropriate, and all producing wells would be hydraulically fractured.

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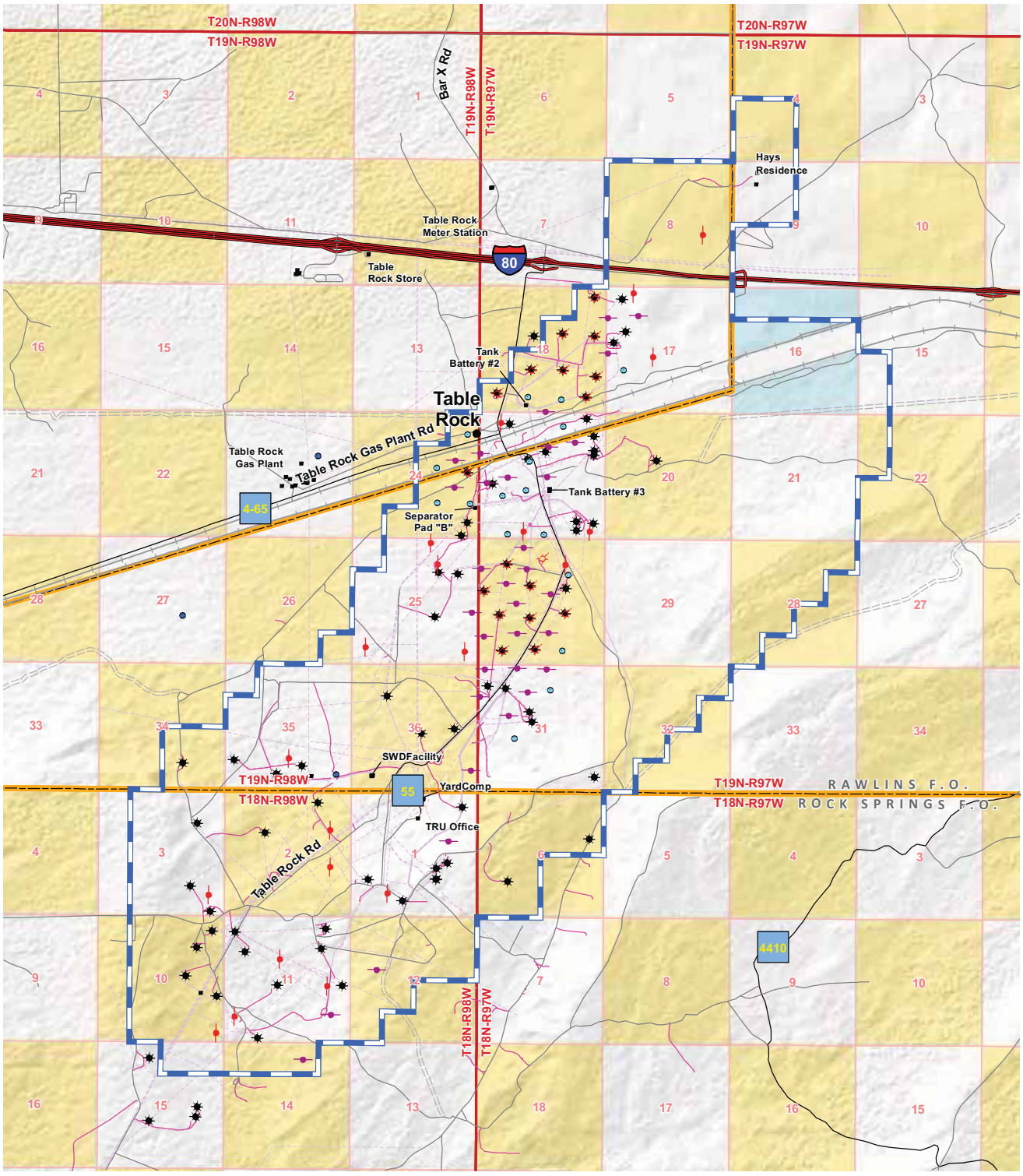

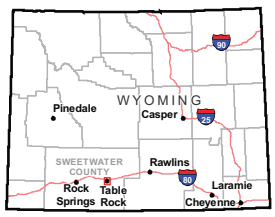

Legend

- Existing Well to be Converted to Injector
- Active O/G Well
- Active Water Injection Well
- Proposed Water Injection Well
- Proposed Shallow Well
- Proposed Deep Well
- Pipeline
- Facility
- Project Boundary
- Interstate Hwy
- County Road
- Local Road
- Chevron O&G Road
- Vehicular Trail (4WD)
- Railroad
- BLM Field Office Boundary

Land Ownership

- Bureau of Land Management
- State
- Private

Figure 2-1

Proposed Action, Conceptual Locations of Wells

0 0.5 1 2 Miles

1:75,000

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Chevron proposes to minimize surface disturbance by utilizing existing well pads by co-locating new wells with existing wells or by establishing multi-well pads throughout the project area to the greatest extent possible. New road construction would be limited and existing roads would be used as much as possible. Existing ROWs would be used for installation of new pipelines and power lines. When the actual locations of necessary new service roads is determine, ROW applications would be submitted to the appropriate agency, either BLM on public lands or the State of Wyoming for private or state lands.

2.2.2 Detailed Plan of Development

The BLM has approved Chevron to drill 8 test wells before the implementation of the Proposed Action to evaluate the potential for producing from the Almond Formation. The wells will be drilled using directional wellbores and a major water flood in the Table Rock Unit.

If the 8 pilot wells are successfully completed and the 2 associated injector wells can successfully inject water into the formation for the water flood, then Chevron proposes to use a similar process for the remaining Almond Formation wells, including co-locating wells on shared pads (up to 4 per pad), directional drilling, and reuse of drilling water. If this pilot process is not successful, then the proposed Almond shallow wells would be drilled as vertical wells, each on a separate well pad.

Well depths are dependent on the target geologic formations. **Table 2-2** summarizes the number of wells and pads for each target formation and well depth.

Table 2-2 Number of Proposed New Wells and Pads by Formation

Formation	Type	Approximate Depth (feet)	Number of New Wells	Number of New Well Pads
Almond	Shallow (oil, gas)	7,000	33	12 to 33[1]
Blair	Deep (gas)	9,500	8	8
Baxter	Deep (gas)	14,000	10	10
Frontier	Deep (gas)	15,000	2	2
Almond	Shallow (water injector)	7,000	35 (17 new and up to 18 replacement	17

[1] Number of well pads depends on the outcome of the 8 pilot wells. If Almond wells can be successfully drilled and produced using directional wellbores, then 28 Almond wells would be located on 7 pads and the remaining 5 Almond wells would be vertical infill wells on separate pads. If the pilot wells are unsuccessful, each Almond well would be located on a separate pad.

The 17 new water injector wells listed in **Table 2-2** would be drilled as part of the proposed water flood Project. The 18 replacement injector wells located in the Almond formation would either be converted to water injector wells or plugged to allow for new water injector wells to be drilled from the existing well pads. A new water injector well would be drilled on the existing pad only if wellbore conditions in the existing producer well are unacceptable. Chevron would attempt to use existing wellbores for these 18 injector wells when possible.

New ancillary facilities would include two freewater knockouts (separator), up to three 1,000-barrel tanks, and three 5 million British Thermal Units (BTU) heater treaters, located at the existing Tank Battery #3; two freewater knockouts, up to four 500-barrel tanks, and one 1 million BTU burner at existing Tank Battery #2. Compressor #2 at Tank Battery #3 would be brought back online as more gas is produced, most likely by 2015 (year 5). This compressor is electric and already taken into account in Chevron's facility permit. Up to six 300-horsepower horizontal pumps would be added by the end of the Project. For the shallow producer wells, there would be up to 5 gas-fired heater treaters (pressure vessel) and unfired relief tanks located on well pads, with the possibility that more would be located at Tank Battery #2. Each deep well pad would include one separator, one tank, and one sales meter. Existing power lines to well pads would be used, and power lines to new locations may be installed on a site-specific basis. An

estimated 2 miles of new power lines would be needed. New pipelines for all new wells would be buried within existing ROWs.

Equipment would be powered by electric power and natural gas when feasible. Electricity would be used to power all monitoring equipment, pump jacks for the Almond producer wells, and downhole pumps for the injector wells. Natural gas would be used to operate the three heater treaters and freewater knockouts at Tank Battery #3, as well as the treater and relief tank at each well pad.

2.2.3 Drilling Operations

During drilling, most equipment except drilling rigs would be electric-powered. The Helmerich and Payne 304 Flex 4M drilling rig or similar size would be used for the shallow oil wells and injector wells. The drilling rig for all deep wells most likely would utilize three Caterpillar 3512LE engines.

It would take approximately 22 days per well to drill and complete the shallow wells, both producers and injectors. It would take an estimated 56 days to drill and complete each of the wells to the Blair Formation and 131 days per well to drill and complete the Baxter and Frontier wells. These overall estimates include time for stimulation, well flowback, and installation of artificial lift equipment (14 days for each shallow well and 21 days for each deep well).

2.2.4 Drilling Schedule

The results of the 8 pilot Almond shallow wells would determine future water flood operations in the Table Rock Unit. If the 8 pilot wells successfully produce oil and the 2 pilot water injectors prove that water can effectively be injected into the Almond Formation, then 28 shallow Almond wells would be drilled and completed as part of a water flood expansion stage that includes drilling infill and water injection wells. There would be 5 infill oil wells unassociated with the water flood drilled toward the end of the 14-year Project. All gas wells are planned to be drilled and completed by the end of 2016 (year 5). The 18 currently producing wells designated to become water injectors would be converted to water injector wells if the casing is in good condition; if not in good condition, then a new water injector well would be drilled on the same pad. **Table 2-3** lists the proposed schedule for drilling wells, beginning with 2012 to represent year 1 of the Project.

Table 2-3 Drilling Schedule by Well Type

Year	Well Type or Target Formation	Number
2012	New injector	2
	Converted or replacement injector	2
	Baxter	2
2013	New injector	2
	Converted or replacement injector	2
	Baxter	3
	Frontier	1
2014	Almond	6
	Converted or replacement injector	2
	Blair	2
	Baxter	4
	Frontier	1
2015	Almond	6
	Converted or replacement injector	2
	Blair	4
	Frontier	1

Table 2-3 Drilling Schedule by Well Type

Year	Well Type or Target Formation	Number
2016	New injector	7
	Converted or replacement injector	3
	Blair	2
2017	Almond	4
	New injector	2
	Converted or replacement injector	2
2018	Almond	4
	New injector	2
	Converted or replacement injector	2
2019	Almond	4
	New injector	2
	Converted or replacement injector	2
2020	Almond	4
	Converted or replacement injector	1
2021	Almond	1
2022	Almond	1
2023	Almond	1
2024	Almond	1
2025	Almond	1

Note: Almond wells listed above are the proposed producing shallow oil wells. Blair, Frontier, and Baxter are proposed gas wells.

2.2.5 Water Requirements

Drilling the shallow Almond wells on separate pads would require 1,000 barrels per well. If the 8 pilot wells on two 4-well pads prove to be successful, then the water needs for drilling would be lower than the needs for the one well per well pad scenario. Water needs for drilling 4 wells per pad would be lower because the water required for drilling the first well would be stored on the pad and reused for the next 3 wells, with an additional 100 barrels of water needed per well after the initial well drilled on a shared pad.

Drilling the deep wells to the Blair Formation would require 1,000 barrels per well, and drilling the deep wells to the Baxter and Frontier formations would require 2,000 barrels per well. Water requirements for hydraulic fracturing would utilize a total of up to 3,300 barrels for each shallow well and 80,500 barrels for each deep well.

Produced water and makeup water from source wells would be injected into the water flood for most of the shallow oil wells via the injector wells. If the water flood is unavailable for water disposal, produced water may be disposed of at the permitted saltwater disposal facility located in Section 36, Township 19N (T19N), Range 98W (R98W). Chevron projects that approximately 500 barrels of water per well per day produced from the Fox Hills Formation, a water-bearing formation approximately 5,000 feet deep, would be the primary water source for the water flood. Five of the proposed Almond oil wells and all the deep gas wells are unassociated with the proposed water flood. In addition to the Fox Hills Formation, other sources of water may come from the Almond or Ericson formations. The annual amount of water needed for water flood would increase as the number of producing oil wells increases.

The assumptions related to the quantity and sources of water needed for the water flood would be tested during the development of the initial 8-well pilot test, so plans for the source of water for the water flood may be adjusted pending the outcome of the pilot. **Table 2-4** summarizes the water requirements for drilling and completions. The total quantity of water needed for the water flood is difficult to predict because it depends on the productive life of each oil well.

Table 2-4 Summary of Water Needs

Well Type and Formation	No. of Wells	Drilling		Hydraulic Fracturing	
		Barrels per Well	Total barrels	Barrels per Well	Total Barrels
Producer, Almond	33	1,000	33,000	3,300	108,900
Producer, Blair	8	1,000	8,000	80,500	644,000
Producer, Baxter	10	2,000	20,000	80,500	805,000
Producer, Frontier	2	2,000	4,000	80,500	161,000
Injector, Almond (new)	17	1,000	17,000	1,500	25,500
Injector, Almond (possible replacement)	18 (max.)	1,000	18,000 (max.)	1,500	27,000

2.2.6 Surface Disturbance

Existing roads and ROWs would be utilized to the extent possible. Surface disturbance would result from construction of new well pads, roads, and pipelines. Following initial construction, disturbed areas would be reclaimed by grading, seeding, or other approved means of stabilization. Up to 7 miles of new roads would be needed to access all new wells by the end of the Project. New roads would be surfaced with gravel and designed to meet current Gold Book standards, using culverts or water bars as needed. The site-specific road design features would be identified during staking and as part of the APD process in cooperation with BLM.

After a well is completed, disturbed areas not needed for operations would be graded to ensure adequate drainage, spread with topsoil, and seeded to reestablish vegetation. The portions of the well pad needed for truck access and operations would be graded and stabilized with gravel. Each new single-well pad for the shallow wells (both producers and injectors) would disturb 2.5 acres initially, and would be reclaimed back to 0.5 acre. If more 4-well pads for the shallow Almond wells are determined to be feasible, then the surface disturbance for each pad would be 7 acres in size initially, reclaimed back to 4 acres. Each deep well pad would disturb 7.5 acres initially to allow for the larger drilling rig, and be reclaimed to 2.5 acres of bare ground after drilling and completion operations are done. The shallow producer wells that would be converted to water injectors would not require new disturbance because they would be located on existing established pads.

Approximately 2 miles of new power lines would be constructed within existing ROWs. The route of each power line would only be mowed, not bladed, so no bare ground would result other than the small area needed to excavate each pole. Up to 7 miles of pipelines would be installed, primarily along roads. Pipeline ROWs would be 50 feet wide, but a small portion of that would be disturbed for installation of the pipe. All disturbed areas within pipeline ROWs would be stabilized.

Table 2-5 summarizes the initial and long-term surface disturbance associated with this Project. Initial surface disturbance includes the areas disturbed by heavy equipment for construction of roads, pipelines, and well pads, before it is contoured and revegetated. Long-term disturbance includes land that is not revegetated and available for current uses, such as the running surface of roads and the operating surface of well pads. For the shallow producing wells to the Almond Formation, there would be

7 multi-well pads for 28 wells if the pilot well project demonstrates that directional wellbores can be used (multi-well scenario). This would create a total of 49 acres of initial disturbance and 28 acres of long-term disturbance for the multi-well pads, plus the disturbance for the 5 infill Almond single-well pads totaling 13 acres initial disturbance and 3 acres long-term disturbance. If all shallow Almond producers must be located on single well pads (unsuccessful pilot wells, called single well scenario), then there would be 83 acres of initial surface disturbance and 17 acres of long-term disturbance. The total acreage disturbed is a range depending on the success of the pilot project and implementation of either the multi-well or single well scenario.

Table 2-5 Summary of Surface Disturbance

Facility	Quantity	Initial Surface Disturbance (acre)	Long-term Disturbance[1] (acre)
Shallow Producers (multi-well scenario)	12 pads	62	31
Shallow Producers (single well scenario)	33 pads	83	17
Deep Producers	20 pads	150	50
New Injectors	17 pads	43	9
Converted or Replacement Injectors	18 pads	9	9
New Roads	7 miles (max.)	17	10
Pipelines [2]	7 miles (max.)	9	0
Totals[3]		281 – 302	95 – 109

[1] Long-term disturbed areas would be graveled on well pads, new roads, and pipelines, not left as bare ground.

[2] Pipeline disturbance would be located within road ROWs and existing disturbed areas where possible so acreage not added to total disturbance to avoid double-counting.

[3] Number of pads for shallow producers and related surface disturbance is dependent on whether wells are directionally drilled and co-located on 4-well pads or vertically drilled and located on single well pads. The range of pads and disturbance is provided.

2.2.7 Applicant-committed Environmental Protection Measures

Chevron will adhere to all lease stipulations, in addition to all federal and state laws, regulations, and BLM policies and guidelines. Chevron is committed to implementing the following environmental protection measures, many of which are currently implemented in the Table Rock Unit as Conditions of Approval. Chevron also anticipates that additional environmental protection measures and mitigation measures may be identified during onsite inspections as part of the APD process.

- Siting pipelines within existing ROWs
- Use of existing roads to minimize surface disturbance for new roads
- Use of closed loop systems for drilling
- Reuse of drilling water for shallow wells to the extent possible
- Use of produced water for the water flood
- Monitoring wells remotely to minimize vehicle travel
- Minimize air emissions by utilizing electric pumps and other equipment for most wells

- Utilize green completions to minimize air emissions where feasible
- Reclaim all disturbed areas not needed for production by grading and seeding to BLM standards

2.3 Environmental Protection Measures Applying to Both Alternatives

Environmental protection measures listed in the GRRMP and RRMP, and those developed to meet the Resource Management Plan (RMP) objectives, that pertain to oil and gas development, surface disturbance, road construction, pipelines, and the issuance of ROW permits would apply to development in the Table Rock Unit.

Each BLM field office (RSFO and RFO) has approved native seed mixtures (grasses, shrubs, and forbs) that must be used to revegetate disturbed areas. All seed must be certified weed-free. Each seed mixture would be selected based on the soil type and species present prior to disturbance. For this reason, the seed mixture to be used at any one site would be identified during the onsite evaluation and specified during the APD process for each well.

In the crucial winter range in the northern part of the project area, drilling operations would not be allowed from November 15 to April 30.

2.4 Alternatives Considered but not Analyzed in Detail

No alternatives to the Proposed Action were recommended during the scoping period and none were raised by members of the BLM ID Team.

3.0 Affected Environment

This chapter includes a brief description of the environment that is likely to be affected by the alternatives under considerations. The description of the affected environment is limited to the information that is relevant to understanding the effects of the alternatives.

3.1 Geology, Geologic Hazards, and Minerals

The project area is located in the eastern Greater Green River Basin, a major sub-basin of the Wyoming Basin physiographic province (Howard and Williams 1972). The Greater Green River Basin covers much of southwestern Wyoming and extends into northeastern Utah and northwestern Colorado. Relief within the project area is approximately 400 feet, ranging from a low elevation of about 6,800 feet above mean sea level (amsl) in north part of the area to around 7,200 feet amsl on the southeast side. The area lies between the east flank of the Rock Springs Uplift and the west side of the Washakie Basin, one of several smaller sub-basins located within the Greater Green River Basin. The topography consists of rolling plains and plateaus bounded by prominent escarpments, referred to locally as rims. Where the plateaus are crossed by drainages, the topography is deeply incised.

3.1.1 Geology

3.1.1.1 Stratigraphy

The bedrock underlying the Table Rock Field consists of portions of the Green River and Wasatch formations from lower Eocene Series of the Tertiary System, which was deposited from 50 to 55 million years ago (Roehler 1992). Stratigraphic relationships between the Green River and Wasatch Formation are complex in this area, with much intertonguing of the members of each formation. The rocks were deposited in a complex of meandering stream, floodplain, swamp, and lake environments that resulted in the complex intertonguing. The bedrock units exposed on the surface in the Table Rock area are listed below:

- **Wasatch Formation (main body)**—The main body of the Wasatch Formation consists of fluvial sandstone, mudstone, and siltstone (Roehler 1992).
- **Luman Tongue of the Green River Formation**—The Luman Tongue is primarily oil shale that was deposited in a freshwater lake environment (Roehler 1992). The Luman Tongue forms the prominent escarpment that generally parallels the proposed route.
- **Niland Tongue of the Wasatch Formation**—The Niland Tongue is similar to the main body of the Wasatch Formation, but also contains carbonaceous shale and coal (Love and Christiansen 1985).

There is a fairly thick sequence of sedimentary rocks that underlie the project area. The Washakie Basin may contain up to 30,000 feet of sedimentary rock (Kent 1972). A deep well in the Table Rock Unit penetrated the Precambrian at a depth of around 19,800 feet (Dickenson 1992a). The Precambrian basement may consist of metamorphic rocks that may be billions of years old (Simms et al. 2001).

3.1.1.2 Geologic Structure

The Table Rock Field is located along an indistinct boundary between the Rock Springs uplift and the Washakie Basin. The Rock Springs Uplift is a very large asymmetric anticlinal structure, with gentle southeast dips ranging from 5 to 9 degrees (BLM 2003). The Table Rock Unit is a hydrocarbon-bearing anticlinal fold structure that interrupts the general trend of dips into the Washakie Basin. The sedimentary rocks continue to dip to the east to the structural axis of the Washakie Basin, generally 20 to 25 miles east of the project area (DeBruin 2002). The Table Rock structure trends southwest to northeast and is about 5 miles wide and 12 miles long.

There are no apparent surface faults in the project area (Love and Christiansen 1985). A southwest to northeast trending high-angle reverse fault is present at depth in the Table Rock Field (Dickenson

1992b). The fault intersects Cretaceous rocks in the subsurface and cut the geologic section down to the Precambrian. The fault originated from mountain building events referred to as the Laramide Orogeny that occurred in late Cretaceous to early Tertiary and are not considered active.

3.1.2 Geologic Hazards

Potential geologic hazards include landslides and earthquakes. Landslides involve the mass movement of earth materials down slopes and can include debris flows, soil creep, and slumping of large blocks of material. There are no identified landslides in the project area (BLM 2003; Wyoming State Geological Survey 2011). The steepest slopes occur along the Sixmile Rim where a 400-foot vertical change occurs over a few hundred feet.

Earthquakes occur when energy is released due to blocks of the earth's crust moving along areas of weakness or faults. There are no identified active faults in the project area, but 50 miles to the northwest are the Chicken Springs faults in northeast Sweetwater County where movement may have taken place within the last 15,000 years (Machette 1999). An active fault is a fault that has demonstrated movement within the last 15,000 years. The subsurface fault associated with the Table Rock Field is not considered active. The unit is located in an area of low risk from ground shaking if a maximum credible earthquake were to occur in the region (U.S. Geological Survey [USGS] 2010).

3.1.3 Minerals

3.1.3.1 Fluid Leasable Minerals

The major fluid minerals in the area are oil, natural gas, and coal bed methane. Geothermal energy also is considered a fluid mineral resource, but there are no identified geothermal resources in the project area.

Oil and Natural Gas. The Greater Green River Basin is estimated to contain undiscovered resources of 84 trillion cubic feet of natural gas and 131 million barrels of oil (USGS 2002). Table Rock Field is located in the vicinity of several other oil and gas fields which are listed in **Table 3-1** below.

Table 3-1 Oil and Gas Field Production in the Vicinity of the Table Rock Unit

Field Name and Location	Date Discovered/ Status	Producing Formation(s)	Oil: Cumulative Production[1] (barrels)	Gas: Cumulative Production[1] (thousand cubic feet)
Antelope T17N; R99-100W	1970/Active	Almond, Mesaverde	27,601	39,288,696
Delaney Rim T18N; R97-98W	1976/Active	Lewis, Almond	1,328,939	9,574,870
Desert Springs T20-21N; R97-98W	1958/Active	Fox Hills, Lance, Lewis, Almond	1,541,831	355,767,903
Desert Springs West T19-20N; R99W	1959/Active	Lewis, Almond	1,952,098	24,428,718
Higgins T17N; R98-99W	1969/Active	Almond, Lewis, Nugget, Weber	38,516	8,408,877
Neff T18N; R98W	1968/Abandoned	Almond	0	0

Table 3-1 Oil and Gas Field Production in the Vicinity of the Table Rock Unit

Field Name and Location	Date Discovered/ Status	Producing Formation(s)	Oil: Cumulative Production[1] (barrels)	Gas: Cumulative Production[1] (thousand cubic feet)
Patrick Draw T18-19N; R98-99W	1959/Active	Lance, Fox Hills, Lewis, Almond, Ericson	12,724,333	35,469,254
Sand Butte T17N; R99W	1960/Active	Mesaverde	0	3,076,100
Stage Stop T18N; R99W	1966/Active	Wasatch, Fort Union, Almond, Lance, Lewis	947,795	13,269,660
Table Rock T18N;R97-98W T19N; R97-98W	1946/Active	Ft. Union, Fox Hills, Lewis, Mesaverde, Frontier, Dakota, Morgan, Nugget, Weber, Madison	6,539,820	806,481,409
Table Rock Southwest T18N, R98W	1955/Active	Almond, Lewis, Mesaverde	19,397	36,357,602

[1] Production as of January 2010.

Source: WOGCC 2011a and Wyoming Geological Association 1992.

Coal Bed Methane. The total undiscovered coal bed methane resources of the Greater Green River Basin are estimated be about 1.5 trillion cubic feet of gas (USGS 2002). The project area is within an area of potential for production of coal bed methane from upper Cretaceous and Tertiary rocks. Anadarko has two coal bed methane projects in the area that are listed below in **Table 3-2**. Although the Copper Ridge Unit has reported production since July 2003, it is still classified as exploratory by the WOGCC.

Table 3-2 Coal Bed Methane Units in the Vicinity of the Proposed Project

Unit Name & Location	Date First Production/Status	Coal	Gas Cumulative Production[1] (thousand cubic feet)
Copper Ridge T16-17N; R100-101W	July 2003/Exploratory/shut-in	Undetermined	612,943
North Copper Ridge T17-18N, R100-101W	Not available/Exploratory	Undetermined	None

[1] Production as of January 2010.

Source: WOGCC 2011b.

3.1.3.2 Solid Leasable Minerals

Solid leasable minerals include coal, trona, and oil shale. Coal and trona are produced in substantial quantities in the Green River Basin. There are no trona leases in the project area and trona is mined in areas west and northwest of Rock Springs. However, there are federal coal leases west of the project area in T17N, R100W (BLM 1997). Although the Luman Tongue consists primarily of oil shale, there are no oil shale leases in the project vicinity.

3.1.3.3 Locatable Minerals

No locatable minerals or mining claims are present in the project area (BLM 1997).

3.1.3.4 Salable Minerals

There is a low potential for mineral materials (sand and gravel) in the project area (BLM 2008, 1997). The Wyoming Department of Transportation (WYDOT) has a sand and gravel pit in Section 4, T19N, R99W, west of the project area, but no pits are in the immediate vicinity (WDEQ 2011a).

3.2 Paleontological Resources

3.2.1 Regulatory Structure

Federal legislative protection for paleontological resources stems from the Antiquities Act of 1906 (P.L. 59-209; 16 USC 431 et seq.; 34 Stat. 225), which calls for protection of historic landmarks, historic and prehistoric structures, and other objects of historic or scientific interest on federally administered lands. Federal protection for scientifically important paleontological resources would apply to construction or other related project impacts that would occur on federally owned or managed lands. The National Registry of Natural Landmarks provides protection to paleontological resources.

The BLM manages paleontological resources (fossils) on federal lands under the following statutes and regulations (BLM 2011a):

- FLPMA (P.L. 94-579).
- NEPA (P.L. 91-190).
- Various sections of BLM's regulations found in Title 43 of the CFR Title 43 CFR that address the collection of invertebrate fossils and, by administrative extension, fossil plants.
- The Paleontological Resources Preservation Act (PRPA) of 2009. The law authorizes the BLM and U.S. Forest Service (USFS) to manage and provide protection to fossil resources using "scientific principles and expertise" (BLM 2011a).

In addition to the statutes and regulations listed above, fossils on public lands are managed through the use of internal BLM guidance and manuals. Included among these are the BLM Manual 8270 and the BLM Handbook H-8270-1 (BLM 2011a). Various internal instructional memoranda have been issued to provide guidance to the BLM in implementing management and protection to fossil resources.

3.2.2 Potential Fossil Yield Classification

The BLM adopted the Potential Fossil Yield Classification (PFYC) system to identify and classify fossil resources on federal lands (BLM 2007). Paleontological resources are closely tied to the geologic units (i.e., formations, members, or beds) that contain them. The probability for finding paleontological resources can be broadly predicted from the geologic units present at or near the surface. Therefore, geologic mapping can be used for assessing the potential for the occurrence of paleontological resources.

The PFYC system is a way of classifying geologic units based on the relative abundance of vertebrate fossils or scientifically significant fossils (plants and invertebrates) and their sensitivity to adverse impacts. A higher class number indicates higher potential. The PFYC is not intended to be applied to specific paleontological localities or small areas within units. Although significant localities may occasionally occur in a geologic unit, a few widely scattered important fossils or localities do not

necessarily indicate a higher class; instead, the relative abundance of significant localities is intended to be the major determinant for the class assignment.

The PFYC system is meant to provide baseline guidance for predicting, assessing, and mitigating paleontological resources. The classification should be considered at an intermediate point in the analysis, and should be used to assist in determining the need for further mitigation assessment or actions. The BLM intends for the PFYC System to be used as a guideline as opposed to rigorous definitions. Descriptions of the potential fossil yield classes are summarized in **Table 3-3**.

Table 3-3 Potential Fossil Yield Classification

Class	Description	Basis	Comments
1	Igneous and metamorphic (tuffs are excluded from this category) geologic units or units representing heavily disturbed preservation environments that are not likely to contain recognizable fossil remains.	Fossils of any kind known not to occur except in the rarest of circumstances. Igneous or metamorphic origin. Landslides and glacial deposits.	The land manager's concern for paleontological resources on Class 1 acres is negligible. Ground disturbing activities will not require mitigation except in rare circumstances.
2	Sedimentary geologic units that are not likely to contain vertebrate fossils or scientifically significant invertebrate fossils.	Vertebrate fossils known to occur very rarely or not at all. Age greater than Devonian. Age younger than 10,000 years before present. Deep marine origin. Aeolian origin. Diagenetic alteration.	The land manager's concern for paleontological resources on Class 2 acres is low. Ground disturbing activities are not likely to require mitigation.
3	Fossiliferous sedimentary geologic units where fossil content varies in significance, abundance, and predictable occurrence. Also sedimentary units of unknown fossil potential.	Units with sporadic known occurrences of vertebrate fossils. Vertebrate fossils and significant invertebrate fossils known to occur inconsistently; predictability known to be low. Poorly studied and/or poorly documented. Potential yield cannot be assigned without ground reconnaissance.	The land manager's concern for paleontological resources on Class 3 acres may extend across the entire range of management. Ground disturbing activities will require sufficient mitigation to determine whether significant paleontological resources occur in the area of a proposed action. Mitigation beyond initial findings will range from no further mitigation necessary to full and continuous monitoring of significant localities during the action.

Table 3-3 Potential Fossil Yield Classification

Class	Description	Basis	Comments
4	Class 4 geologic units are Class 5 units (see below) that have lowered risks of human-caused adverse impacts and/or lowered risk of natural degradation.	Significant soil/vegetative cover; outcrop is not likely to be impacted. Areas of any exposed outcrop are smaller than 2 contiguous acres. Outcrop forms cliffs of sufficient height and slope that most is out of reach by normal means. Other characteristics that lower the vulnerability of both known and unidentified fossil localities.	The land manager's concern for paleontological resources on Class 4 acres is toward management and away from unregulated access. Proposed ground disturbing activities will require assessment to determine whether significant paleontological resources occur in the area of a proposed action and whether the action will impact the paleontological resources. Mitigation beyond initial findings will range from no further mitigation necessary to full and continuous monitoring of significant localities during the action.
5	Highly fossiliferous geologic units that regularly and predictably produce invertebrate fossils and/or scientifically significant invertebrate fossils, and that are at risk of natural degradation and/or human-caused adverse impacts.	Vertebrate fossils and/or scientifically significant invertebrate fossils are known and documented to occur consistently, predictably, and/or abundantly. Unit is exposed; little or no soil/vegetative cover. Outcrop areas are extensive; discontinuous areas are larger than 2 contiguous acres. Outcrop erodes readily; may form badlands. Easy access to extensive outcrop in remote areas. Other characteristics that increase the sensitivity of both known and unidentified fossil localities.	The land manager's highest concern for paleontological resources should focus on Class 5 acres. Mitigation of ground disturbing activities is required and may be intense. Areas of special interest and concern should be designated and intensely managed. Two of the named geologic formations exposed in the project area are categorized as Class 5.

Sources: BLM 2008, 2007.

Paleontological resources within sedimentary deposits exposed at the surface record the history of animal and plant life in Wyoming during the early part of the Cenozoic Era (Paleocene and Eocene Epochs). Three geologic units are exposed at the surface within the project area: 1) unnamed deposits of Quaternary (Holocene) age; 2) Green River Formation of middle Eocene age; and 3) Wasatch Formation of early to middle Eocene age (BLM 2003).

The Green River Formation originated as sediments deposited in Lake Gosiute, a large lake that repeatedly increased and decreased in size over several million years. Deposits in the low-lying terrestrial areas adjacent to the lake became the Wasatch Formation. The alternating lake/terrestrial periods resulted in interfingering deposits termed members, a subgroup of formations.

3.2.2.1 Green River Formation

Plant, invertebrate (ostracod), and vertebrate fossils (fish and bird) are well known from the lower part of the Wilkins Peak Member. Freshwater gastropods, such as *Goniobasis tenera* and *Viviparus sp.*, and the large unionid bivalve, *Lampsilis* as well as fish fossils occur abundantly in the Tipton Tongue, and at least one fossil mammal locality has been reported. The fossil mammal locality discovered in an ostracodal limestone, produced the mold of a jaw of the early horse *Hyracotherium*, with incisors preserved and molar impressions. Fish fossils from the Green River Formation are known worldwide because of their superb preservation and high abundance.

Fossils of fresh water mollusks are abundant throughout the Luman Tongue and the assemblages of fossils are commonly characterized by the large prosobranch gastropods Goniobasis tenera and *Viviparus sp.*, and by the large unionid bivalve, *Lampsilis*. Fish, ostracod, and trace fossils also are common in the Luman Tongue (Roehler 1992). The BLM considers the Green River Formation a Class 5 formation.

3.2.2.2 Wasatch Formation

The high paleontological potential of the Wasatch Formation in southern Wyoming is well known. Along the east flank of the Rock Springs Uplift, both the Niland Tongue and main body contain accumulations of fossil vertebrates (fish, turtles, crocodiles, birds, and mammals), invertebrates (snails and clams), and traces and tracks of these organisms and fossil plants. Vertebrate remains include isolated bones and teeth and rarely articulated skeletal parts. The fossil mammals include primates, insectivores, marsupials, condylarths, (archaic hoofed animals), artiodactyls, perissodactyls, carnivores, creodonts, bats, rodents, arctocyonids, and tillodonts (BLM 2003).

Numerous fossil vertebrate localities have been identified in the Wasatch Formation along the east flank of the uplift (BLM 2003). Fossil vertebrate localities occur in the Niland Tongue. Fossil localities are known from the main body of the formation exposed in the area of the Patrick Draw Road. The BLM considers the Wasatch Formation to be a Class 5 formation.

3.3 Soils

This section provides context for the evaluation of potential Project-induced environmental consequences to soil resources occurring within the project area. Baseline information used to characterize soils was derived from the University of Wyoming, Soils of Wyoming: A Digital Statewide Map at 1:500,000-Scale, data review and analyses (Munn and Arneson 1998). This mapping was developed using soil-landscape models and available data in the form of published soil surveys, maps, and reports of the Natural Resources Conservation Service (NRCS), the USFS, the BLM, and numerous theses and scientific papers published by the Wyoming Agricultural Experiment Station and the University of Wyoming.

3.3.1 Regional Overview

Soil resources within the project area have formed within the Cool Central Desertic Basins, Mountains, and Plateaus, Major Land Resource Area (MLRA) 34A (U.S. Department of Agriculture [USDA]-NRCS 2006). The physiography of the area is characterized by alluvial fans, piedmont plains, and pediments slopes from the surrounding mountains that form broad intermountain basins. The topography ranges from nearly level to steep and slopes are commonly dissected. Most of the soils formed in alluvium, slope alluvium, or residuum derived from sedimentary materials. Many of the soils are shallow or moderately deep to shale or sandstone bedrock. The average annual precipitation generally is 7 to 12 inches, but it can range from 7 to 32 inches (180 to 815 millimeters). Much of the precipitation occurs as snow from October through April and as rain from May through September.

The dominant soil orders in this MLRA are Aridisols and Entisols. Aridisols form in an arid or semi-arid climate. Aridisols are well developed soils that have a very low concentration of organic matter. In contrast, Entisols are considered recent soils that lack soil development because erosion or deposition rates occur faster than the rate of soil development.

3.3.2 Soil Characteristics within the Project Area

Soils in Wyoming are a function of climate, vegetation communities, topography, geologic parent materials, and time (Munn and Arneson 1998). The bedrock within the project area is composed of several different Tertiary-aged sedimentary formations. These sedimentary parent materials influence the soil physical and chemical characteristics and vegetation communities. In some cases, the parent materials are high in salts, sodium, and selenium, which often limits reclamation opportunities and presents unique challenges in controlling soil erosion and degradation. Soils that occur on the tertiary bedrock range from Haplocambids to Torriorthents. Fluvents occur along ephemeral channels. The project area contains Psamments on stabilized sand dunes and salinized soils in playas and bottomlands. Sodium-affected soils (Natrargids) occur on alluvial fans on high sodium parent materials. Much of the project area has been previously disturbed and soil cover is sparse in some areas or consists of halogeton and other weedy species. The soils for this location in Sweetwater County include map units WY10, WY17, and WY40, which are described in further detail below.

Approximately 7 percent of the soils in the project area are Typic Torripsamments (map unit WY10). In this intermountain basin environment, Typic Torripsamments occur on stabilized dunes intermingled with active dune lands. Thin topsoil horizons are evident at the dune surface; however, soil development in these soils is poor. These soils have developed in eolian parent materials. These soils include strongly alkaline fine sand to coarse loamy soils about 60 inches deep, and are excessively drained. These soils occur as nearly level to undulating alluvial bottomlands and fans with scattered dune lands. Where these soils are undisturbed the sand is stabilized by vegetation, and the potential for water erosion is slight and wind erosion is moderate. In disturbed or unstabilized dune communities, the hazard for wind erosion is severe. In addition to being wind erodible, eolian deposits also are droughty which limits mitigation opportunities when coupled with the harsh, arid climate.

Approximately 35 percent of the soils in the project area are comprised of Rock Outcrop and loamy-skeletal, Typic Torriorthents (map unit WY17). These poorly developed stony soils occupy ridge crests intermixed with areas of rock outcrop. These soils range in depth from very shallow to moderately deep. The soils tend to be much coarser than the soils on the adjacent lower slopes, and contain hard clasts of local bedrock. The adjacent lower slopes generally developed from shale residuum, which weathers to fine textured clays, and slope alluvium. These clays result in poor infiltration, high runoff, and high potential for slumping. Sensitive soils are found on steeper slopes (greater than 25 percent) and areas of exposed bedrock, often associated with badlands.

Approximately 58 percent of the project area is comprised of the soils in map unit WY40, described in the subsequent text. Ustic Haplocambids are moderately to weakly developed and occur on gentle to steep slopes. Coarse-loamy, Ustic Torriorthents have soil textures that generally range from silt loams to sandy loams. Loamy-skeletal, Typic Torrifluvents have 35 percent or more rock fragments and textures range from sands to sandy clay loams. This portion of the project area also has shallow and moderately deep Haplocambids and poorly developed Torriorthents occurring on slopes along ephemeral channels. Torrifluvents formed in alluvial deposits along larger gully and drainage bottoms and are very deep. Bottomland soils have developed primarily in alluvial deposits. These bottomland soils can be saline or sodic in relation to the parent material they are derived from. Revegetation potential may be limited due to the chemical characteristics of these soils.

3.4 Water Resources

This section addresses surface water and groundwater resources that may be affected by the proposed Table Rock Unit Project (Project). The assessment of potential impacts to these resources was based on desktop analyses of existing information.

3.4.1 Surface Water

According to the Watershed Boundary Dataset, the majority of the project site is located in the Patrick Draw-Bitter Creek and Bitter Creek-Antelope Creek watersheds within the Upper Green Basin, with a small portion in the Salt Sage Draw Watershed within the Great Divide Closed Basin (USDA-NRCS et al. 2010). These watersheds do not contain any U.S. Environmental Protection Agency (USEPA), state, or

locally designated surface water protection areas (Medina 2011; USEPA 2011a; WDEQ 2004). **Table 3-4** describes the project area location and acreage by watershed.

Table 3-4 Project area Acreage by Watershed Boundary

Region	Sub-region	Basin	Sub-basin	Watershed	Sub-watershed	Hydrologic Unit Code	Acres
Upper Colorado	Great Divide-Upper Green	Upper Green	Bitter Creek	Bitter Creek-Patrick Draw	Lower Patrick Draw	140401050201	10,405
				Bitter Creek-Antelope Creek	Red Wash	140401050107	2,559
		Great Divide Closed Basin	Great Divide Closed Basin	Salt Sage Draw	Upper Salt Sage Draw	140402000601	680

Source: USDA-NRCS et al. 2010.

Streams in the project area are classified by the National Hydrography Dataset (NHD) (USGS 2011) as all being intermittent; however evidence through literature review and past field reconnaissance would indicate these waterways are likely ephemeral in nature, only flowing in direct response to runoff events caused by direct precipitation and seasonal events such as snowmelt and runoff.

Streams in the Bitter Creek-Patrick Draw Watershed flow to the northwest off of the divide between Patrick Draw and Red Wash, then turn southwest below the Project boundary toward Bitter Creek. As mapped, these streams terminate in a low-lying area approximately 6 miles downstream of the Project's northwestern boundary. Streams in the Bitter Creek-Antelope Creek watershed drain to the south, where they join with a perennial reach of Bitter Creek approximately 6 miles downstream of the Project's southern boundary. Bitter Creek joins the Green River over 60 miles downstream at the town of Green River, Wyoming. The Green River is part of the Colorado River system, and as such is monitored under the Colorado River Basin Salinity Control Program. Only one waterway is identified that drains to the Salt Sage Draw Watershed (Great Divide Closed Basin), and it crosses a small portion (approximately 300 feet) of the eastern project area.

3.4.1.1 Surface Water Quality

The CWA, Section 303(c), requires each state to review, establish, and revise water quality standards for all surface waters within the state. To comply with this requirement, Wyoming has developed a beneficial use classification system to describe state-designated use(s). Section 303(d) of the CWA also requires states to list all streams that do not meet their water use classifications, and are therefore considered impaired streams.

No streams in the project area are listed as impaired or threatened by the State of Wyoming (WDEQ 2010a); however, Bitter Creek's designated uses of recreation and aquatic life, non-game fish are not supported approximately 30 miles downstream from the project area due to fecal coliform and chloride concentrations, respectively, from unknown and/or natural sources (WDEQ 2010a).

Erosion caused by surface water runoff on existing roads within the project area may increase sediment delivery and turbidity levels below stream crossings and where roads are adjacent to drainages.

3.4.1.2 Surface Water Use

Water use of both surface water and groundwater in the State of Wyoming is administered by the WSEO. There are no surface water rights within the project area (WSEO 2011).

3.4.2 Groundwater

The Upper Colorado River Basin regional aquifer system underlies an area of approximately 20,000 square miles in the southwestern part of Wyoming, which equates to approximately one-quarter

the total area of the state (Whitehead 1996). This aquifer system, also referred to as the Colorado Plateaus aquifer system, extends extensively to the south into Colorado, Utah, New Mexico, and Arizona. The aquifer system underlies approximately 130,000 square miles in total (Robson and Banta 1995; Whitehead 1996), with approximately 15 percent of the total aquifer system area in Wyoming.

The Tertiary-aged Wasatch-Fort Union formation is the shallowest principal aquifer that underlies the project site and is considered part of the Upper Colorado River Basin regional aquifer system by Whitehead (1996). Surficial geologic mapping indicates that Quaternary-aged eolean sands are present on the surface in nearby areas (Case et al. 1998), which may constitute surficial aquifers of small aerial extent. Below the surficial and Wasatch-Fort Union aquifers are the Cretaceous-aged Fox-Hills and Mesaverde aquifers and the Jurassic-aged Cloverly aquifer (Whitehead 1996). The four named, more extensive aquifers are described in further detail below.

3.4.2.1 Wasatch-Fort Union Aquifer

The Wasatch-Fort Union aquifer is composed of two water-bearing zones, one in the Wasatch Formation, and the other in the Fort Union Formation. These zones are generally considered as one hydrostratic unit (Bartos and Hallberg 2010; Whitehead 1996) because of their direct hydrologic communication. The Wasatch zone is composed of sandstone interbedded with fine grained sedimentary rocks approximately 1000 feet thick, with groundwater flow direction generally to the northeast in the project area (Bartos and Hallberg 2010). The Fort Union zone is directly below the Wasatch zone and also comprised of sandstone and fine grained sedimentary rocks approximately 1,000 feet thick in the project area; groundwater flow direction is not well defined in the project area due to a lack of monitoring wells (Bartos and Hallberg 2010).

The Wasatch-Fort Union aquifer has been reported to be 11,000 feet thick near Pinedale, Wyoming, and approximately 7,000 feet thick in the center of the Great Divide Basin (Whitehead 1996), both of which are north of the project area. The Green River Formation acts as an overlying confining unit in the project area and over much of this aquifer (Roehler 1992; Whitehead 1996).

Depth to the top of the water bearing unit in shallower stock watering wells and one domestic well located in the project area (see Section 3.1.1.2) average approximately 275 feet below ground surface (bgs) with static water levels averaging approximately 115 feet (WSEO 2008), indicating confined conditions in the shallow aquifer.

3.4.2.2 Fox Hills Aquifer

The Fox Hills aquifer is composed of sandstone interbedded with siltstone, shale, and coal. This aquifer generally downwarps and faults in the structural basins of Wyoming, and contains saline water in the deeper areas. Wells are reported to yield approximately 5 to 50 gallons per minute (gpm), but may be as high as 1,000 gpm in certain locations (Whitehead 1996). Well bore records indicate that the Fox Hills aquifer is approximately 5,000 feet bgs in the project area. The Lewis Shale is found below the Fox Hills aquifer, and it hydraulically separates the Fox Hills from the underlying Mesaverde in this area with a thickness of approximately 1,000 feet (Roehler 1993).

3.4.2.3 Mesaverde Aquifer

The Mesaverde aquifer is composed of sandstone interbedded with shale. Both the Almond Formation and the Blair Formation are considered as part of the Mesaverde aquifer (Bartos and Hallberg 2010). The top of the Mesaverde formation is approximately 6,200 feet bgs in the project area (Roehler 1993).

3.4.2.4 Cloverly Aquifer

The Cloverly aquifer is the deepest aquifer in the project area, and is equivalent to the more-widely recognized Dakota aquifer (Whitehead 1996). It also is composed of sandstone that is confined by overlying and underlying confining units.

3.4.2.5 Groundwater Quality

Groundwater quality is classified and regulated by the WDEQ, Water Quality Division (WQD). Standards have been established, and waters are classified for application of these standards (Bartos et al. 2010).

Water quality can generally be expected to deteriorate with increased depth (Bartos et al. 2010). The **Table 3-5** summarizes the classifications of groundwater quality as defined by WDEQ-WQD (2005).

Table 3-5 Wyoming Groundwater Use Classification

I	Class I Groundwater is suitable for domestic use. The ambient quality of underground water of this suitability includes not exceeding total dissolved solids concentrations of 500 milligrams per liter (mg/l), among other standards.
II	Class II Groundwater is suitable for agricultural use where soil conditions and other factors are adequate. The ambient quality of underground water of this suitability includes not exceeding total dissolved solid (TDS) concentrations of 2,000 mg/l, among other standards.
III	Class III Groundwater is suitable for livestock. The ambient quality of underground water of this suitability includes not exceeding TDS concentrations of 5,000 mg/l, among other standards.
A	Class Special (A) is suitable for fish and aquatic life. The ambient quality of underground water of this suitability includes the standards set for Class I, II, or III, and shall not contain any biological, hazardous, toxic, or potentially toxic materials or substances that would affect natural biota.
IV (A)	Class IV (A) Groundwater is suitable for industry. The ambient quality of underground water of this suitability includes not exceeding TDS concentrations of 10,000 mg/l.
IV (B)	Class IV (B) Groundwater is suitable for livestock. The ambient quality of underground water of this suitability includes TDS concentrations in excess of 10,000 mg/l.
V	Class V Groundwater is closely associated with commercial deposits of hydrocarbons and/or other minerals, or is considered a geothermal resource. Discharge into Class V (Hydrocarbon Commercial) is to be used for oil and gas production but must not degrade, pollute, or waste other water resources.

Source: WDEQ 2005.

Water in the Wasatch-Fort Union aquifer is generally of good quality with areas of highly saline water where it is deeply buried (Whitehead 1996). Bartos et al. (2010) reports water quality in the Wasatch zone as having TDS of approximately 1,000 mg/l in the project area. This indicates that this aquifer may be a Class II Groundwater. However, other constituents exceed standards for domestic, agriculture, and livestock (Bartos et al. 2010), and would need to be considered in the classification of this aquifer.

Water in the Fox Hills aquifer is reported to have TDS concentrations ranging from 3,330 to 64,800 mg/l, with a median of nearly 15,000 mg/l in the region surrounding the project area. Other constituents exceed standards for domestic, agriculture, and livestock (Bartos et al. 2010). This indicates the aquifer would fall within the Class IV Groundwater designations.

Water in the Mesaverde aquifer is reported to have TDS concentrations exceeding 10,000 mg/l in the project area. Other constituents exceed standards for domestic, agriculture, and livestock (Bartos et al. 2010), indicating that the aquifer is a Class IV (B) Groundwater.

Water in the Cloverly aquifer is reported to have TDS concentrations ranging from 426 to 26,200 mg/l, with a median of 6,480 mg/l. Other constituents exceed standards for domestic, agriculture, and livestock (Bartos et al. 2010), indicating this aquifer also falls within the Class IV Groundwater designations.

3.4.2.6 Groundwater Use

Water use of both surface water and groundwater in the State of Wyoming is administered by the WSEO. WSEO records list 13 well permits on record in the project area. These wells have beneficial uses of miscellaneous (5), stock watering (3), industrial (4), and domestic (1). The domestic and stock watering wells have total well depths ranging from 200 to 380 feet bgs, and the miscellaneous and industrial wells have total depths ranging from 540 to 6,927 feet bgs (WSEO 2011, 2008).

The same records list 247 well permits within an arbitrarily selected 5-mile radius of the project area. Beneficial uses in this area include monitoring (190), miscellaneous (26), stock watering (15), industrial (13), and domestic (7) (WSEO 2008). Domestic and stock watering wells within this radius of the project area report depths to water bearing unit ranging from 0 foot bgs to 555 feet bgs, while wells with industrial use indicate a range from 200 to 3,273 feet bgs for the top of the water-bearing unit, with an average of approximately 1,090 feet bgs (WSEO 2008).

These records indicate that water used for consumption by humans or livestock is obtained from the surficial eolean sands or shallower Wasatch-Fort Union aquifer. Only water for industrial, miscellaneous, or monitoring purposes has its source from the Fox Hills aquifer or deeper.

3.5 Vegetation, Noxious Weeds, and Invasive Species

3.5.1 Vegetation Types

The project area is located at the intersection of the Wyoming Basin rolling sagebrush steppe/salt desert shrub basin floristic regions of south-central Wyoming. This ecoregion is characterized as a broad arid intermontane basin interrupted by hills and low mountains and dominated by grasslands and shrublands. The semiarid Rolling Sagebrush Steppe is a vast region of rolling plains with hills, cuestas, mesas, terraces, and near the mountains, footslopes, ridges, alluvial fans, and outwash fans. The arid Salt Desert Shrub Basins ecoregion includes disjunct playas and sand dunes scattered throughout the Wyoming Basin. Vegetation community characterizations were compiled and described below using the Wyoming subset of the Northwest (NW) Regional Gap Analysis Project (ReGAP) (USGS 2004). Six vegetation cover types occur within the project area and include grassland, shrubland, wetland/ riparian, dune, barren, and developed lands. The developed lands cover type was created using a modified NW ReGAP data set that has been updated to reflect current existing disturbance. Distribution and composition of each vegetation cover type varies based on landscape position, soil type, climatic conditions, moisture, elevation, aspect, and grazing and land management practices. Descriptions of the plant communities within each vegetation cover type are provided in the following text. Species nomenclature is consistent with the NRCS Plants Database (USDA 2010). **Table 3-6** summarizes the vegetation cover types and associated acreage within the project area. **Figure 3-1** illustrates the vegetation cover types within the project area.

Table 3-6 Vegetation Cover Types within the Project Area

Vegetation Cover Type	Acreage within the Project Area	Percent of Project Area
Shrubland	11,886	87
Dune	642	5
Grassland	325	2
Wetland/riparian	277	2
Barren	111	1
Developed	392	3
TOTAL	**13,633**	**100**

Source: USGS 2004.

3.5.1.1 Shrubland

The shrubland vegetation type is comprised of three vegetation classes: Intermountain Basin Big Sagebrush Shrubland, Intermountain Basin Mat Sagebrush Shrubland, and Intermountain Basin Mixed Salt Desert Scrub. The shrubland vegetation cover type comprises approximately 90 percent (12,210 acres) of the vegetation within the project area. This type is most commonly found in broad basins, on plains, or in foothills. Widely distributed within the project area, this cover type is dominated by

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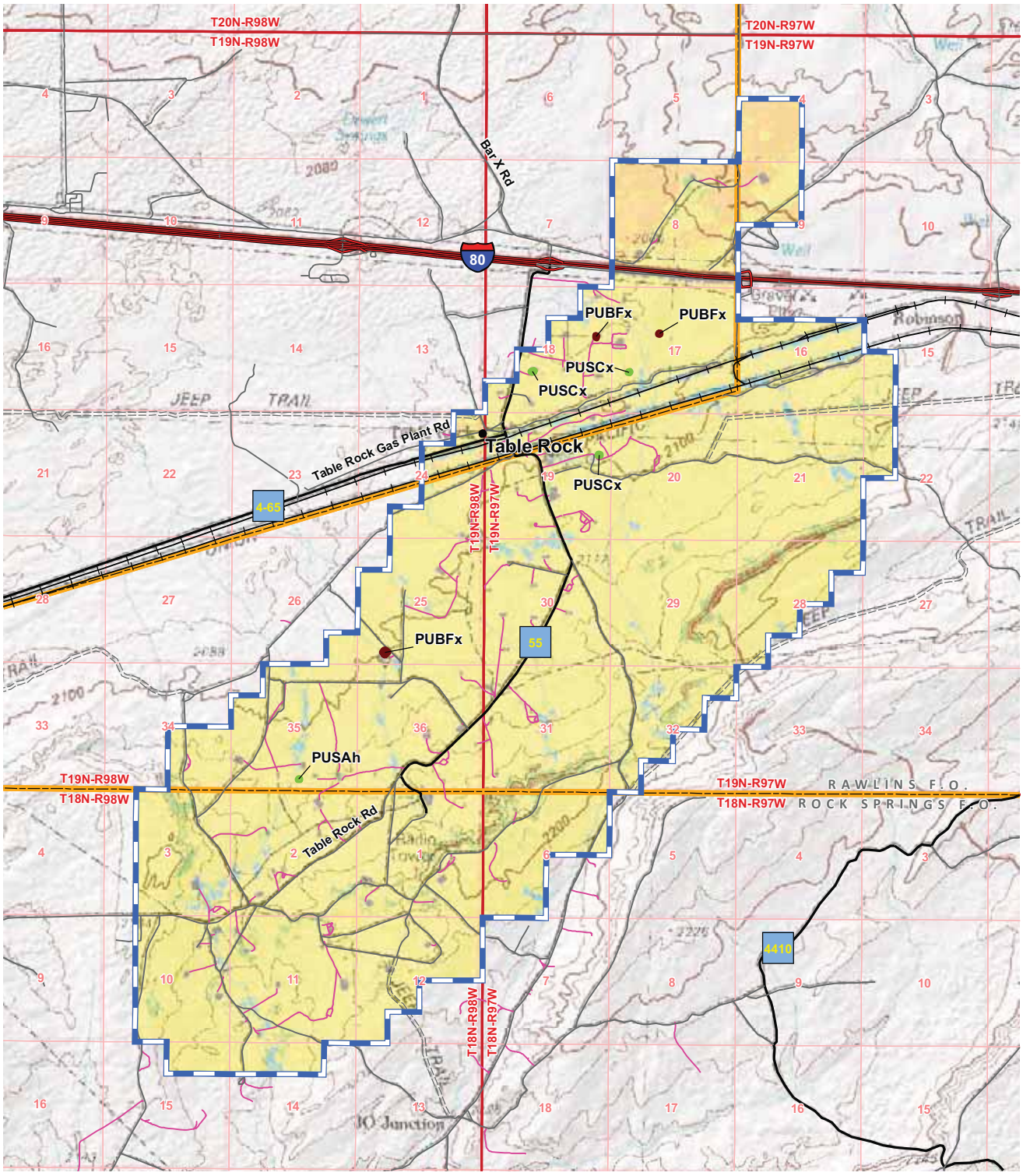

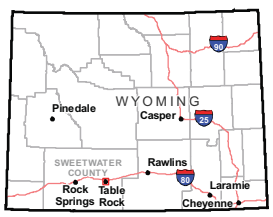

Legend

- Town
- Project Boundary
- BLM Field Office Boundary

Palustrine Wetlands (Not to Scale)

- Unconsolidated Bottom
- Unconsolidated Shore

Vegetation Classification

- Barren
- Developed
- Dune
- Grassland
- Shrubland
- Wetland/Riparian

Figure 3-1

Vegetation and Wetlands in Project Area

0 0.5 1 2 Miles
0 0.5 1 2 Kilometers
1:75,000
N

numerous shrub species including basin big sagebrush (*Artemisia tridentata* spp. *tridentata*), Wyoming big sagebrush (*Artemisia tridentata* spp. *wyomingensis*), bitterbrush (*Purshia* spp.), rabbitbrush (*Chrysothamnus* spp.), mat saltbush (*Atriplex corrugate)*, Gardner saltbush (*Atriplex gardneri*), birdfoot sage (*Artemisia pedatifida)*, longleaf wormwood (*Artemisia longifolia),* bud sagebrush (*Picrothamnus desertorum)*, or winterfat (*Krascheninnikovia lanata)*. Understory grass species comprise less than 25 percent of the total cover and may include the following species: western wheatgrass (*Pascopyrum smithii*), bottlebrush squirreltail (*Elymus elymoides)*, and Sandberg bluegrass (*Poa secunda)* (USGS 2004).

3.5.1.2 Dune

The dune vegetation type is comprised of one vegetation class: Inter-Mountain Basins Active and Stabilized Dune. The dune vegetation cover type comprises approximately 5 percent (655 acres) of the vegetation within the project area. This habitat develops in environments subjected to high winds with sandy soils. Vegetation is sparse on active, moving dunes and moderate on more stabilized dunes. Early and mid-seral species occupying stabilized dune complexes may include basin big sagebrush, mountain big sagebrush (*Artemisia tridentata* ssp*. vaseyana*), three-tip sagebrush (*Artemisia tripartita* ssp*. tripartita*), rabbitbrush, needle-and-thread (*Hesperostipa comata)*, and Idaho fescue (*Festuca idahoensis*) (USGS 2004).

3.5.1.3 Grassland

The grassland vegetation type is comprised of three vegetation classes: Intermountain Basin Big Sagebrush Steppe, Intermountain Basin Montane Sagebrush Steppe, and Wyoming Basin Dwarf Sagebrush Shrubland and Steppe. The grassland vegetation cover type comprises approximately 2 percent (326 acres) of the vegetation within the project area. The type is dominated by perennial grasses and forbs with various sagebrush species co-dominating the open to moderately dense shrub layer. Common grass species include Indian ricegrass (*Achnatherum hymenoides*), plains reedgrass (*Calamagrostis montanensis*), thickspike wheatgrass (*Elymus lanceolatus* ssp. *Lanceolatus*), Idaho fescue, rough fescue (*Festuca campestris*), prairie junegrass (*Koeleria macrantha*), Sandberg bluegrass, and bluebunch wheatgrass (*Pseudoroegneria spicata*). Common overstory shrub species include basin big sagebrush, Wyoming big sagebrush, big sagebrush (*Artemisia tridentata* ssp. x*ericensis*), antelope bitterbrush (Purshia tridentata), shadscale saltbush (*Atriplex confertifolia)*, rabbitbrush, horsebrush (*Tetradymia* spp.), and prairie sandwort (*Artemisia frigid*a) (USGS 2004).

3.5.1.4 Wetland/Riparian

The wetland/riparian vegetation type is comprised of three vegetation classes: Intermountain Basin Greasewood Flat, Western Great Plains Riparian Woodland and Shrubland, and Western Great Plains Saline Depression Wetland. The wetland/riparian vegetation cover type comprises approximately 2 percent (285 acres) of the vegetation within the project area. This type is typically associated with stream and creekside woodlands and shrublands occurring within shortgrass prairie or other types of grasslands. Dominant species may include the Russian olive (*Elaeagnus angustifolia)*, tamarisk (*Tamarix* spp.), willows (*Salix* spp.), and silver sagebrush (*Artemisia cana*) with an herbaceous understory composed of grasses including little bluestem (*Schizachyrium scoparium)*, western wheatgrass, and sand dropseed (*Sporobolus cryptandrus)* (USGS 2004).

3.5.1.5 Barren

The barren cover type is comprised of two vegetation classes: Intermountain Basins Cliff and Canyon and Intermountain Basins Shale Badland. The barren vegetation cover type comprises approximately 1 percent (110 acres) of the vegetation within the project area. The cliff/canyon component of this vegetation cover type includes barren and sparsely vegetated landscapes of steep cliff faces, narrow canyons, and smaller rock outcrops. Also included is vegetation of unstable scree and talus slopes that typically occurs below cliff faces. The vegetation is very sparse at best, and consists of scattered dwarf-shrubs including Gardner saltbush, birdsfoot sage or shrubs including shadscale saltbush, Wyoming big sagebrush, greasewood (*Sarcobatus vermiculatus)*, yellow rabbitbrush (*Chrysothamnus viscidiflorus),* and grasses including western wheatgrass and Sandberg bluegrass (USGS 2004).

3.5.1.6 Developed

The developed cover type is comprised of two classes: Low Intensity Developed and Open Space Developed. The developed cover type comprises 3 percent (392 acres) of the vegetation within the project area and includes lands that have been disturbed by well field development including buildings and well pads (USGS 2004).

3.5.2 Noxious Weeds and Invasive Species

An increasing concern on public, state, and private lands is the introduction, spread, and proliferation of noxious weeds and invasive plants. In compliance with the Wyoming Weed and Pest Control Act of 1973, a total of 24 plant species are defined as designated and prohibited noxious weed species (Designated Noxious Weeds W.S. 11-5-102 (a)(xi) and Prohibited Noxious Weeds W.S. 11-12-104) (Wyoming Department of Agriculture no date). In addition to the Wyoming state designated species, management is required for county-specific species for Sweetwater County, Wyoming (Wyoming Department of Agriculture 2011) and the RSFO (BLM 2011b). The state is required to manage weeds on the state and county lists. The BLM can only require management for the BLM-listed weed species on public lands.

Based on consultation with a Sweetwater County representative (2011), there is the potential for six noxious weed species (Russian knapweed, musk thistle, Canada thistle, whitetop, halogeton, and black henbane) to occur within the project area. **Table 3-7** lists the noxious weeds and invasive species on the relevant lists and their potential to occur in the project area.

Table 3-7 Noxious Weed Species Potentially Occurring within the Project Area

Common Name	Scientific Name	Wyoming Noxious Weed List	Sweetwater County, Wyoming Weed List	BLM Additional Management Species	Potentially Present Within Project Area
Russian knapweed	*Acroptilon repens*	X			X
Skeletonleaf bursage	*Ambrosia tomentosa*	X			
Common burdock	*Arctium minus*	X			
Cheatgrass	*Bromus tectorum*			X	
Whitetop	*Cardaria draba* and *C. pubescens*	X			X
Musk thistle	*Carduus nutans*	X			X
Plumeless thistle	*Carduus* spp.	X			
Spotted knapweed	*Centaurea biebersteinii*	X			
Diffuse knapweed	*Centaurea diffusa*	X			
Canada thistle	*Cirsium arvense*	X			X
Field bindweed	*Convolvulus arvensis*	X			
Houndstongue	*Cynoglossum officinale*	X			
Quackgrass	*Elymus repens*	X			
Leafy spurge	*Euphorbia esula*	X			

Table 3-7 Noxious Weed Species Potentially Occurring within the Project Area

Common Name	Scientific Name	Wyoming Noxious Weed List	Sweetwater County, Wyoming Weed List	BLM Additional Management Species	Potentially Present Within Project Area
Lady's bedstraw	*Galium verum*		X		
Wild licorice	*Glycyrrhiza lepidota*		X		
Halogeton	*Halogeton glomeratus*			X	X
Foxtail barley	*Hordeum jubatum*		X		
Black henbane	*Hyoscyamus niger*		X		X
Common St. Johnswort	*Hypericum perforatum*	X			
Dyer's woad	*Isatus tinctoria*	X			
Perennial pepperweed	*Lepidium latifolium*	X			
Oxeye daisy	*Leucanthemum vulgare*	X			
Dalmation toadflax	*Linaria dalmatica*	X			
Yellow toadflax	*Linaria vulgaris*	X			
Purple loosestrife	*Lythrum salicaria*	X			
Scotch thistle	*Onopordum acanthium*	X			
Perennial sowthistle	*Sonchus arvensis*	X			
Saltcedar	*Tamarix ramosissima*	X			
Common tansy	*Tanacetum vulgare*	X			
Mountain thermopsis	*Thermopis montana*		X		

Source: BLM 2011b; Sweetwater County 2011; Wyoming Department of Agriculture 2011 and no date.

3.6 Wetland and Riparian Resources

The term "wetlands" has a regulatory definition defined in 33 CFR 328.7(b) as "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." Under the USACE 1987 Wetland Delineation Manual, a "three-parameter" approach is required for delineating wetlands (USACE 1987). Based on this approach, areas are identified as wetlands if they exhibit hydrophytic plants, hydric soils, and at least periodically saturated conditions at some time during the growing season of the prevalent vegetation (USACE 1987; Wetland Training Institute 1995). Within the project area, an area would need to be saturated for a period of approximately 15 days to support vegetation adapted to saturated soils based on the average number of days above 32 degrees Fahrenheit (°F) (NRCS 2002). Final regulatory authority and delineation boundaries for wetlands within the project area lie with the USACE.

Based on the USFWS National Wetland Inventory (NWI) data available, two wetland types were identified within the project area: 1) palustrine unconsolidated bottom (totaling approximately 1.3 acres) and 2) palustrine unconsolidated shore (totaling approximately 0.9 acre) (USFWS 2011a) as illustrated in **Figure 3-1**. The spatial extent of wetlands presented in this section is less than those presented above in Section 3.5.1.4, Wetland/Riparian, as a result of the use of two distinct datasets (i.e., NW ReGAP versus NWI). Although site-specific wetland/waterbody delineations were not completed, cursory field reconnaissance efforts indicate that the values presented within this section are more consistent with on-site conditions.

3.7 Wildlife and Aquatic Resources

As discussed in Section 3.5, Vegetation and Noxious Weeds and Section 3.6, Wetland and Riparian Resources, the project area includes six habitat types including grassland, shrubland, dune, wetland/riparian, barren, and developed lands. Baseline descriptions of both resident and migratory wildlife include species that have either been documented within the project area or those that may occur in the region based on habitat associations. Wildlife species that may occur within the project area are typical of the grassland/shrubland communities of south-central Wyoming.

3.7.1 Big Game Species

Big game species that occur in the project area include pronghorn and mule deer, and elk (BLM 2008, 1997; WGFD 2010, 2004). Approximately 880 acres of crucial winter/yearlong pronghorn range occurs within the project area (**Table 3-8**; **Figure 3-2**). Crucial winter range, designated by the WGFD, is considered to be essential for pronghorn during the winter months (November 15 to April 30). This seasonal range provides adequate forage and thermal cover for over-winter survival and reproduction requirements, particularly during severe winters.

Table 3-8 Important Big Game Seasonal Range within the Project Area

Species	Seasonal Range Type[1]	Acres
Pronghorn	Crucial Winter/Yearlong	880

[1] Crucial Winter/Yearlong = Animals occupy the habitat year-round but concentrate in this habitat during the winter months (especially during severe winters) as both resident and migratory herds mix together.

Pronghorn are fairly common and occur throughout the project area. Pronghorn inhabit grasslands and semi-desert shrublands on flat to rolling topography and browse on shrubby plants, especially sagebrush, throughout the year. During the winter, pronghorn generally utilize areas of relatively high sagebrush densities and overall low snow accumulations, on south- and east-facing slopes.

Mule deer also occur throughout the project area, but are generally found in rolling hills and drainages. Mule deer feed on a wide variety of plants including forbs, grasses, sedges, shrubs, and trees. Like pronghorn, winter habitat for mule deer occurs in areas of relatively high sagebrush densities and overall low snow accumulation, on south- and east-facing slopes. The project area does not contain any mule deer crucial winter range.

Elk typically are not found within the project area, although they may occasionally migrate through the project area in the fall and spring. Elk in this region of Wyoming are usually found in low densities away from human disturbance (e.g., oil and gas fields, Interstate-80 [I-80], etc.). The project area does not contain any elk crucial winter range.

3.7.2 Small Game Species

Small game species that occur within the project area include upland game birds, small mammals, and furbearers. Upland game birds that occur within the project area include greater sage-grouse, and mourning dove. The greater sage-grouse is a federal candidate species as well as a BLM sensitive species and discussed further in Section 3.8, Special Status Species. Mourning doves occur in habitats

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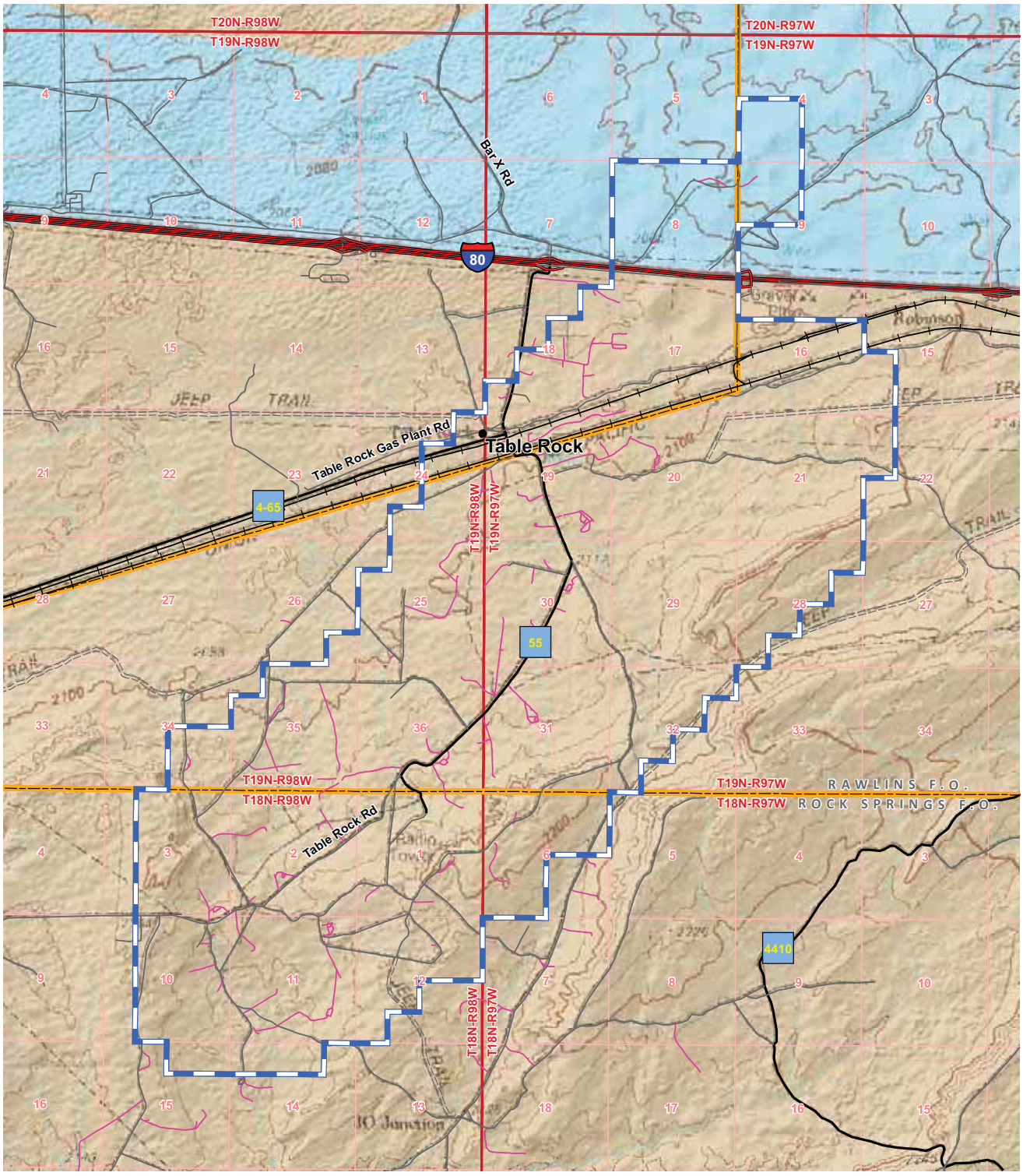

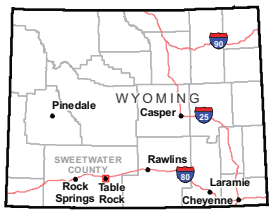

Legend

- Interstate Hwy
- County Road
- Local Road
- Chevron O&G Road
- Vehicular Trail (4WD)
- Railroad
- Town
- Project Boundary
- BLM Field Office Boundary

Pronghorn Seasonal Ranges

- Winter/Yearlong
- Crucial Winter/Yearlong

Figure 3-2

Location of Pronghorn Seasonal Ranges

0 0.5 1 2 Miles
0 0.5 1 2 Kilometers
1:75,000
N

ranging from deciduous forests to shrubland and grassland communities, often nesting in trees or shrubs near riparian areas or water sources (Stokes and Stokes 1996; WGFD 2010, 2004). Small game mammals likely to occur within the project area include desert cottontail and white-tailed jackrabbit.

Furbearers likely to occur within the project area include raccoon, striped skunk, long-tailed weasel, short-tailed weasel, badger, bobcat, coyote, and red fox (BLM 2008, 1997; WGFD 2010, 2004). These species have a wide distribution in Wyoming and are found within a variety of habitat types including grassland, shrubland, dune, wetland/riparian, barren, and developed lands.

Due to a lack of waterbodies, no waterfowl concentrations are known to occur within the project area.

3.7.3 Nongame Species

A diversity of nongame species (e.g., small mammals, raptors, passerines, amphibians, and reptiles) occupies a variety of trophic levels (position in the food chain) and habitat types within the project area. Common nongame wildlife species include small mammals such as bats, voles, squirrels, gophers, prairie dogs, woodrats, and mice. These small mammals provide a substantial prey base for predators in the project region including larger mammals (coyote, badger, bobcat), raptors (eagles, buteos, accipiters, owls), and reptiles (snakes). The white-tailed prairie dog and Wyoming pocket gopher are BLM sensitive species and are discussed further in Section 3.8, Special Status Species. A number of bat species also occur within the project area including long-legged myotis, little brown myotis, big brown bat, and western small-footed myotis. Additional BLM sensitive bat species are discussed further in Section 3.8, Special Status Species.

Raptors and Other Migratory Birds

Nongame birds encompass a variety of passerine and raptor species including migratory bird species that are protected under the MBTA (16 USC 703-711) and Executive Order (EO) 13186 (66 Federal Register [FR] 3853). Pursuant to EO 13186, a Memorandum of Understanding (MOU) between the BLM and USFWS outlines a collaborative approach to promote the conservation of migratory bird populations. The purpose of the MOU is to strengthen migratory bird conservation by identifying and implementing strategies that promote conservation and avoid or minimize adverse impacts on migratory birds in coordination with state, tribal, and local governments. This MOU identifies specific activities where cooperation between the BLM and USFWS would contribute to the conservation of migratory birds and their habitat.

Raptor species that could potentially occur as residents or migrants within the project area include eagles (bald and golden eagles), buteos (e.g., red-tailed hawk, Swainson's hawk, ferruginous hawk), falcons (e.g., prairie falcon, American kestrel), accipiters (e.g., Cooper's hawk, sharp-shinned hawk), owls (e.g., great-horned owl, burrowing owl, long-eared owl, short-eared owl), northern harrier, and turkey vulture (BLM 2008,1997; Stokes and Stokes 1996; WGFD 2010, 2004). BLM records indicate a total of 13 raptor nests have been documented within the project area including four ferruginous hawk, six golden eagle, two prairie falcon, and one red-tailed hawk nests (**Table 3-9**; **Figure 3-3**). Field surveys in 2011 documented an additional active ferruginous hawk nest located on a power line pole in the southern portion of the project area (AECOM 2011).

Table 3-9 Raptor Nests within the Project Area

Species	Number of Nests	BLM FO	Protection Buffer[1,2]	Timing Restriction[1,2]
Ferruginous Hawk	2	Rawlins	1 mile	March 1 to July 31
	3	Rock Springs	1 mile	February 1 to July 31
Golden Eagle	6	Rawlins	1 mile	February 1 to July 15
Prairie Falcon	2	Rawlins	0.75 mile	April 1 to July 31
Red-tailed Hawk	1	Rawlins	0.75 mile	February 1 to July 15

[1] Applied if the nest is determined to be active during the breeding season.

[2] Protection buffers and timing restrictions taken from the Green River RMP and Rawlins RMP.

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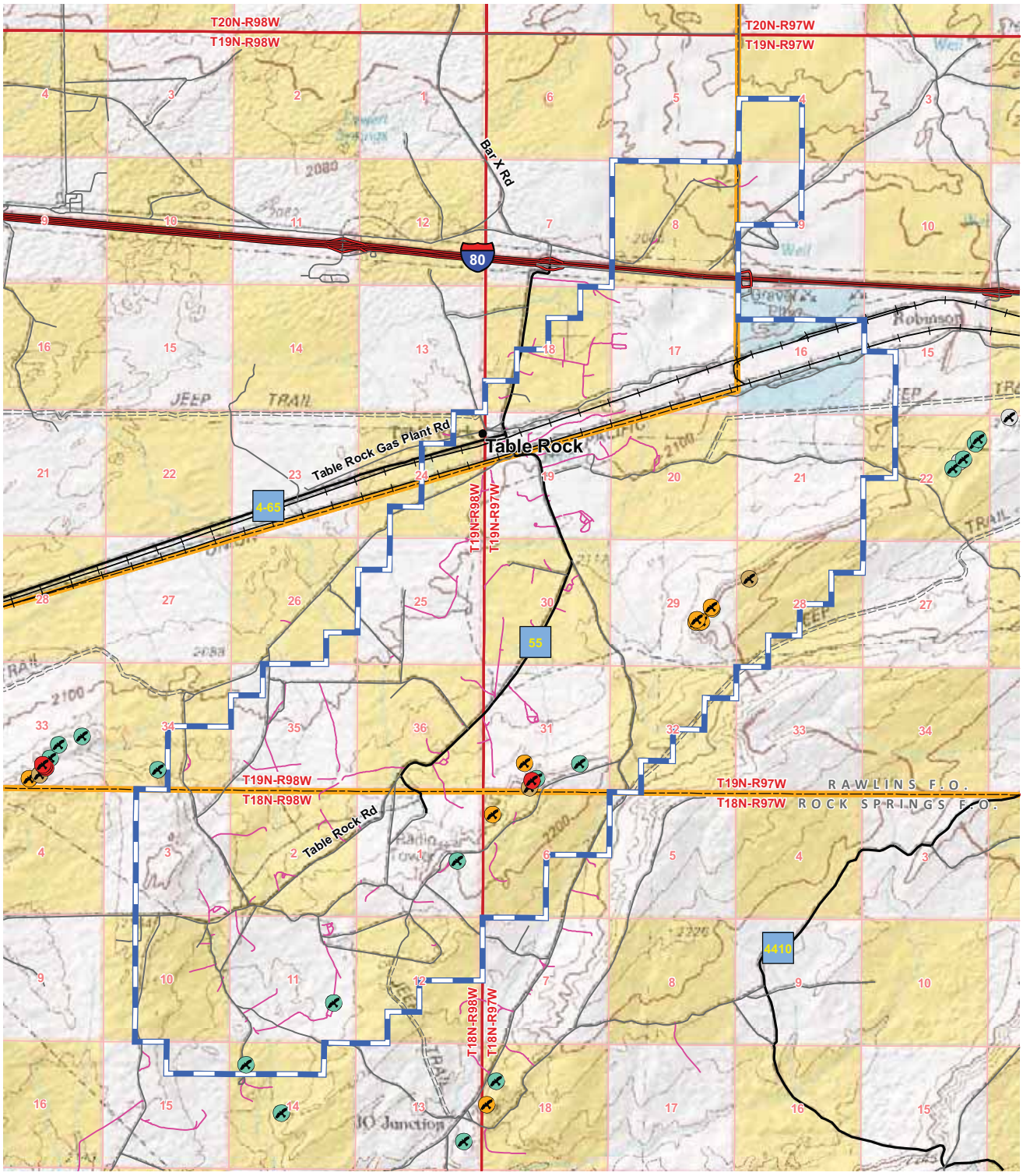

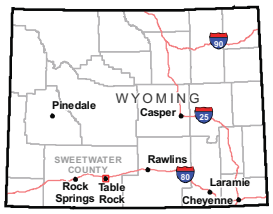

Legend

- Town
- Interstate Hwy
- County Road
- Local Road
- Chevron O&G Road
- Vehicular Trail (4WD)
- Railroad
- Project Boundary

Raptor Nest

- American Kestrel
- Ferruginous Hawk
- Golden Eagle
- Prairie Falcon
- Red-Tailed Hawk
- Unknown
- BLM Field Office Boundary

Figure 3-3

General Location of Raptor Nests

0 0.5 1 2 Miles
0 0.5 1 2 Kilometers
1:75,000
N

A variety of passerines occur within the project area throughout the year; however, they are most abundant during the spring/fall migration as well as during the breeding season, from May 15 to June 30 (Nicholoff 2003). Field surveys in 2011 documented a variety of grassland/shrubland migratory bird species including sage thrasher, sage sparrow, Brewer's sparrow, vesper sparrow, common raven, loggerhead shrike, and horned lark (AECOM 2011). These surveys occurred at eight predetermined points spread throughout the project area (**Figure 3-3**). Additional detail on BLM sensitive migratory bird species is presented in Section 3.8, Special Status Species.

Reptiles and Amphibians

Reptiles and amphibians occupying the project area are typically limited by their specific habitat requirements. Species that could potentially occur within the project area include the Great Basin spadefoot toad, eastern short-horned lizard, northern sagebrush lizard, Great Basin gopher snake, wandering garter snake, and midget faded rattlesnake (Baxter and Stone 1980; BLM 2008, 1997; WGFD 2010, 2004). BLM sensitive reptile and amphibian species are presented in Section 3.8, Special Status Species.

3.7.4 Aquatic Resources

Due to a lack of suitable habitat (i.e., perennial water sources), no aquatic species or habitat is known to occur within the project area.

3.8 Special Status Species

Special status species are those species for which state or federal agencies afford an additional level of protection by law, regulation, or policy. Sixty-three special status species including federally listed, federally proposed, and federal candidate; and BLM sensitive species were identified as potentially occurring within the project area (BLM 2010, 2008; USFWS 2010; WGFD 2011, 2010; Wyoming Natural Diversity Database [WYNDD] 2011a).

3.8.1 Federally Listed and Candidate Wildlife Species

Eight wildlife species were evaluated based on review of the USFWS' Sweetwater County List (USFWS 2010). The potential occurrence of wildlife species within the project area was based on range, known distribution, and the presence of potentially suitable habitat within the project area (**Table 3-10**). A total of six wildlife species were eliminated from detailed analysis (Preble's meadow jumping mouse, western yellow-billed cuckoo, bonytail, Colorado pikeminnow, humpback chub, and razorback sucker) based on rationale presented in **Table 3-10**. The remaining two wildlife species that have the potential to occur within the project area are discussed below.

Table 3-10 Federally Listed Wildlife Species Potentially Occurring within the Project Area

Common Name ***Scientific Name***	**Status[1]**	**Habitat Association[1]**	**Potential for Occurrence within the Project Area[1]**	**Eliminated from Detailed Analysis (Yes/No)**
Mammals				
Preble's meadow jumping mouse *Zapus hudsonius preblei*	Threatened	Riparian vegetation along waterways. Typically found in tall grass near streams.	None. This species is not known to occur within the project area.	Yes. The project area is not within the known geographic range of the species.

Table 3-10 Federally Listed Wildlife Species Potentially Occurring within the Project Area

Common Name *Scientific Name*	Status[1]	Habitat Association[1]	Potential for Occurrence within the Project Area[1]	Eliminated from Detailed Analysis (Yes/No)
Black-footed ferret *Mustela nigripes*	Endangered	Grasslands and shrublands with prairie dog colonies.	Low. White-tailed prairie dog colonies located within the project area in the RSFO do not meet USFWS requirements for surveys and therefore indicate a low probability of containing ferrets. No surveys are required in block-cleared areas of the project area in the RFO.	No.
Birds				
Greater sage-grouse *Centrocercus Urophasianus*	Candidate	Sagebrush shrublands.	High. Suitable habitat occurs within the project area.	No.
Western yellow-billed cuckoo *Coccyzus americanus*	Candidate	Lowland riparian areas west of the Continental Divide.	None. This species is not known to occur within the project area.	Yes. Suitable lowland riparian habitat does not occur within or near the project area.
Fish				
Colorado River Fish Species Bonytail (*Gila elegans*), Colorado pikeminnow (*Ptychocheilus lucius*), humpback chub (*Gila cypha*), and razorback sucker (*Xyrauchen texanus*)	Endangered	Downstream riverine habitat in the Yampa, Green, and Colorado River systems.[2]	None. These species are not known to occur within the project area.	Yes. No impacts to water quantity or quality would occur to the Colorado River system as a result of the Project.

Table 3-10 Federally Listed Wildlife Species Potentially Occurring within the Project Area

Common Name *Scientific Name*	Status[1]	Habitat Association[1]	Potential for Occurrence within the Project Area[1]	Eliminated from Detailed Analysis (Yes/No)
Colorado River fish critical habitat		Designated for the endangered Colorado River fish in Colorado and Utah in downstream riverine habitat in the Yampa, Green, and Colorado River systems.	None.	Yes. Critical habitat is located outside of the project area and no impacts to water quantity or quality would occur to the Colorado River system as a result of the Project.

[1] Status, habitat association, and potential for occurrence within the project area taken from USFWS 2011b and WGFD 2010.

[2] If the Proposed Action may lead to consumptive use of water or have the potential to affect the water quality in the Colorado River system, there may be impacts to endangered fish species inhabiting the downstream reaches and formal consultation with the USFWS would be required.

3.8.1.1 Black-footed Ferret

The black-footed ferret (*Mustela nigripes*) is classified as a federally endangered species. The historic range of this species included the Rocky Mountain and western Great Plains regions of North America (Fitzgerald et al. 1994). This species utilizes semi-arid grasslands and mountain basins associated with prairie dog colonies. The only known populations of black-footed ferrets are either captive or have been reintroduced, with no natural wild populations known to occur. In Wyoming, the known distribution of this species is limited to a nonessential experimental population area within the Shirley Basin approximately 120 miles northeast of the project area (WGFD 2010). A portion of the project area within the RSFO (**Figure 3-4**) is not USFWS "block-cleared" for black-footed ferrets (USFWS 2004). In order to determine whether or not surveys are required for black-footed ferrets, white-tailed prairie dog surveys were completed for the non-block-cleared portions of the project area on June 16 and 17, 2011. Surveys documented four white-tailed prairie dog colonies totaling 61 acres in size (**Figure 3-4**). Details on the four white-tailed prairie dog colonies found within the project area are presented in **Table 3-11**.

Due to the size and density of the white-tailed prairie dog colonies found within the project area, surveys for black-footed ferrets are not warranted and therefore, the likelihood of black-footed ferrets occurring within the project area is low.

3.8.1.2 Greater Sage-grouse

The greater sage-grouse (*Centrocercus urophasianus*) is classified as a federal candidate species as well as a BLM sensitive species. On March 5, 2010, the USFWS determined that the greater sage-grouse warrants protection under the ESA; however, the USFWS concluded that proposing the species for protection is precluded by the need to take action on other species facing more immediate and severe extinction threats. Therefore, greater sage-grouse in Wyoming continue to be managed by the WGFD. Conservation efforts for this species in Wyoming currently are coordinated by the WGFD in cooperation with the USFWS, BLM, and regional greater sage-grouse working groups in an attempt to increase population levels and avoid federal listing under the ESA. In an effort to prevent federal listing of greater sage-grouse, the WGFD has recently completed a revised map of greater sage-grouse

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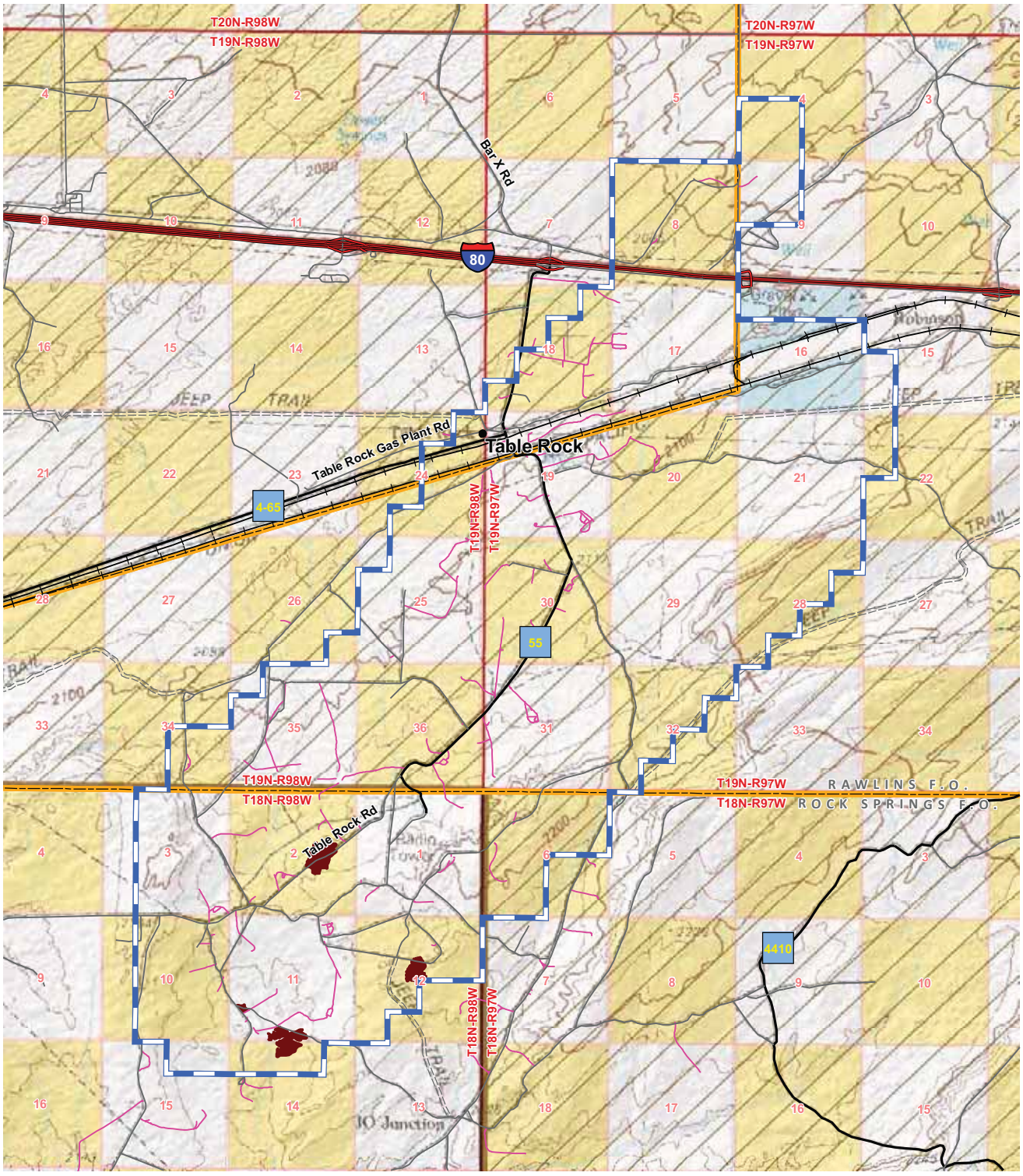
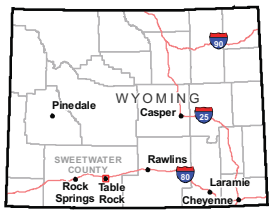




Legend

- Town
- Interstate Hwy
- County Road
- Local Road
- Chevron O&G Road
- Vehicular Trail (4WD)
- Railroad
- Blocked Cleared Areas
- Prairie Dog Town
- Project Boundary
- BLM Field Office Boundary

Land Ownership

- Bureau of Land Management
- State
- Private

Figure 3-4

2011 White-Tailed Prairie Dog Survey Areas and Block Cleared Areas

0 0.5 1 2 Miles
0 0.5 1 2 Kilometers
1:75,000
N

Table 3-11 White-tailed Prairie Dog Colonies found within the Project Area

Name and Location[1]	Universal Transverse Mercator Coordinates (NAD 83)	Date Surveyed	Activity (Y, N, U)	All Mounds (acres)	Active Mounds (acres)	Estimated Burrows/ Acre	Land Ownership
Table Rock South #1: 4.2 miles SSW of Table Rock, Wyoming	0715270 E 4602248 N	6/16/11	Yes	23	15	4	Private
Table Rock East #1: 4 miles SSW of Table Rock, Wyoming	0716980 E 4603495 N	6/16/11	No[2]	13	0	3	BLM
Table Rock Central #1: 3.8 miles SSW of Table Rock, Wyoming	0715772 E 4604844 N	6/16/11	Yes	23	17	6	BLM
Table Rock South #2: 2.7 miles SSW of Table Rock, Wyoming	0714766 E 4602809 N	6/17/11	Yes	2	2	5	Private

[1] Location description based on distance from the town of Table Rock, Wyoming.

[2] No white-tailed prairie dogs were observed; however, the colony was occupied by Wyoming ground squirrels.

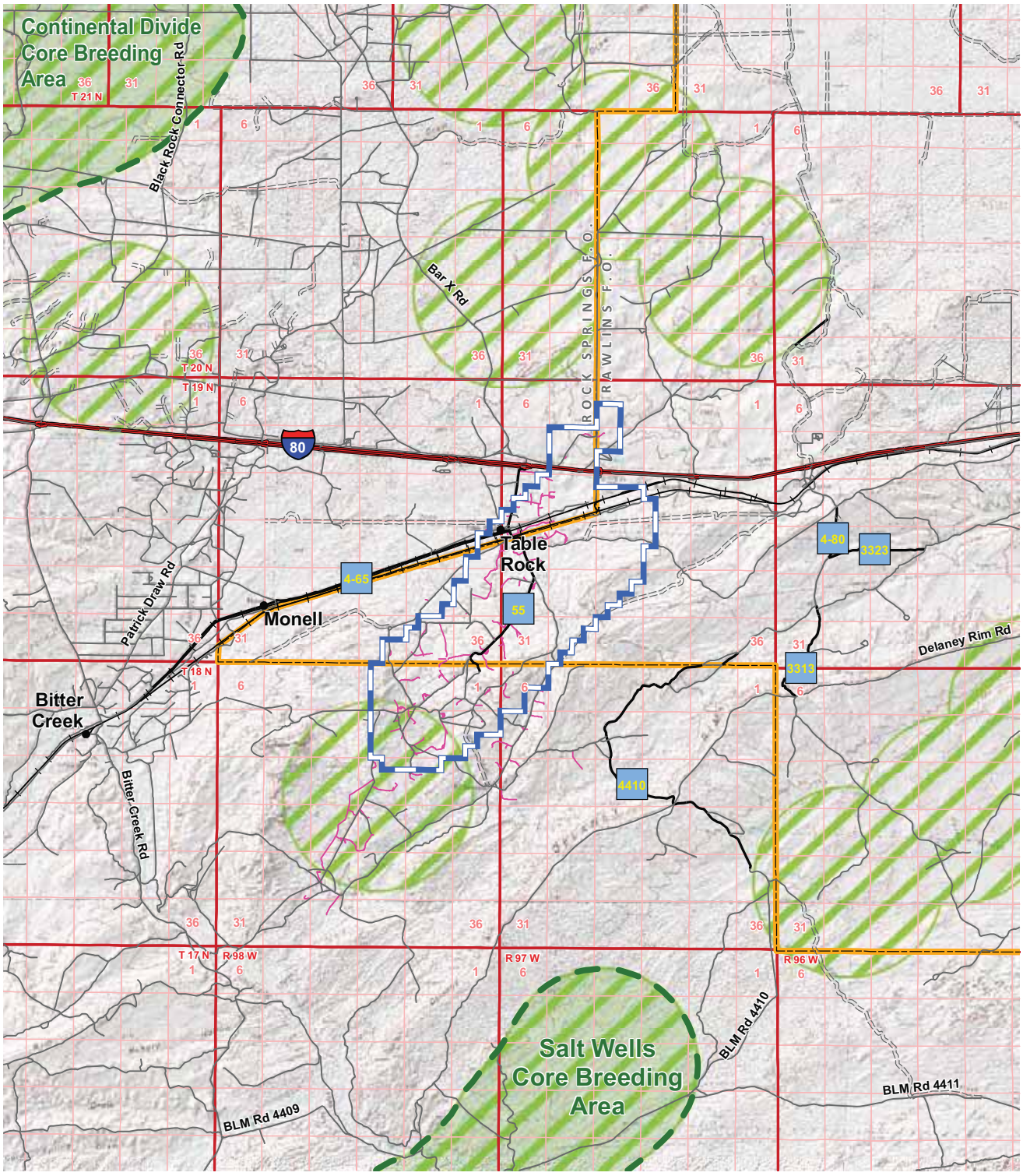
core population areas in Wyoming. Greater sage-grouse core population areas include areas with the highest densities of breeding greater sage-grouse in the state, as well as areas important for connectivity between populations. The core population areas include roughly 25 percent of the state but contain 83.1 percent of the greater sage-grouse population in the state. No greater sage-grouse core population areas are located within the project area. The nearest core population area is the Salt Wells core population area which is approximately 5 miles southeast of the project area (**Figure 3-5**).

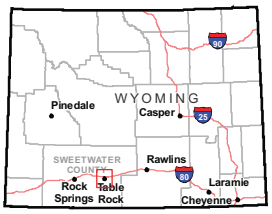
Lekking/Nesting Habitat

The center of breeding activity for greater sage-grouse is referred to as a strutting ground or lek. Leks are characterized as flat, sparsely vegetated areas within large tracts of sagebrush (Connelly et al. 2004). Males begin to appear on leks in March with peak attendance of Wyoming leks occurring in April (WGFD 2010). Greater sage-grouse nesting habitat typically is centered on active leks and consists of medium to tall sagebrush with a perennial grass understory (Connelly et al. 2000). Studies have shown that taller sagebrush with larger canopies and more residual understory cover usually lead to higher nesting success (Connelly et al. 2004, 2000). No lek sites are known to occur within the project area. However, 1,337.6 acres of suitable nesting habitat in non-core population areas is located within the project area (**Figure 3-5**).

Brooding Habitat

During the late spring and summer, hens and broods typically are found in more lush habitats consisting of a high diversity of grasses and forbs that attract insects. These habitats include wet meadows, riparian areas, and irrigated farmland within or near sagebrush. Hens with broods would utilize these habitats until forbs desiccate and insect abundance decreases. Unsuccessful hens and cocks also would utilize these same habitats; however, due to their nutritional flexibility, they are able to occupy a wider variety of





Legend

- Town
- Project Boundary
- BLM Field Office Boundary
- Greater Sage-grouse Nesting Habitat
- Greater Sage-grouse Core Breeding Area
- Interstate Hwy
- County Road
- Local Road
- Chevron O&G Road
- Vehicular Trail (4WD)
- Railroad

Figure 3-5

Greater Sage-grouse Nesting Habitat

0 1 2 4 Miles
0 1 2 4 Kilometers
1:200,000
N

habitats during the spring and summer months (Connelly et al. 2004). In many greater sage-grouse populations, high quality brooding habitat is often the limiting factor due to drought, invasive weeds, and overgrazing associated with improper range management. Suitable brooding habitat is found within the extreme southwest portion of the project area along drainages and wet areas found within the nesting habitat presented in **Figure 3-5**.

Wintering Habitat

Depending on the severity of the winter, greater sage-grouse would move to south- and east-facing slopes that maintain exposed sagebrush. Studies have shown that south-facing slopes with sagebrush at least 10 to 12 inches above the snow level are required for both food and cover. Windswept ridges, draws, and swales also may be used, especially if these areas are in close proximity to exposed sagebrush (Connelly et al. 2004). In years with severe winter conditions (i.e., deep snow), greater sage-grouse would often gather in large flocks in areas with the highest quality winter habitat. It is suggested that high quality winter habitat is limited in portions of the greater sage-grouse's range (Connelly et al. 2000). While no winter concentration areas have been mapped within the project area, suitable sagebrush habitat for wintering greater sage-grouse is present within the project area.

Based on the presence of suitable nesting, brooding, and wintering habitat, the potential for this species to occur within the project area is considered high.

3.8.2 BLM Sensitive Wildlife Species

Thirty-eight wildlife species were evaluated based on review of the BLM RSFO and RFO sensitive species lists (BLM 2010). The potential occurrence of wildlife species within the project area was based on range, known distribution, and the presence of potentially suitable habitat within the project area (**Table 3-12**). A total of 22 wildlife species were eliminated from detailed analysis (long-eared myotis, black-tailed prairie dog, Idaho pocket gopher, Preble's meadow jumping mouse, swift fox, trumpeter swan, white-faced ibis, bald eagle, northern goshawk, peregrine falcon, Columbian sharp-tailed grouse, Baird's sparrow, midget faded rattlesnake, boreal toad, Columbian spotted frog, northern leopard frog, Colorado River cutthroat trout, bluehead sucker, flannelmouth sucker, hornyhead chub, northern leatherside chub, and roundtail chub) based on the rationale presented in **Table 3-12**. The remaining 16 wildlife species that have the potential to occur within the project area are discussed below.

Table 3-12 BLM Sensitive Wildlife Species Potentially Occurring within the Project Area

Common Name *Scientific Name*	BLM Field Office	Habitat Association[1]	Potential for Occurrence within the Project Area[2]	Eliminated from Detailed Analysis (Yes/No)
Mammals				
Long-eared myotis *Myotis evotis*	BLM (RFO and RSFO)	Montane forests. Caves and mines.	Low. No suitable roosting or foraging habitat occurs within the project area.	Yes. Occurrences would be limited to migrating individuals.
Fringed myotis *Myotis thysanodes*	BLM (RFO and RSFO)	Semi-desert shrublands, pinyon-juniper woodlands, and montane forests. Caves and mines.	High. Suitable foraging habitat occurs within the project area.	No.
Spotted bat *Euderma maculatum*	BLM (RSFO)	Cliffs; semi-desert shrublands, pinyon-juniper woodlands, and montane forests.	High. Suitable foraging habitat occurs within the project area.	No.

Table 3-12 BLM Sensitive Wildlife Species Potentially Occurring within the Project Area

Common Name *Scientific Name*	BLM Field Office	Habitat Association[1]	Potential for Occurrence within the Project Area[2]	Eliminated from Detailed Analysis (Yes/No)
Townsend's big-eared bat *Corynorhinus townsendii*	BLM (RFO and RSFO)	Semi-desert shrublands, pinyon-juniper woodlands, and montane forests. Caves and mines.	High. Suitable foraging habitat occurs within the project area.	No.
Pygmy rabbit *Brachylagus idahoensis*	BLM (RFO and RSFO)	Sagebrush shrublands.	High. Species has been documented within the project area.	No.
White-tailed prairie dog *Cynomys leucurus*	BLM (RFO and RSFO)	Mountain basins; sagebrush shrublands; semi-desert grasslands.	High. Four colonies totaling 61 acres occur within the project area.	No.
Black-tailed prairie dog *Cynomys ludovicianus*	BLM (RFO)	Short-grass and mixed-grass prairie.	None. This species is not known to occur within the project area.	Yes. Project is outside the known range and distribution of this species in Wyoming.
Idaho pocket gopher *Thomomys idahoensis*	BLM (RSFO)	Semi-desert grassland and sagebrush shrublands.	None. This species is not known to occur within the project area.	Yes. Project is outside the known range and distribution of this species in Wyoming.
Wyoming pocket gopher *Thomomys clusius*	BLM (RFO and RSFO)	Semi-desert grassland and sagebrush shrublands.	Moderate. Suitable habitat occurs within the project area.	No.
Preble's meadow jumping mouse *Zapus hudsonius preblei*	BLM (RFO)	Riparian areas with well developed dense vegetation.	None. This species is not known to occur within the project area.	Yes. Project is outside the known range and distribution of this species in Wyoming.
Swift fox *Vulpes velox*	BLM (RFO and RSFO)	Short-grass and mid-grass prairie.	None. This species is not known to occur within the project area.	Yes. Project is outside the known range and distribution of this species in Wyoming.

Table 3-12 BLM Sensitive Wildlife Species Potentially Occurring within the Project Area

Common Name *Scientific Name*	BLM Field Office	Habitat Association[1]	Potential for Occurrence within the Project Area[2]	Eliminated from Detailed Analysis (Yes/No)
Birds				
Trumpeter swan *Cygnus buccinators*	BLM (RFO and RSFO)	Lakes, ponds, marshes, rivers, wetlands.	None. This species is not known to occur within the project area.	Yes. Project is outside the known range and distribution of this species in Wyoming.
White-face ibis *Plegadis chihi*	BLM (RFO and RSFO)	Marshes, wet meadows, wetlands.	None. No suitable habitat occurs within the project area.	Yes. Occurrence would be limited to migrating individuals.
Bald eagle *Haliaeetus leucocephalus*	BLM (RFO and RSFO)	Large perennial waterbodies with suitable roosting trees.	Low. No suitable habitat occurs within the project area.	Yes. Occurrence would be limited to migrating and foraging individuals.
Northern goshawk *Accipiter gentilis*	BLM (RFO and RSFO)	Coniferous forests and aspen forests.	None. No suitable habitat occurs within the project area.	Yes. Occurrence would be limited to migrating individuals.
Ferruginous hawk *Buteo regalis*	BLM (RFO and RSFO)	Mountain foothills, badlands, semi-desert shrublands.	High. Five nest sites have been documented within the project area, including an active nest on a power line pole in the southern portion of the project area.	No.
Peregrine falcon *Falco peregrinus*	BLM (RFO and RSFO)	Cliffs near riparian areas and wetlands.	None. No suitable nesting habitat occurs within the project area.	Yes. Occurrence would be limited to migrating and foraging individuals.
Columbian sharp-tailed grouse *Tympanuchus phasianellus columbianus*	BLM (RFO)	Mountain shrub communities.	None. This species is not known to occur within the project area.	Yes. Project is outside the known range and distribution of this species in Wyoming.
Mountain plover *Charadrius montanus*	BLM (RFO and RSFO)	Prairie and shrublands.	High. Suitable habitat occurs within the project area.	No.

Table 3-12 BLM Sensitive Wildlife Species Potentially Occurring within the Project Area

Common Name *Scientific Name*	BLM Field Office	Habitat Association[1]	Potential for Occurrence within the Project Area[2]	Eliminated from Detailed Analysis (Yes/No)
Long-billed curlew *Numenius americanus*	BLM (RFO and RSFO)	Wet meadows and grasslands.	Low. Marginal habitat occurs within the project area.	No.
Burrowing owl *Athene cunicularia hypugea*	BLM (RFO and RSFO)	Shrublands with suitable burrows for nesting and cover.	High. Suitable habitat occurs within the project area.	No.
Sage thrasher *Oreoscoptes montanus*	BLM (RFO and RSFO)	Sagebrush shrublands.	High. Suitable habitat occurs within the project area. This species was documented during field surveys in 2011.	No.
Loggerhead shrike *Lanius ludovicianus*	BLM (RFO and RSFO)	Open habitat such as grasslands, shrublands, and agricultural areas.	High. Suitable habitat occurs within the project area. This species was documented during field surveys in 2011.	No.
Brewer's sparrow *Spizella breweri*	BLM (RFO and RSFO)	Sagebrush shrublands.	High. Suitable habitat occurs within the project area. This species was documented during field surveys in 2011.	No.
Sage sparrow *Amphispiza belli*	BLM (RFO and RSFO)	Sagebrush shrublands.	High. Suitable habitat occurs within the project area. This species was documented during field surveys in 2011.	No.
Baird's sparrow *Ammodramus bairdii*	BLM (RFO)	Grasslands and fallow, weedy fields.	Low. Uncommon spring/summer resident in the project region.	Yes. Occurrence would be limited to migrating individuals.

Table 3-12 BLM Sensitive Wildlife Species Potentially Occurring within the Project Area

Common Name *Scientific Name*	BLM Field Office	Habitat Association[1]	Potential for Occurrence within the Project Area[2]	Eliminated from Detailed Analysis (Yes/No)
Reptiles				
Midget faded rattlesnake *Crotalus viridis concolor*	BLM (RSFO)	Rocky outcrops in semi-desert shrublands.	None. This species is not known to occur within the project area.	Yes. Project is outside the known range and distribution of this species in Wyoming.
Amphibians				
Boreal toad *Bufo boreas boreas*	BLM (RFO and RSFO)	High elevation ponds and wetlands.	None. This species is not known to occur within the project area.	Yes. Project is outside the known range and distribution of this species in Wyoming.
Columbia spotted frog *Rana luteiventris*	BLM (RSFO)	Ponds, streams, and wetlands.	None. This species is not known to occur within the project area.	Yes. Project is outside the known range and distribution of this species in Wyoming.
Northern leopard frog *Rana pipiens*	BLM (RFO and RSFO)	Ponds, streams, and wetlands.	None. No suitable habitat occurs within the project area.	Yes. Lack of suitable habitat within or near the project area.
Great Basin spadefoot *Spea intermontana*	BLM (RFO and RSFO)	Spring seeps, temporary wetlands and playas.	Low. Marginal habitat occurs within the project area in ephemeral washes.	No.
Fish				
Colorado River cutthroat trout *Oncorhynchus clarkia pleuriticus*	BLM (RFO and RSFO)	Colorado River drainage; clear mountain streams.	None. This species is not known to occur within the project area.	Yes. Project is outside the known range and distribution of this species in Wyoming.
Bluehead sucker *Catostomus discobolus*	BLM (RFO and RSFO)	Bear, Snake, and Green river drainages.	None. This species is not known to occur within the project area.	Yes. Project is outside the known range and distribution of this species in Wyoming.
Flannelmouth sucker *Catostomus latipinnis*	BLM (RFO and RSFO)	Colorado River drainage; large rivers, streams, and lakes.	None. No suitable habitat occurs within the project area.	Yes. Lack of suitable habitat within or near the project area.

Table 3-12 BLM Sensitive Wildlife Species Potentially Occurring within the Project Area

Common Name *Scientific Name*	BLM Field Office	Habitat Association[1]	Potential for Occurrence within the Project Area[2]	Eliminated from Detailed Analysis (Yes/No)
Hornyhead chub *Nocomis biguttatus*	BLM (RFO and RSFO)	Lower Laramie and North Laramie river watersheds; small to medium sized streams.	None. This species is not known to occur within the project area.	Yes. Project is outside the known range and distribution of this species in Wyoming.
Northern leatherside chub *Lepidomeda copei*	BLM (RSFO)	Bear, Snake, and Green river drainages.	None. This species is not known to occur within the project area.	Yes. Project is outside the known range and distribution of this species in Wyoming.
Roundtail chub *Gila robusta*	BLM (RFO and RSFO)	Colorado River drainage; large rivers, streams, and lakes.	None. This species is not known to occur within the project area.	Yes. Project is outside the known range and distribution of this species in Wyoming.

[1] Habitat association and potential for occurrence within the project area taken from BLM (2010, 2008) and WGFD (2010).

Sensitive Bat Species

The Townsend's big-eared bat (*Corynorhinus townsendii*), spotted bat (*Euderma maculatum*), long-eared myotis (*Myotis evotis*), and fringed myotis (*Myotis thysanodes*) are classified as BLM sensitive species. These species occur in a wide variety of habitats including semi-desert scrub, sagebrush shrubland, grassland, coniferous forest, and riparian areas. Roost sites consist of buildings, caves, mines, rock crevices, trees, and cliffs (Fitzgerald et al. 1994; WGFD 2010). No roost sites have been identified within the project area. However, based on the presence of suitable foraging habitat, the potential for these species to occur within the project area is considered high.

Pygmy Rabbit

The pygmy rabbit (*Brachylagus idahoensis*) is classified as a BLM sensitive species. Pygmy rabbits inhabit sagebrush shrublands and require dense sagebrush canopies with deep soils with high clay content for burrowing. This species is often found in drainages with tall sagebrush present (BLM 2004; WGFD 2010). According to the WYNDD pygmy rabbit distribution model (WYNDD 2008a), 228 acres of low probability, 1,075 acres of moderate probability, 12,249 acres of high probability, and 91 acres of very high probability habitat occur within the project area (**Figure 3-6**). In addition, BLM records indicate several occurrences of pygmy rabbit within the project area (**Figure 3-6**). Based on the known occurrence of this species within the project area, the potential for this species to occur within the project area is high.

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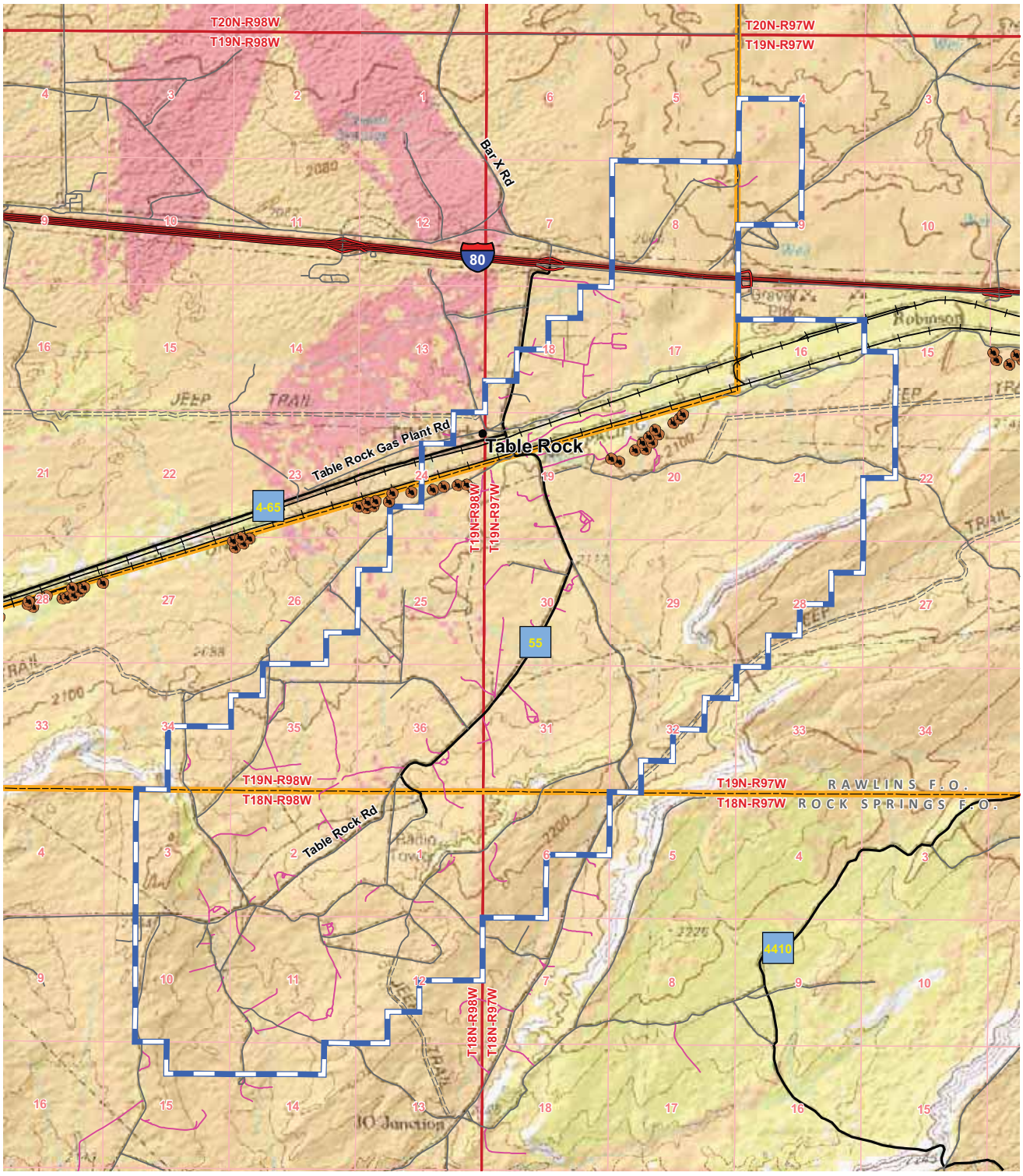

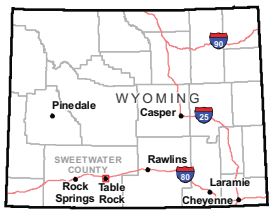

Legend

- Town
- Interstate Hwy
- County Road
- Local Road
- Chevron O&G Road
- Vehicular Trail (4WD)
- Railroad
- Pygmy Rabbit Occurrences

Pygmy Rabbit Distribution

- Low Probability
- Moderate Probability
- High Probability
- Very High Probability
- Project Boundary
- BLM Field Office Boundary

Figure 3-6

Pygmy Rabbit Distribution

0 0.5 1 2 Miles
0 0.5 1 2 Kilometers
1:75,000
N

White-tailed Prairie Dog

The white-tailed prairie dog (*Cynomys leucurus)* is classified as a BLM sensitive species. White-tailed prairie dogs inhabit xeric sites with mixed shrubs and grasses. This species is often associated with sagebrush and saltbrush and tends to occupy higher elevations than the black-tailed prairie dog (WGFD 2010). In Wyoming, the white-tailed prairie dog is found in the western two-thirds of the state, excluding the areas near Yellowstone and Grand Teton National parks (WGFD 2010). White-tailed prairie dog surveys were conducted on June 16 and 17, 2011, to determine location, size, and density of active colonies located within the project area. Surveys documented four white-tailed prairie dog colonies totaling 61 acres (**Figure 3-4**; **Table 3-12**). Based on the results of these surveys the potential for this species to occur within the project area is considered high.

Wyoming Pocket Gopher

The Wyoming pocket gopher (*Thomomys clusius*) is classified as a BLM sensitive species. Wyoming pocket gophers prefer dry, gravelly, shallow-soil ridge tops within greasewood plant communities. Burrow systems associated with pocket gophers range from 6 inches to 1 foot below the surface, typically consisting of a network of feeding tunnels connected to a smaller and deeper system of chambers that are used for nesting and food storage (WGFD 2010). According to the WYNDD Wyoming pocket gopher distribution model, 4,742 acres of low probability, 8,901 acres of moderate probability, and 0 acre of high probability habitat occur within the project area (**Figure 3-7**). Based the results of the WYNDD distribution model, the potential for this species to occur within the project area is moderate.

Ferruginous Hawk

The ferruginous hawk (*Buteo regalis*) is classified as a BLM sensitive species. The ferruginous hawk breeds from the Canadian Prairie Provinces south to Oregon, Nevada, Arizona, and Oklahoma. It winters from the central and southern portions of its breeding range south into Baja California and central Mexico. This species inhabits semiarid open country, primarily grasslands, basin-prairie shrublands, and badlands. It requires large tracts of relatively undisturbed rangeland and nests on rock outcrops, the ground, knolls, cliff ledges, or trees (Johnsgard 1990; WGFD 2010). In Wyoming, this species is found throughout the state, although it is most common in the south-central portion of the state (WGFD 2010). A total of five ferruginous hawk nests are known to occur within the project area, including an active nest on a power line pole in the southern portion of the project area (**Figure 3-8**). Therefore, the potential for this species to occur within the project area is considered high.

Burrowing Owl

The burrowing owl (*Athene cunicularia*) is classified as a BLM sensitive species. This species breeds from south-central British Columbia, south through most of the western U.S. and Mexico (WGFD 2010). The burrowing owl typically inhabits level, open areas in heavily grazed or low-stature desert vegetation, with available burrows for nesting and cover (Johnsgard 1988; WGFD 2010). Nesting habitat consists of abandoned mammal burrows on flat, dry, and relatively open terrain (Johnsgard 1988). Based on the habitats present within the project area, the potential for this species to occur within the project area is considered high.

Mountain Plover

The mountain plover (*Charadrius montanus*) is classified as a federally proposed species as well as a BLM sensitive species. The historic breeding range of the mountain plover included short-grass prairies from extreme southern Canada, south through the Great Plains of the U.S. (WGFD 2010). Currently, mountain plovers only nest in isolated areas throughout their range. In Wyoming, the breeding range of this species is widespread and relatively common in favored habitat; however, population levels and trends are not known (WGFD 2010). Breeding habitat for this species appears to vary geographically. However, throughout its range, suitable breeding habitat is characterized primarily by shortgrass prairie grassland where grazing is intensive, or in areas of fallow fields or active prairie dog towns (WGFD 2010). According to the WYNDD mountain plover distribution model, 2,350 acres of low probability, 6,051 acres of medium probability, and 5,218 acres of high probability habitat occur within the project area (**Figure 3-9**). Based the results of the WYNDD distribution model, the potential for this species to occur within the project area is high.

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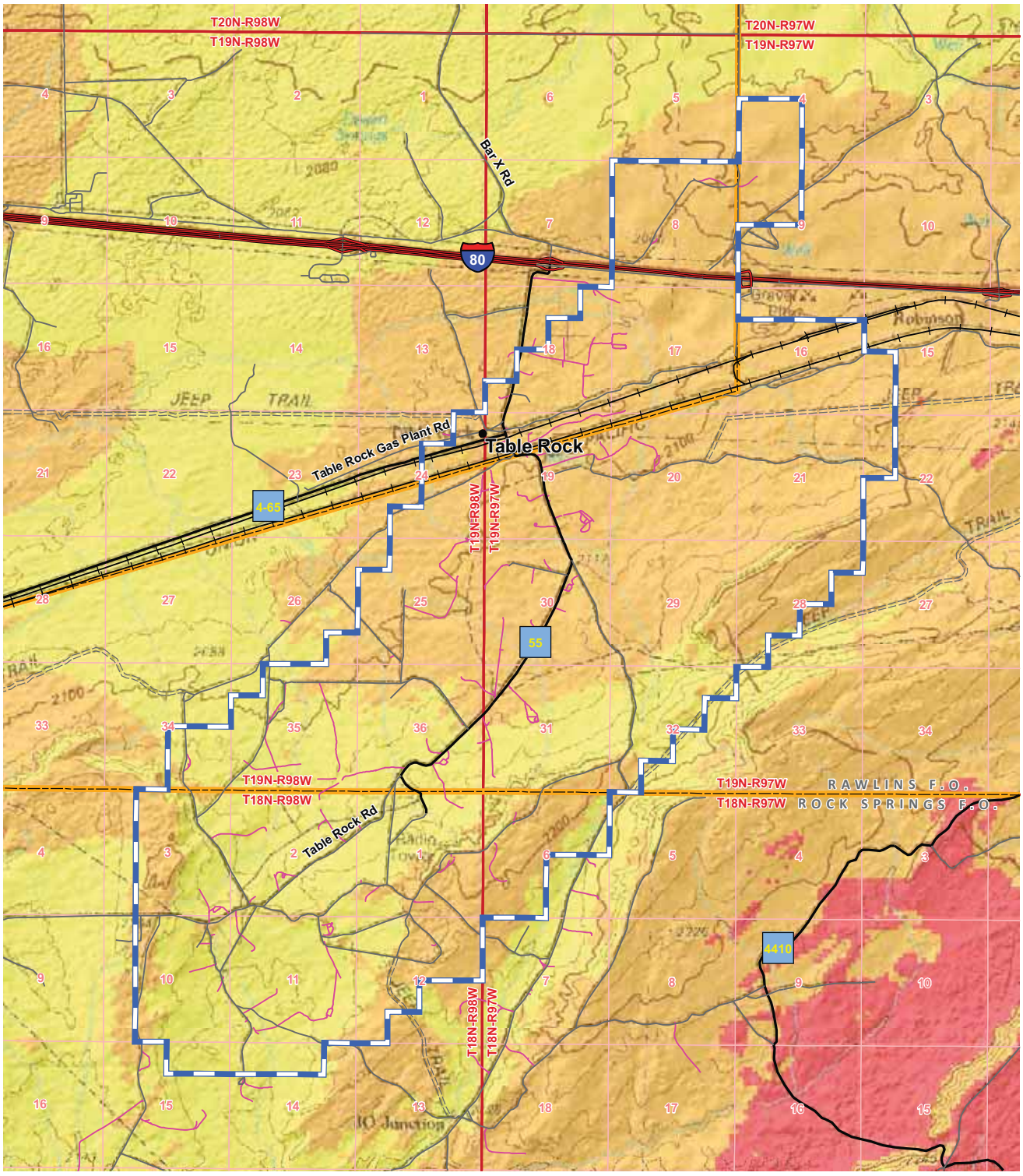
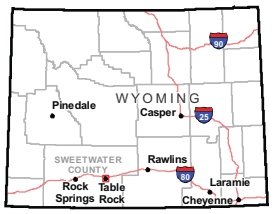




Legend

- Town
- Interstate Hwy
- County Road
- Local Road
- Chevron O&G Road
- Vehicular Trail (4WD)
- Railroad
- BLM Field Office Boundary
- Project Boundary

Wyoming Pocket Gopher Distribution*

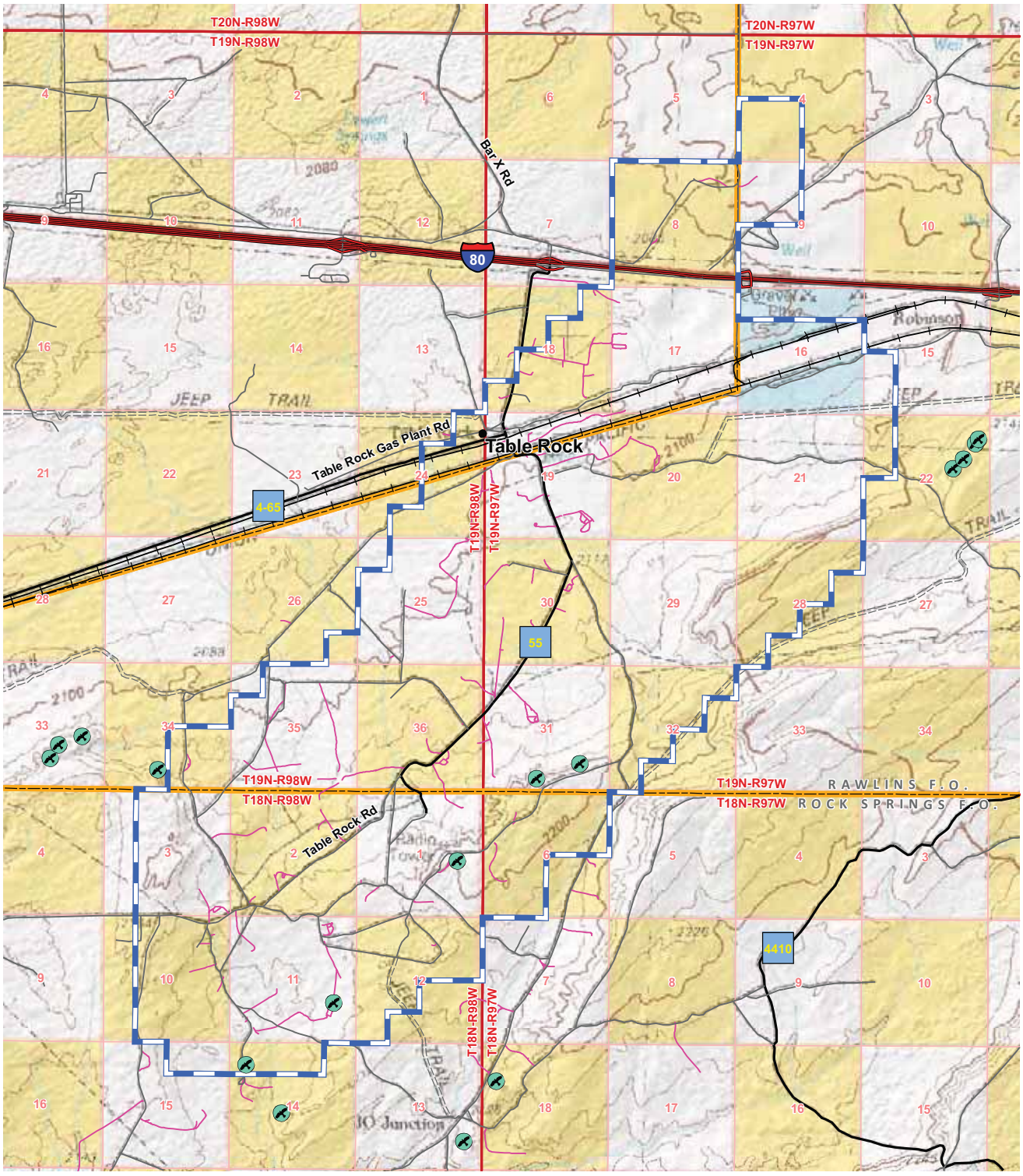
- Absent
- Low Probability
- Moderate Probability
- High Probability

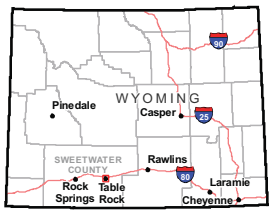
Figure 3-7

Probability of Wyoming Pocket Gopher Habitat

0 0.5 1 2 Miles
0 0.5 1 2 Kilometers
1:75,000
N

X:\0Projects\Chevron_TableRockEA_60195742\Figures\DOC\EA\Fig_3-08_FerruginousNests_20110801.mxd





Legend

- Town
- Interstate Hwy
- County Road
- Local Road
- Chevron O&G Road
- Vehicular Trail (4WD)
- Railroad
- Ferruginous Hawk
- Project Boundary
- BLM Field Office Boundary

Land Ownership

- Bureau of Land Management
- State
- Private

Figure 3-8

General Location of Ferruginous Hawk Nests

0 0.5 1 2 Miles
0 0.5 1 2 Kilometers
1:75,000
N

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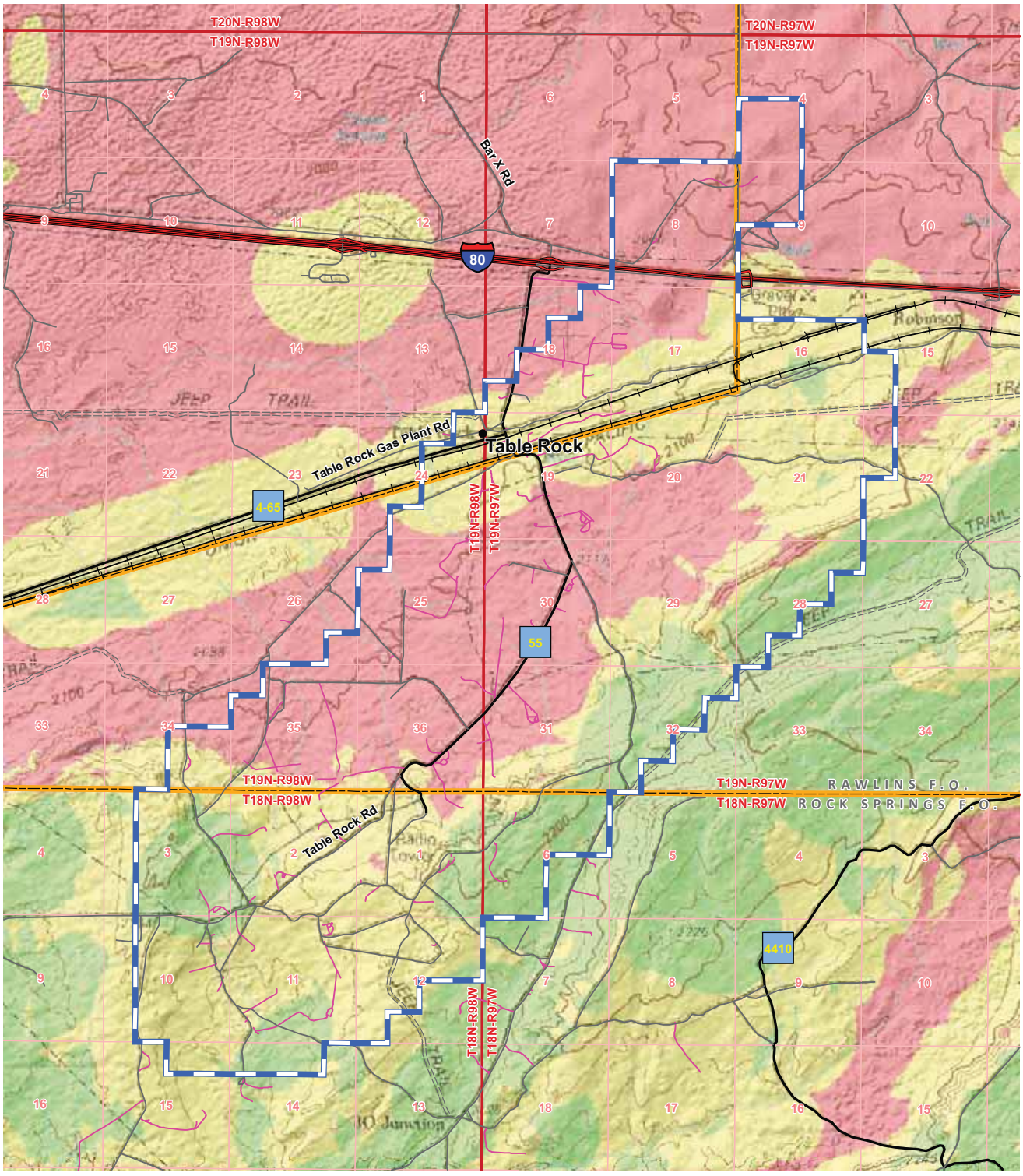
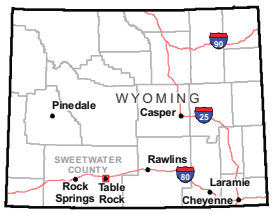




Legend

- Town
- Interstate Hwy
- County Road
- Local Road
- Chevron O&G Road
- Vehicular Trail (4WD)
- Railroad
- Project Boundary
- BLM Field Office Boundary

Mountain Plover Distribution

- High Probability
- Medium Probability
- Low Probability

Figure 3-9

Probability of Mountain Plover Habitat

0 0.5 1 2 Miles
0 0.5 1 2 Kilometers
1:75,000
N

Long-billed Curlew

The long-billed curlew (*Numenius americanus*) is classified as a BLM sensitive species. The long-billed curlew breeds in southern Canada south into portions of most of the western U.S. It winters in California, Arizona, Mexico, Texas, Louisiana, and South Carolina. The long-billed curlew occurs and breeds throughout a majority of Wyoming. This species inhabits a variety of grassland types ranging from moist meadow grasslands to agricultural areas to dry prairie uplands, usually near water. This species prefers a complex of shortgrass prairies, agricultural fields, wet and dry meadows and prairies, and grazed mixed-grass and scrub communities (WGFD 2010). Based on the presence of marginal habitat, the potential for this species to occur within the project area is considered low.

Sage Thrasher, Loggerhead shrike, Brewer's sparrow, and Sage sparrow

The sage thrasher (*Oreoscoptes montanus*), loggerhead shrike (*Lanius ludovicianus*), Brewer's sparrow (*Spizella breweri*), and sage sparrow (*Amphispiza belli*), are classified as BLM sensitive species. These species are typically found in open habitats including grassland, sagebrush shrubland, semi-desert scrub, and agricultural areas (BLM 2008; WGFD 2010). These species have been documented within the project area and are fairly abundant in areas of suitable habitat (AECOM 2011a; WGFD 2010). Based on the presence of suitable habitat, the potential for these species to occur along the project route is considered high.

Great Basin Spadefoot Toad

The Great Basin spadefoot toad (*Spea intermontana*) is classified as a BLM sensitive species. This species ranges from southern British Columbia south through the Great Basin to northern Arizona and New Mexico. Great Basin spadefoots prefer sagebrush communities below 6,000 feet amsl, although they have been found at elevations of 9,200 feet amsl. This species requires loose soil for burrowing. In Wyoming, this species is most abundant west of the Continental Divide in the Wyoming Basin and the Green River Valley, but in the center of the state, it crosses the Divide into Fremont and Natrona counties (WGFD 2010). Marginal habitat occurs within the project area in ephemeral washes; therefore, the potential for this species to occur along the project route is considered low.

3.8.3 Federally Listed, Proposed, and Candidate Plant Species

Three federally listed plant species were evaluated based on review of the USFWS' Sweetwater County List (USFWS 2010). The potential occurrence of these plant species within the project area was based on range, known distribution, and the presence of suitable habitat within the project area (**Table 3-13**). All species were eliminated from detailed analysis based on rationale presented in **Table 3-13**.

3.8.4 BLM Sensitive Plant Species

Twenty-one BLM sensitive plant species were evaluated based on review of the BLM Rock Springs and RFO's sensitive species lists (BLM 2010). The potential occurrence of these species within the project area was based on range, known distribution, and the presence of suitable habitat within the project area (**Table 3-13**). A total of 19 BLM sensitive plant species were eliminated from detailed analysis based on rationale presented in **Table 3-13**. The remaining two BLM sensitive plant species that have the potential to occur within the project area, dune wildrye and persistent sepal yellowcress, are discussed below. The project area is located within the upper Green River Basin, and within the species-specific elevational range for the dune wildrye and persistent sepal yellowcress. Potentially suitable habitat may be present within the project area.

Table 3-13 BLM Sensitive Plant Species Potentially Occurring within the Project Area

Common Name *Scientific Name*	BLM Field Office	Habitat Association	Potential for Occurrence within the Project Area	Eliminated from Detailed Analysis (Yes/No)
Meadow pussytoes *Antennaria arcuata*	BLM (RSFO)	Subirrigated meadows within broad stream channels dominated by *Deschampsia caespitosa, Juncus balticus, Poa pratensis, P. nevadensis, Koeleria macrantha,* and *Carex praegracilis between* 4,950 and 7,900 feet amsl. The species may be found on hummocks, level ground, or shallow depressions on alkaline, clayey soils high in organic matter.	None. Regional endemic found in three disjunct areas in south-central Idaho, northeastern Idaho, and central Wyoming. In Wyoming, it is known only from the Sweetwater River Valley and the South Pass area of the southern Wind River Range in the vicinity of Atlantic City and Jeffrey City (Fremont County) and from the northern Green River Basin (Sublette County).	Yes, due to limited geographic range and known species occurrence populations.
Laramie columbine *Aquilegia laramiensis*	BLM (RFO)	Shady, and usually level, microsites associated with granite outcrops, boulders, crevices, ledges, and cliff bases shaded by tree cover between 5,400 and 10,100 feet amsl.	None. Regional endemic to the Laramie Range of southwest Wyoming (Albany and Converse counties).	Yes, due to limited geographic range and known species occurrence populations.
Meadow milkvetch *Astragalus diversifolius*	BLM (RFO and RSFO)	Moist, often alkaline meadows and swales in sagebrush valleys or closed drainage basins on subirrigated silt loams. In Wyoming, it grows in alkaline meadows at fringes of playa landscapes between 6,500-6,620 feet amsl.	None. Occurs in east-central Idaho, the southwestern edge of the Salt Lake Desert in Utah, southern Nevada, south-central Wyoming and a historical report in southwest Wyoming. In Wyoming, it is known from the Great Divide Basin (Sweetwater County) and the one historical collection is thought to be from the Green River Basin (Sweetwater or Sublette counties).	Yes, due to limited geographic range and known species occurrence populations.

Table 3-13 BLM Sensitive Plant Species Potentially Occurring within the Project Area

Common Name *Scientific Name*	BLM Field Office	Habitat Association	Potential for Occurrence within the Project Area	Eliminated from Detailed Analysis (Yes/No)
Precocious milkvetch *Astragalus proimanthus*	BLM (RSFO)	Sparsely vegetated rims and gullied upper slopes of benches, bluffs, and mesa-like ridges between 6,400 and 7,200 feet amsl. Associated with the Eocene Green Bridger Formation.	None. Narrow endemic restricted to the bluffs of the Henry's Fork River and vicinity of McKinnon in the southern Green River Basin in southwestern Sweetwater County, Wyoming.	Yes, due to limited geographic range and known species occurrence populations.
Small rockcress *Boechera (Arabis) pusilla*	BLM (RSFO)	Crevices and sparsely vegetated, coarse granite soil in granite-pegmatite outcrops surrounded by sagebrush grassland at between 8,000 and 8,100 feet amsl.	None. State endemic restricted to the southern Wind River Range (South Pass area) in Fremont County, Wyoming.	Yes, due to limited geographic range, elevational range, and known species occurrence populations.
Cedar Rim thistle *Cirsium aridum*	BLM (RFO)	Barren slopes, fans, and draws on whitish-gray sandstone, chalk, turfaceous colluviums, or clay substrates derived from the Split Rock, White River, Wagon Bed, Wind River, Green River, and Wasatch formations. Populations are found mostly in sparsely vegetated openings within Wyoming big sagebrush grasslands between 5,800 and 7,500 feet amsl.	None. State endemic, restricted to the Green River Basin in Sublette County, Beaver Rim area of Fremont County, Sweetwater River Valley in Carbon County, and highlands on the east side of Flaming Gorge in Sweetwater County.	Yes, due to limited geographic range and known species occurrence populations.
Ownbey's thistle *Cirsium ownbeyi*	BLM (RSFO)	Semi-barren rims or steep slopes of broken gray slate below shaley cliffs between 6,440 and 8,200 feet amsl on sandy clay soils covered by bleached and broken whitish, red, or bluish-gray limey-slate fragments derived from the Eocene Green River Formation.	None. Regional endemic of northeast Utah, southwest Wyoming, and northwest Colorado. In Wyoming, it is restricted to the Green River Basin on the east side of Flaming Gorge Reservoir in Sweetwater County.	Yes, due to limited geographic range and known species occurrence populations.

Table 3-13 BLM Sensitive Plant Species Potentially Occurring within the Project Area

Common Name *Scientific Name*	BLM Field Office	Habitat Association	Potential for Occurrence within the Project Area	Eliminated from Detailed Analysis (Yes/No)
Many-stemmed spider flower *Cleome multicaulis*	BLM (RFO)	Whitish, alkali-rich, strongly hydrogen-sulfide scented soils bordering shallow, spring-fed playa lakes or dried lakebeds; most abundant on damp flats with approximately 90 percent cover of *Spartina gracilis, Distichlis stricta,* and *Juncus balticus.*	None. Disjunct populations known in south-central Colorado and central Wyoming. In Wyoming, populations are restricted to the Sweetwater River Valley in Natrona County.	Yes, due to limited geographic range and known species occurrence populations.
Wyoming tansymustard *Descurainia torulosa*	BLM (RSFO)	Sandy soil at the base of cliffs composed of volcanic breccias or sandstone, under slight overhangs, in cavities in volcanic rock or on ledges between 7,700 and 10,500 feet amsl.	None. State endemic restricted to the southern Absorka Range in Fremont, Park, and Teton counties; and the Rock Springs Uplift in Sweetwater County.	Yes, due to limited geographic range and known species occurrence populations.
Dune wildrye *Elymus simplex* var. *luxurians*	BLM (RSFO)	Drifting sand dunes at 7,130 feet amsl.	Low. The species is only known from Sweetwater County, in upper Green River Basin.	No.
Large-fruited bladderpod *Lesquerella macrocarpa*	BLM (RSFO)	Sparsely vegetated *Atriplex gardneri-Elymus elymoides* communities on barren, fine-textured clays and shales, often with gypsum or bentonite. Populations are usually on slopes of 0-15% on low hills, knolls, and colluvial fans between 6,740 and 7,760 feet amsl.	None. Endemic to the western rim of the Great Divide Basin in Fremont and Sweetwater counties; the Green River Basin near Opal, Wyoming in Lincoln County; and upper Green River in Sublette County.	Yes, due to limited geographic range and known species occurrence populations.

Table 3-13 BLM Sensitive Plant Species Potentially Occurring within the Project Area

Common Name *Scientific Name*	BLM Field Office	Habitat Association	Potential for Occurrence within the Project Area	Eliminated from Detailed Analysis (Yes/No)
Stemless beardtongue *Penstemon acaulis* var. *acaulis*	BLM (RSFO)	Sparsely vegetated cushion plant/bunchgrass communities in openings within *Artemisia nova* grasslands on low slopes, outwash fans, ridgetops, and flats between 6,080 and 8,020 feet amsl. The species occurs on shallow, rocky soils derived from the Bridger Formation.	None. Narrow endemic of southwestern Wyoming in Sweetwater County; and northeastern Utah in Daggett County in the vicinity of Mckinnon and Manila.	Yes, due to limited geographic range and known species occurrence populations.
Gibbens' beardtongue *Penstemon gibbensii*	BLM (RFO)	Barren shale or sandstone slopes of the Browns Park Formation or Laney member of the Green River shale, often located below caprock, on the steep, upper or middle slopes eroding out below the resistant layer. Sites are sparsely vegetated slopes of *Elymus spicatus, Oryzopsis hymenoides*, and *Stipa comata* with scattered shrubs between 6,200 and 7,700 feet amsl.	None. Known in south-central Wyoming, northwestern Colorado, and adjacent northeastern Utah. Wyoming occurrences are restricted to the southern Washakie Basin and North Platte River Valley in Carbon and Sweetwater counties.	Yes, due to limited geographic range and known species occurrence populations.
Beaver Rim phlox *Phlox pungens*	BLM (RSFO)	Sparsely vegetated cushion plant communities on slopes of limestone, volcanic-rich sandstone, siltstone, or red-bed clays between 6,000 and 7,400 feet amsl.	None. Endemic to the Wind River and Green River basins extending to the Beaver Rim and southeastern foothills of the Wind River Range in Fremont, Lincoln, Rock Springs, and Sublette counties, Wyoming.	Yes, due to limited geographic range and known species occurrence populations.

Table 3-13 BLM Sensitive Plant Species Potentially Occurring within the Project Area

Common Name *Scientific Name*	BLM Field Office	Habitat Association	Potential for Occurrence within the Project Area	Eliminated from Detailed Analysis (Yes/No)
Tufted twinpod *Physaria condensata*	BLM (RSFO)	Dry, rocky calcareous knolls and ridges, clay banks, and shaley hills in sparsely vegetated cushion plant communities in opening within sagebrush grassland between 6,700 and 7,400 feet amsl.	None. Narrow endemic of the southern Overthrust Belt and lower Green River Basin in southwest Wyoming in Lincoln, Sublette, and Uinta counties.	Yes, due to limited geographic range and known species occurrence populations.
Limber pine *Pinus flexilis*	BLM (RFO and RSFO)	Dry, rocky sites between 4,900 and 11,800 feet amsl. Limber pine can occur scattered throughout forested regions on more mesic sites, especially in low density, open areas.	None. Known to occur both east and west of the Continental Divide within suitable habitat.	Yes, due to specific geographic range and known species occurrence populations.
Persistent sepal yellowcress *Rorippa calycina*	BLM (RFO)	Sparsely vegetated, moist sandy to muddy banks of streams, stock ponds, and man-made reservoirs near the high water line. In Wyoming, it occurs mostly on semi-disturbed or recently flooded openings in small inlets or bays with scattered clumps of *Hordeum jubatum*, *Poa secunda*, *Elymus smithii* and a variety of native and exotic early successional forbs between 3,660 and 6,800 feet amsl.	Low. Originally a regional endemic of south-central Montana, western North Dakota, and central Wyoming. Currently only known to be extant and persisting in Wyoming, where it is known from the North Platte River drainage, and Bighorn, Great Divide, Green River, and Wind River basins in Albany, Big Horn, Carbon, Fremont, Park, Sweetwater, and Washakie counties.	No.

Table 3-13 BLM Sensitive Plant Species Potentially Occurring within the Project Area

Common Name *Scientific Name*	BLM Field Office	Habitat Association	Potential for Occurrence within the Project Area	Eliminated from Detailed Analysis (Yes/No)
Laramie false sagebrush *Sphaeromeria simplex*	BLM (RFO)	Gentle slopes or rims of dry, rocky limestone-sandstone "pebble plains" in wind-scoured openings dominated by cushion plant communities within more densely vegetated juniper, limber pine, big sagebrush, or mountain mahogany stands between 7,200 and 8,760 feet amsl.	None. Endemic to southeast Wyoming in the western foothills of the Laramie Range, Shirley Basin, and Shirley Mountains in Albany, Carbon, Converse, and Natrona counties.	Yes, due to limited geographic range and known species occurrence populations.
Green River greenthread *Thelesperma caespitosum*	BLM (RSFO)	White shale slopes and ridges of the Green River Formation at approximately 6,300 feet amsl associated with *Pinus edulis* and pinyon and *Cercocarpus* spp.	None. Regional endemic known only from southwestern Wyoming (Sweetwater County) and northeastern Utah (Uinta Basin in southern Duchesne County, Utah).	Yes, due to limited elevational range, lack of the Green River Formation within the project area, and known species occurrence populations.
Uinta greenthread *Thelesperma pubescens*	BLM (RSFO)	Sparsely vegetated benches and ridges within cushion plant communities and sagebrush grasslands on coarse, cobbly soils of Bishop Conglomerate between 8,200 and 8,900 feet amsl.	None. Endemic to foothills of the southern Green River Basin and northern Uinta Range in southwest Wyoming (Uinta and Sweetwater counties) and reported for adjacent northeast Utah.	Yes, due to limited geographic range, elevational range, and known species occurrence populations.
Cedar Mountain Easter daisy *Townsendia microcephala*	BLM (RSFO)	Exposed, west-facing upper slopes and ridges on shallow, sandy soils between 8,200 and 8,500 feet, apparently restricted to Oligocene age Bishop Conglomerate.	None. Endemic to southwestern Wyoming; known only from the northern foothills of the Uinta Range in Sweetwater and Uinta counties.	Yes, due to limited geographic range, elevational range, and known species occurrence populations.

Sources: BLM 2010; NatureServe 2010a,b,c; WYNDD 2011b,c; 2010a,b; 2009a,b; 2008b,c,d; 2001a,b,c,d; 2000a,b,c,d,e,f; No Date_a,b.

Persistent Sepal Yellowcress

The persistent sepal yellowcress (*Rorippa calycina*) is classified as a BLM sensitive species (BLM 2010). Persistent sepal yellowcress is a rhizominous perennial occurring in sparsely vegetated, moist sandy to muddy banks of streams, stock ponds, and man-made reservoirs near the high water line. Its habitat is usually sparsely vegetated with bunchgrasses, early successional or weedy forbs, and scattered shrubs. In Wyoming, it occurs mostly on semi-disturbed or recently flooded openings in small inlets or bays with scattered clumps of *Hordeum jubatum*, *Poa secunda*, *Elymus smithii* and a variety of native and exotic early successional forbs between 3,660 and 6,800 feet amsl. Occasional populations also can be found in openings in grassy streambanks, in barren patches among thickets of *Salix exigua* or *Tamarix chinensis*, and on the banks of small playa lakes. The flowering and fruiting period for this species extends from May through August. Originally a regional endemic of south-central Montana, western North Dakota, and central Wyoming, currently this species is known only to be extant and persisting in Wyoming, where it is known form the North Platte River drainage, and Bighorn, Great Divide, Green River, and Wind River basins in Albany, Big Horn, Carbon, Fremont, Park, Sweetwater, and Washakie counties. Occurrences in Wyoming are known from 28 populations, all of which have been observed since 1979. Potentially suitable habitat may be present within the project area, as such the potential for this species to occur within the project area is low.

Dune Wildrye

The dune wildrye (*Elymus simplex* var. *luxurians*) is classified as a BLM sensitive species (BLM 2010). Dune wildrye is a perennial grass found in drifting sand dunes at 7,130 feet amsl. The flowering and fruiting period for this species occurs throughout the summer months. Known from only two confirmed specimens, this species is known only from Sweetwater County, within the upper Green River Basin (WYNDD 2009a, 2001a). The project area is located within the upper Green River Basin, and within the species-specific elevational range. Potentially suitable habitat may be present within the project area, as such the potential for this species to occur within the project area is low.

3.9 Air Quality and Climate Change

The air quality study area is southwestern Wyoming. Air quality within the study area has the potential to be affected by such activities as emissions from the construction and operation of oil and gas facilities, access roads, and other elements of management activities. Regional air quality also is affected by natural events such as windstorms and wildfires, and larger emissions generating facilities such as power plants and facilities and transportation activities in urban corridors. Natural events generally are short lived, lasting from several hours to several days. The effects during these events may affect human health and the environment, and generally are considered part of the natural physical environment. This section describes the existing air quality resource of the region and the applicable air regulations and standards that would apply to the Proposed Action and No Action alternatives.

3.9.1 Air Quality Regulatory Framework

The CAA of 1970 (42 USC 7401 et seq.) as amended in 1977 and 1990 is the basic federal statute governing air pollution. Provisions of the CAA of 1970 that potentially are relevant to the Project are listed below.

- National Ambient Air Quality Standards (NAAQS)
- Prevention of Significant Deterioration (PSD)
- New Source Performance Standards (NSPS)
- Maximum Achievable Control Technology (MACT) Standards
- Conformity Requirements
- Greenhouse Gas (GHG) Reporting Rule

In addition to federal regulations, the CAA provides states with the authority to regulate air quality within state boundaries. The State of Wyoming has enacted additional Ambient Air Quality Standards

(Wyoming Ambient Air Quality Standards [AAQS]) that are applicable to the project area. In addition, Wyoming established mitigation measures that are required for oil and gas producers in this region. These mitigation measures are referred to as Wyoming Best Achievable Control Technology (BACT) and are applicable to the Project. The regulations are outlined in the WDEQ's Oil and Gas Production Facilities, Chapter 6, Section 2, Permitting Guidance (March 2010). The federal and Wyoming state regulations that potentially are relevant to the Project are discussed in the following sections.

3.9.1.1 National and State Ambient Air Quality Standards

The Federal CAA amendments of the 1990s require all states to control air pollution emission sources so that NAAQS are met and maintained. In addition to these requirements, the National Park Service (NPS) Organic Act requires the NPS to protect the natural resources of the lands it manages from the adverse effects of air pollution.

The NAAQS establishes maximum acceptable concentrations for NO_2, CO, SO_2, PM_{10}, $PM_{2.5}$, O_3, and lead. Given the extremely low levels of lead emissions from Project sources, the lead standards are not addressed in this analysis. These pollutants are known as criteria pollutants. The NAAQS are established by the USEPA and are outlined in 40 CFR 50. Wyoming AAQS also establish maximum acceptable concentrations of H_2S. These standards represent the maximum allowable atmospheric concentrations that may occur to protect public health and welfare, and include a reasonable margin of safety to protect the more sensitive individuals in the population. The air quality impacts in the air quality study area must meet the NAAQS, which apply nationwide. An area that does not meet the NAAQS is designated as a nonattainment area on a pollutant-by-pollutant basis. Applicable federal and state criteria are presented in **Table 3-14**.

Table 3-14 Applicable Ambient Air Quality Standards

Pollutant (Units)	Averaging Period	Ambient Air Quality Standards[1]	
		National[2]	Wyoming[3]
NO_2 (µg/m^3)	1-hour	188[12]	--
	Annual[4]	100	100
PM_{10} (µg/m^3)	24-hour[5]	150	150
	Annual[4]	--[13]	50
$PM_{2.5}$ (µg/m^3)	24-hour[6]	35	65
	Annual[4]	15	15
SO_2 (µg/m^3)	1-hour[7]	196	--
	3-hour[8]	1,300	1,300
	24-hour[8]	--[14]	260
	Annual[4]	--[14]	60
CO (µg/m^3)	1-hour[8]	40,000	40,000
	8-hour[8]	10,000	10,000
O_3 (parts per million [ppm])	8-hour[9]	0.075	0.075
H_2S (µg/m^3)	30-minute[10]	--	70
	30-minute[11]	--	40

1 Due to the lack of an identified regional issue for lead, it will not be analyzed as part of this study.

2 Source: USEPA 2011b.

3 Source: WDEQ 2011b.

Table 3-14 Applicable Ambient Air Quality Standards

[4] Not to be exceeded.

[5] Not to be exceeded more than once per year on average over 3 years.

[6] 24-hour average of the 98th percentile concentrations (effective December 17, 2006).

[7] The 3-year average of the 99th percentile of the daily maximum 1-hour average must not exceed this standard.

[8] Not to be exceeded more than once per year.

[9] To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average O_3 concentrations measured at each monitor within an area over each year must not exceed 0.075 ppm.

[10] Not to be exceeded more than 2 times per year. Note that the ambient air quality models do not produce results for less than a 1-hour averaging period. Therefore, the 1-hour average impact for H_2S will be compared to the standard.

[11] Not to be exceeded more than 2 times in any 5 consecutive days. Note that the ambient air quality models do not produce results for less than a 1-hour averaging period. Therefore, the 1-hour average impact for H_2S will be compared to the standard.

[12] The 3-year average of the 98th percentile of the daily maximum 1-hour average is not to exceed this standard.

[13] The annual PM_{10} National Ambient Air Quality Standards (NAAQS) of 50 µg/m^3 was revoked by USEPA on September 21, 2006; see FR volume 71, number 200, 10/17/06.

[14] The 24-hour and annual SO_2 NAAQS was revoked by USEPA on June 2, 2010.

µg/m^3 = micrograms per cubic meter

NO_2 = nitrogen dioxide

PM_{10} = particulate matter with an aerodynamic diameter of 10 microns or less

$PM_{2.5}$ = particulate matter with an aerodynamic diameter of 2.5 microns or less

SO_2 = sulfur dioxide

CO = carbon monoxide

O_3 = ozone

H_2S = hydrogen sulfide

3.9.1.2 Prevention of Significant Deterioration

New emissions sources in an attainment area are required to follow PSD regulations. PSD regulations restrict the degree of ambient air quality deterioration allowed and apply to proposed new or modified major stationary sources located in an attainment area that have the potential to emit criteria pollutants in excess of predetermined de minimis values (40 CFR Part 51). As defined in 40 CFR 51, a source is a major stationary source if it:

1. Can be classified in one of the 28 named source categories listed in Section 169 of the CAA and it emits or has the potential to emit 100 tons per year (tpy) or more of any pollutant regulated by the CAA; or
2. Is any other stationary source that emits or has the potential to emit 250 tpy or more of any pollutants regulated by the CAA (USEPA 1990).

The upstream oil and gas sources that are anticipated to be operated as part of the Project are not listed as one of the 28 named source types in Section 169 of the CAA; therefore, 250 tpy is the threshold for major source status for the Project.

Allowable deterioration to air quality can be expressed as the incremental increase to ambient concentrations of criteria pollutants, or PSD increment. The PSD increments for criteria pollutants are based on the PSD classification of the area. Class I area status is assigned to federally protected wilderness areas and allows the lowest amount of permissible deterioration. Class II designations allow a higher level of increment consumption relative to Class I areas. There are no designated Class III or heavy industrial use areas in the U.S.

A project's PSD increment consumption is typically determined through the use of an air quality model. Atmospheric concentrations of NO_2, SO_2, and PM_{10} predicted by the air quality model are compared with allowable PSD increments. The allowable PSD increments for Class I and Class II areas are given in **Table 3-15**. For NEPA analyses, a comparison of project impacts to PSD Class II increments does not represent an official regulatory PSD increment consumption analysis because:

1. Increment consumption is not evaluated for regulatory purposes under NEPA; and
2. An official increment consumption analysis requires a special set of emissions data not available for this NEPA analysis.

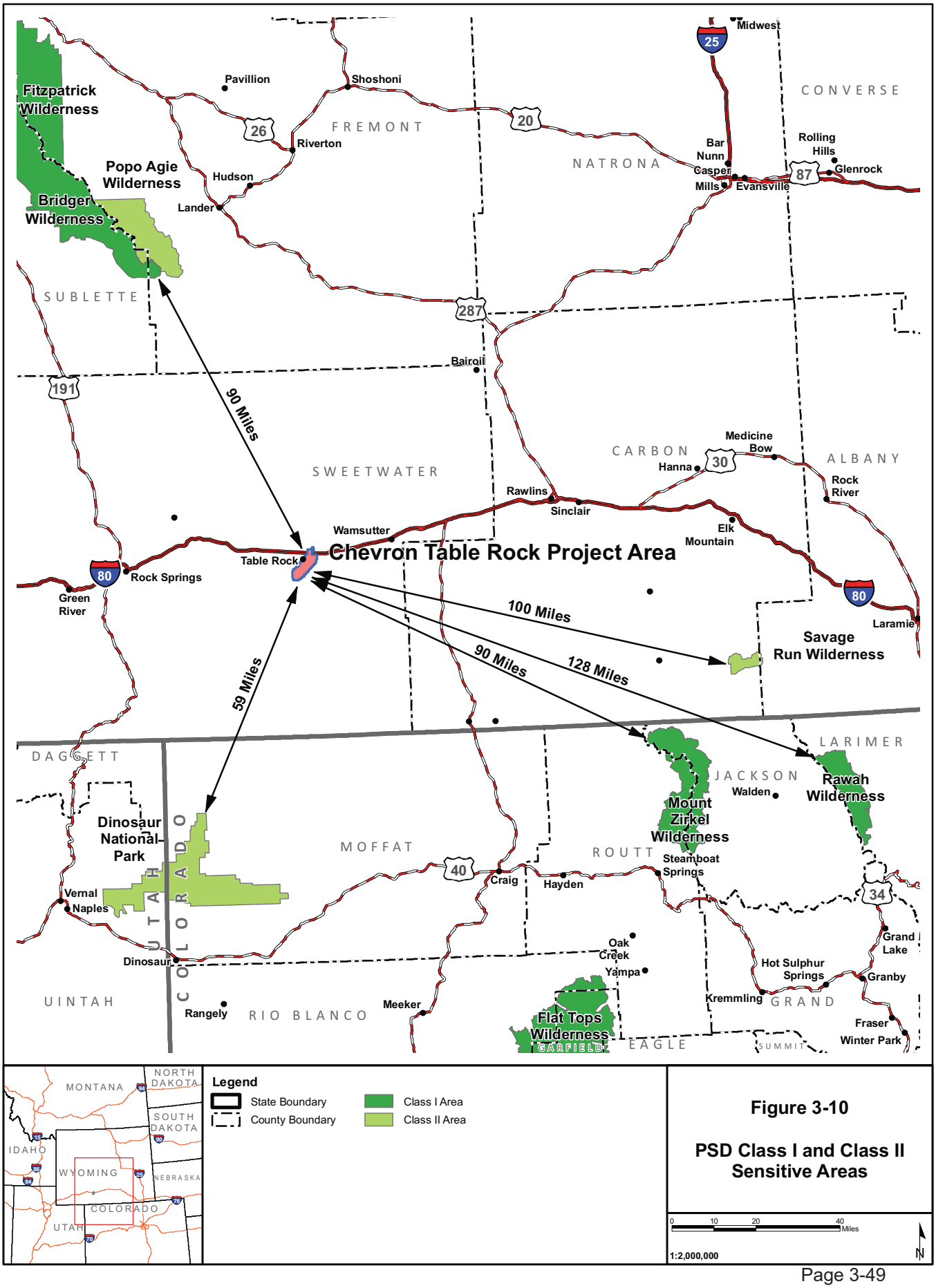
Table 3-15 Increments for Class I and Class II Areas

PSD Class	Pollutant	Allowable Increment ($\mu g/m^3$)		
		Annual Arithmetic Mean	24-hour Maximum	3-hour Maximum
Class I	NO_2	2.5	-	-
	SO_2	2	5	25
	PM_{10}	4	8	-
Class II	NO_2	25	-	-
	SO_2	20	91	512
	PM_{10}	17	30	-

The project area is located within a PSD Class II area; however, PSD Class I and other sensitive Class II areas are located within the project air quality study area. The closest PSD Class I area is Bridger Wilderness Area, which is approximately 90 miles northwest of the project area. The PSD Class I areas and sensitive Class II areas in proximity to the project area are shown in **Figure 3-10**. Those areas that are analyzed as part of in the air quality analysis include:

- Bridger Wilderness Area, Wyoming (Class I)
- Fitzpatrick Wilderness Area, Wyoming (Class I)
- Savage Run Wilderness Area, Wyoming (Federal Class II, Wyoming Class I)
- Mount Zirkel Wilderness Area, Colorado (Class I)
- Rawah Wilderness Area, Colorado (Class I)
- Popo Agie Wilderness Area , Wyoming (Class II)
- Wind River Roadless Area, Wyoming (Class II)
- Dinosaur National Monument, Colorado-Utah (Federal Class II, Colorado Class I (SO_2 only)

In addition to more stringent PSD increments, Class I areas are protected by Federal Land Managers (FLMs) who manage of air quality related values (AQRVs) such as visibility and atmospheric deposition. Though not a regulatory program under PSD, FLMs review the issuance of a PSD permit for any impacts that exceed guideline thresholds for these parameters. In addition to analysis of the visibility and atmospheric deposition, the change in the acid neutralizing capacity (ANC) of sensitive lakes is assessed by FLMs. The lakes that have been designated as acid sensitive and are located within the sensitive PSD Class I and Class II Wilderness areas include:


X:\0Projects\Chevron_TableRockEA_60195742\Figures\DOC\EA\Fig_3-10_Class_I_II_20110801.mxd
Fitzpatrick Wilderness
Popo Agie Wilderness
Bridger Wilderness
Pavillion
Shoshoni
Riverton
Hudson
Lander
FREMONT
SUBLETTE
SWEETWATER
Bairoil
Midwest
CONVERSE
NATRONA
Bar Nunn
Casper
Mills
Evansville
Rolling Hills
Glenrock
CARBON
Medicine Bow
Hanna
ALBANY
Rock River
Rawlins
Sinclair
Elk Mountain
Wamsutter
Table Rock
Chevron Table Rock Project Area
Rock Springs
Green River
90 Miles
59 Miles
100 Miles
90 Miles
128 Miles
Savage Run Wilderness
Laramie
LARIMER
JACKSON
Walden
Rawah Wilderness
Mount Zirkel Wilderness
Steamboat Springs
ROUTT
DAGGETT
Dinosaur National Park
MOFFAT
Vernal
Naples
Dinosaur
Craig
Hayden
Oak Creek
Yampa
Meeker
Rangely
UINTAH
RIO BLANCO
Flat Tops Wilderness
GARFIELD
EAGLE
SUMMIT
Hot Sulphur Springs
Kremmling
GRAND
Granby
Grand Lake
Fraser
Winter Park
UTAH
COLORADO
Legend
State Boundary
County Boundary
Class I Area
Class II Area
MONTANA
NORTH DAKOTA
SOUTH DAKOTA
IDAHO
WYOMING
NEBRASKA
COLORADO
UTAH
Figure 3-10
PSD Class I and Class II Sensitive Areas
0 10 20 40 Miles
1:2,000,000
N

- Deep Lake in the Bridger Wilderness Area, Wyoming
- Black Joe Lake in the Bridger Wilderness Area, Wyoming
- Hobbs Lake in the Bridger Wilderness Area, Wyoming
- Upper Frozen Lake in the Bridger Wilderness Area, Wyoming
- Lazy Boy Lake in the Bridger Wilderness Area, Wyoming
- Ross Lake in the Fitzpatrick Wilderness Area, Wyoming
- Lower Saddlebag Lake in the Popo Agie Wilderness Area, Wyoming
- Lake Elbert in the Mount Zirkel Wilderness Area, Colorado
- Seven Lakes in the Mount Zirkel Wilderness Area, Colorado
- Summit Lake in the Mount Zirkel Wilderness Area, Colorado
- Island Lake in the Rawah Wilderness Area, Colorado
- Rawah Lake #4 in the Rawah Wilderness Area, Colorado.

3.9.1.3 New Source Performance Standards

The regulation of new sources, through the development of standards applicable to a specific category of sources, was an important step taken by the CAA. NSPS apply to all new, modified, or reconstructed sources within a given category, regardless of geographic location or the existing ambient air quality. The standards defined emission limitations that would be applicable to a particular source group. The NSPS potentially applicable to the Project include the following subparts of 40 CFR Part 60:

- Subpart A – General Provisions
- Subpart Kb – Standards of Performance for Volatile Organic Storage Vessels
- Subpart KKK – Standards of Performance for Equipment Leaks of Volatile Organic Compounds (VOCs) from Onshore Natural Gas Processing Plants
- Subpart LLL– Standards of Performance for Onshore Natural Gas Processing Plants: SO_2 Emissions
- Subpart IIII – Standards of Performance for Stationary Compression Ignition Internal Combustion Engines
- Subpart JJJJ – Standards of Performance for Stationary Spark-Ignition Internal Combustion Engines

3.9.1.4 National Emission Standards for Hazardous Air Pollutants

Under the National Emission Standards for Hazardous Air Pollutants, the USEPA promulgated MACT standards pursuant to Section 112 of the 1990 CAA Amendments and these rules are provided in 40 CFR 63. The MACT standards that potentially would be applicable to the proposed Project include the following:

- Subpart A – General Provisions
- Subpart HH – Oil and Natural Gas Production Facilities
- Subpart VV – National Emission Standards for Oil-Water Separators and Organic-Water Separators
- Subpart HHH – Natural Gas Transmission and Storage Facilities

- Subpart ZZZZ – Stationary Reciprocating Internal Combustion Engines
- Subpart DDDDD – Industrial, Commercial, and Institutional Boilers and Process Heaters

3.9.1.5 Wyoming Best Available Control Technology

The project area is located in the Concentrated Development Area (CDA) designated by the WDEQ. As such, the Project must install and operate the presumptive BACT requirements for CDA facilities set forth by the WDEQ (WDEQ 2010b). This requires installation of control equipment for flashing, dehydration units, pneumatic pumps, pneumatic controllers, well completions, produced water tanks, and blow down/venting. In addition, there are specified WDEQ BACT limits for internal combustion engines. Wyoming BACT requirements will be followed as part of the applicant-committed measures (ACMs). Project emissions calculations include controls stipulated by Wyoming BACT.

3.9.1.6 Conformity for General Federal Actions

According to Section 176I of the CAA (40 CFR 51.853), a federal agency must make a conformity determination in the approval of a project having air emissions that exceed specified thresholds in nonattainment and/or maintenance areas. The proposed Project is not located in a nonattainment or maintenance area; therefore, a general conformity analysis is not required.

3.9.1.7 Carbon Dioxide and Other Greenhouse Gases

In *Massachusetts v. EPA*, the U.S. Supreme Court (April 7, 2007) held that carbon dioxide (CO_2) satisfies the definition of "air pollutant" and that USEPA has authority to regulate emissions of CO_2 and other GHGs from new motor vehicles under the CAA. The Supreme Court remanded the case to USEPA to determine whether such motor vehicle emissions contribute to global climate change, and thereby endanger public health or welfare. The ruling, however, did not require the USEPA to create any emission control standards or ambient air quality standards for GHG emissions.

CO_2 and other GHGs are naturally occurring gases in the atmosphere whose status as a pollutant is not related to their toxicity, but to the added long-term impacts they may have on climate because of their increased incremental levels in the earth's atmosphere. Because they are non-toxic and non-hazardous at normal ambient concentrations, CO_2 and other naturally occurring GHGs do not have applicable ambient standards or emission limits under the major environmental regulatory programs.

On October 30, 2009, the USEPA issued the final mandatory reporting rule for major sources of GHG emissions. The rule requires a wide range of sources and source groups to record and report selected GHG emissions, including CO_2, methane (CH_4), nitrous oxide (N_2O), and some halogenated compounds. The USEPA delayed a comparable rule for GHG emissions for various petroleum and natural gas industry groups. On April 10, 2010, the USEPA proposed an additional subpart of the original rule to address natural gas production and natural gas transmission source groups, among others. The USEPA promulgated a final rule for these sources on November 30, 2010.

The USEPA rules do not require any controls or establish any standards related to GHG emissions or impacts. Therefore, there is no evident requirement at this time that would affect development of the proposed Project under the proposed rule, other than the possibility of monitoring, recordkeeping, and reporting of GHG emissions. GHG could be limited on a case-by-case basis for new or modified facilities or sources that emit above the threshold quantities of a calculated carbon dioxide equivalent (CO_2(e)) amount of GHG.

3.9.2 Regional Air Quality

Air quality in a given location is defined by pollutant concentrations in the atmosphere and is generally expressed in units of ppm or $\mu g/m^3$. Representative ambient background levels of pollutants measured in Sublette, Uinta, and Freemont Lake counties in Wyoming, are shown in **Table 3-16**. Data for this table were obtained from the USEPA Air Monitoring Network data archives website. The sites were selected to provide a representative estimate of current background conditions in the project area.

Table 3-16 Ambient Air Quality Background Values

Pollutant	Averaging Period	Ranking[1]	Year	Concentration	Units	Number of Exceedences	Monitor/ County
NO_2	1-hour	H	2006	0.062	ppm	—	Sweetwater (Wamsutter station)
		H	2007	0.063	ppm	—	Sweetwater (Wamsutter station)
		H	2008	0.051	ppm	—	Sweetwater (Wamsutter station)
	Annual	H	2006	0.007	ppm	0	Sweetwater (Wamsutter station)
		H	2007	0.007	ppm	0	Sweetwater (Wamsutter station)
		H	2008	0.006	ppm	0	Sweetwater (Wamsutter station)
CO	1-hour	H2H	2007	1.60	ppm	0	Murphy Ridge/Uinta
		H2H	2008	0.90	ppm	0	Murphy Ridge/Uinta
	8-hour	H2H	2007	1.50	ppm	0	Murphy Ridge/Uinta
		H2H	2008	0.70	ppm	0	Murphy Ridge/Uinta
SO_2	1-hour	H	2006	0.011	ppm	—	Sweetwater (Moxa station)
		H	2007	0.010	ppm	—	Sweetwater (Moxa station)
		H	2008	0.011	ppm	—	Sweetwater (Moxa station)
	3-hour	H2H	2006	0.007	ppm	0	Sweetwater (Moxa station)
		H2H	2007	0.006	ppm	0	Sweetwater (Moxa station)
		H2H	2008	0.006	ppm	0	Sweetwater (Moxa station)
	24-hour	H2H	2006	0.004	ppm	0	Sweetwater (Moxa station)
		H2H	2007	0.002	ppm	0	Sweetwater (Moxa station)

Table 3-16 Ambient Air Quality Background Values

Pollutant	Averaging Period	Ranking[1]	Year	Concentration	Units	Number of Exceedences	Monitor/ County
		H2H	2008	0.002	ppm	0	Sweetwater (Moxa station)
	Annual	H	2006	0.001	ppm	0	Sweetwater (Moxa station)
		H	2007	0.001	ppm	0	Sweetwater (Moxa station)
		H	2008	0.001	ppm	0	Sweetwater (Moxa station)
PM_{10}	24-hour	H2H	2006	67	$\mu g/m^3$	0	Sweetwater (Wamsutter station)
		H2H	2007	199	$\mu g/m^3$	2	Sweetwater (Wamsutter station)
		H2H	2008	47	$\mu g/m^3$	0	Sweetwater (Wamsutter station)
	Annual	H	2006	17	$\mu g/m^3$	0	Sweetwater (Wamsutter station)
		H	2007	19	$\mu g/m^3$	0	Sweetwater (Wamsutter station)
		H	2008	15	$\mu g/m^3$	0	Sweetwater (Wamsutter station)
$PM_{2.5}$	24-hour	H2H	2008	18.9	$\mu g/m^3$	0	Sweetwater (Rock Springs station)
	Annual	H	2008	7.18	$\mu g/m^3$	0	Sweetwater (Rock Springs station)
O_3	8-hour	H	2006	.071	ppm	0	Sweetwater (Wamsutter station)
		H	2007	0.069	ppm	0	Sweetwater (Wamsutter station)
		H	2008	0.087	ppm	1	Sweetwater (Wamsutter station)

[1] H = Highest value recorded and H2H = High Second High (second highest value from the highest receptor site).

3.9.2.1 Air Quality Attainment Status

As the data shown in **Table 3-16** demonstrates, although the area surrounding the project area is in attainment for all criteria pollutants, with the exception of the 8-hour O_3 standard and 24-hour PM_{10} standard, the USEPA has not officially designated any part of Wyoming as non-attainment for the O_3 standard. However, the designation of a potential non-attainment area is likely to be forthcoming. Once an area is designated as non-attainment, the State of Wyoming is required to develop a State Implementation Plan (SIP) under the CAA section 176(c)(4)(E), which provides the requirements for SIPs.

3.9.2.2 Air Quality Related Values

An AQRV is defined by the NPS (NPS 2011) as:

> "a resource as identified by the Federal Land Manager for one or more federal areas, that may be adversely affected by a change in air quality. The resource may include visibility or a specific scenic, cultural, physical, biological, ecological, or recreational resource identified by the Federal Land Manager for a particular area."

AQRVs include changes in visibility or atmospheric deposition of pollutants to soils and water bodies. Regional haze is visibility impairment caused by the cumulative air pollutant emissions from numerous sources over a wide geographic area. Visibility impairment is caused by particles and gases in the atmosphere. Some particles and gases scatter light while others absorb light. The primary cause of regional haze in many parts of the country is light scattering resulting from fine particles (i.e., $PM_{2.5}$) in the atmosphere. Additionally, coarse particles between 2.5 and 10 microns in diameter can contribute to light extinction. Coarse particulates and $PM_{2.5}$ can be naturally occurring or the result of human activity. The natural levels of these species result in some level of visibility impairment, in the absence of any human influences, and will vary with season, daily meteorology, and geography (Malm 1999).

The visibility at Bridger Wilderness Area, the Class I area that is closest to the project area, is one of the best, or least impaired, in the nation. During the regional haze baseline period from 2000 through 2004, the average total light extinction for the 20 percent best days was 12.4 inverse megameter (Mm^{-1}), for the worst 20 percent days it was 31.6 Mm^{-1}, and averaged over the whole baseline period it was 19.7 Mm^{-1} (IMPROVE 2010). Mm^{-1} (inverse megameter) is the direct measurement unit for visibility impairment data. It is the amount of light scattered and absorbed as it travels over a distance of 1 million meters. Most of the particulate matter at Bridger Wilderness Area is composed of organic material, sulfates, and soil. The relative fractions of each component vary seasonally. Typically May and early fall are when Bridger Wilderness Area experiences the greatest reduction in visible range (IMPROVE 2010).

Background total S and N deposition data are collected at National Acid Deposition Program National Trends Network and Clean Air Status and Trends Network station monitoring locations near Centennial and Pinedale, Wyoming. The most recent available background N and S deposition data are shown in **Table 3-17**.

Table 3-17 Background N and S Deposition Values (kilograms per hectare per year [kg/ha-yr])

Site Location	Nitrogen Deposition	Sulfur Deposition	Year of Monitoring
Centennial	2.7	1.0	2005
Pinedale	1.5	0.63	2007

The ANC values that were currently available, and the number of samples used in the calculation of the 10^{th} percentile lowest ANC values, are provided in **Table 3-18**. Of the 12 lakes listed in **Table 3-18**, 2 lakes (Lazy Boy and Upper Frozen) are considered by the USFS as extremely sensitive to atmospheric deposition since the background ANC values are less than 25 micro equivalents per liter (µeq/l).

Table 3-18 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
Bridger	Black Joe	42º44'22"	109º10'16"	70.6	72
Bridger	Deep	42º43'10"	109º10'15"	61.1	62
Bridger	Hobbs	43º02'08"	109º40'20"	69.8	76
Bridger	Lazy Boy	43º19'57"	109º43'47"	27.8	1
Bridger	Upper Frozen	42º41'13"	109º09'39"	13.2	3
Fitzpatrick	Ross	43º22'41"	109º39'30"	54.0	55
Mount Zirkel	Lake Elbert	40º38'3"	106º42'25"	52.0	61
Mount Zirkel	Seven Lakes	40º53'45"	106º40'55"	39.9	18
Mount Zirkel	Summit Lake	40º32'43"	106º40'55"	48.0	102
Popo Agie	Lower Saddlebag	42º37'24"	108º59'38"	55.5	54
Rawah	Island	40º37'38"	105º56'28"	71.9	25
Rawah	Rawah Lake #4	40º37'38"	105º56'28"	41.5	24

[1] From USFS (2011).

[2] 10th percentile lowest ANC values reported.

3.9.3 Regional Climate

The climate in the region is characterized as arid, with cold winters and moderate summers. Annual precipitation (rainfall and snowfall) in the region ranges from 7 to 10 inches. A climate summary for Rock Springs, Wyoming, which is reasonably representative of climate conditions in the project area, is presented in **Table 3-19**.

Table 3-19 Monthly Climate Summary for Rock Springs, Wyoming

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Avg. Max. Temp. (°F)	31.7	36.7	43.8	55.2	66.8	77.4	86.2	83.7	73.6	61.3	44.8	34.7	58
Avg. Min. Temp. (°F)	9.8	14.3	20.6	28.7	37.2	44.9	51	48.8	39.7	30	19.4	13.2	29.8
Avg. Total Precip. (inches)	0.43	0.53	0.65	1.02	1.18	1.05	0.71	0.66	0.78	0.74	0.55	0.45	8.75
Avg. Total Snow Fall (inches)	7.5	7.3	7.2	6.2	1.6	0.2	0	0	0.5	3.3	6.1	7.4	47.2
Avg. Snow Depth (inches)	1	1	0	0	0	0	0	0	0	0	0	1	0

Source: Western Regional Climate Center 2011.

Three important meteorological factors influence the dispersion of pollutants in the atmosphere: mixing height, stability, and wind (speed and direction). Mixing height is the height above ground within which the air is well mixed due to wind-induced turbulence or buoyancy from surface heating. A relatively high mixing height allows the surface-level pollutants to be mixed into a deeper layer, thereby diluting the concentration and reducing the ambient air quality impact from those emissions. Mixing heights vary by several factors: 1) time of day due to the influence of the sun's heating of the surface inducing buoyant mixing within that layer and the cooling at night; 2) terrain features that may inhibit flow; 3) cloud cover that inhibits daily heating and cooling; 4) turbulence from winds in relation the roughness of the surface; and 5) the passage of weather systems and large-scale convection that act to mix air vigorously. In the project area, average morning mixing heights are approximately 1,000 feet and annual mean afternoon mixing heights are more than 7,800 feet (Holzworth 1972). Mean morning mixing heights tend to be lowest in the summer and fall, and highest in the spring months.

Atmospheric stability patterns are related to the temperature change with height above the surface and also are affected by surface winds. If the temperature decreases rapidly with height, the atmosphere tends to be unstable and the pollutants are well mixed. If the temperature increases with height (a temperature inversion), the atmosphere is stable, and that atmospheric structure inhibits the dispersion of pollutants. As related to the mixing heights, the atmosphere is more unstable in afternoon hours due to solar heating, and tends to be more stable late at night and early morning due to surface cooling. The atmosphere generally is most stable on clear, cold, winter mornings with calm winds and on days with snow cover at the surface. In and around the project area, the typically dry atmosphere leads to increased instability in the afternoons with extended periods of sunshine, and the dry conditions lead to stable conditions in the early morning because of the clear skies and strong night-time surface cooling. Stable conditions also develop along lower lying terrain features, such as valleys, due to the sinking of colder air into those valleys, with warmer air aloft. Thus, the topography plays a role in development of localized atmospheric stability conditions. The dispersion of pollutants also is related to local wind speeds and changing wind direction. Dispersion is enhanced by higher wind speeds that simply dilute the emitted pollutants. Dispersion also is enhanced by wind flow that changes direction in short periods of time or changes direction at various levels above the surface layers. The project area lies within the prevailing westerly wind belt, and within that belt, the associated large-scale storm systems that pass through the area act to enhance dispersion of pollutants.

Air pollutant dispersion in the area also is dependent on wind direction and speed. Although wind direction is highly influenced by the local terrain, the wind direction at Rock Springs tends to be westerly, (i.e., blowing from the west).

3.9.4 Climate Change

Ongoing scientific research has identified the potential impacts of anthropogenic (man-made) GHG emissions and changes in biological carbon sequestration due to land management activities on global climate. Through complex interactions on a regional and global scale, these GHG emissions and net losses of biological carbon sinks cause a net warming effect of the atmosphere, primarily by impeding the rate of heat energy radiated by the earth back into space. Although GHG levels have varied for millennia, recent industrialization and burning of fossil carbon sources have caused CO_2(e) concentrations to increase dramatically, and are likely to contribute to overall global climatic changes. The Intergovernmental Panel on Climate Change (IPCC) recently concluded that warming of the climate system is unequivocal and most of the observed increase in globally average temperatures since the mid-20th century very likely is due to the observed increase in anthropogenic GHG concentrations (IPCC 2007).

Global mean surface temperatures increased nearly 1.8°F from 1890 to 2006. Models indicate that average temperature changes are likely to be greater in the Northern Hemisphere. Northern latitudes (above 24°N) have exhibited temperature increases of nearly 2.1°F since 1900, with nearly a 1.8°F increase since 1970. Without additional meteorological monitoring systems, it is difficult to determine the spatial and temporal variability and change of climatic conditions, but increasing concentrations of GHGs are likely to accelerate the rate of climate change.

In 2001, the IPCC projected that by the year 2100, global average surface temperatures could increase by 2.5 to 10.4°F above 1990 levels. The National Academy of Sciences (2010) has confirmed these

projections, but also has indicated that there are uncertainties regarding how climate change may affect different regions. Computer model predictions indicate that increases in temperature would not be equally distributed, but are likely to be accentuated at higher latitudes. Warming during the winter months is expected to be greater than during the summer, and increases in daily minimum temperatures have been observed to increase in the region during the last few decades, while there are no strong indications of increases in daily maximum temperatures. Although large-scale spatial shifts in precipitation distribution may occur, these changes are more uncertain and difficult to predict.

As with any field of scientific study, there are uncertainties associated with the science of climate change; however, this does not imply that scientists do not have confidence in many aspects of climate change science. Some aspects of the science are known with virtual certainty because they are based on well-known physical laws and documented trends (USEPA 2011c).

Several activities contribute to the phenomena of climate change, including emissions of GHGs (especially CO_2 and CH_4) from fossil fuel development, large wildfires, activities using combustion engines, changes to the natural carbon cycle, and changes to radiative forces and reflectivity (albedo) of the earth-atmosphere system. It is important to note that GHGs will have a sustained climatic impact over different temporal scales. For example, recent emissions of CO_2 may influence climate for 100 years.

It may be difficult to discern whether climate change is already affecting resources globally, let alone those in the vicinity of the proposed Project. In most cases, there is little information about potential or projected effects of global climate change on resources. It is important to note that projected changes are likely to occur over several decades to a century. Therefore, many of the projected changes associated with climate change may not be measurably discernible within the reasonably foreseeable future. Existing climate prediction models are global in nature; therefore, they are not at the appropriate scale to estimate potential impacts of climate change on the project area and vicinity.

3.10 Land Use and Special Designations

Land use is currently comprised of livestock grazing, recreation, and oil and gas leases with well sites and associated infrastructure. Due to the nature of the existing land uses, portions of the project area are highly disturbed. There are no areas with wilderness characteristics within or near the project area. The nearest special designation is the Monument Valley Management Area, located over 11 miles from the southeast boundary of the project area. The management objective for the Monument Valley area is to provide protection of wildlife, geologic, cultural, watershed, scenic, and scientific values.

As shown in **Table 3-20**, the federal lands, administered by the BLM, and private lands make up the majority of the project area. Private lands, are mostly owned by the Union Pacific Land Resources (UPLR), Rock Springs Grazing Association, and P H Land & Livestock Inc. The Wyoming Office of State Lands and Investments manages state trust land. Revenues generated by trust lands and minerals are reserved for the exclusive benefit of public schools and certain other designated public institutions in Wyoming such as the Wyoming State Hospital (Wyoming Office of State Lands and Investments 2011). The surface ownership pattern within and adjacent to the Project is checkerboard, typically where even-numbered sections are owned by the federal government and odd-numbered sections are privately owned, mostly by the UPLR and several livestock companies.

Table 3-20 Land and Mineral Ownership

Ownership	Surface		Minerals	
	%	Acres	%	Acres
Federal Lands	49	6,674	44	6,034
State Lands	2	339	56	7,599
Private Lands	48	6,620		
Total	**100**	**13,633**	**100**	**13,633**

There are two designated utility corridors within the project area, one which includes Union Pacific rail lines, and the other which includes I-80. Both run in an east-west direction. There also are numerous ROWs within the project area consisting of multiple pipelines from existing oil and gas operations, overhead utilities, and the previously stated interstate ROW and Union Pacific co-located railroad ROWs. **Figure 3-11** depicts ROWs and special designations in and around the project area.

3.11 Transportation

The project area is transected by one interstate highway and multiple county, BLM, and private gravel roads and unimproved access roads. The majority of the roads within the project area are county roads (CRs), BLM-maintained access roads, and roads associated with oil and gas development, but there also are a number of secondary unmaintained two-track roads. Access to the project area is provided by I-80, Sweetwater CR 24 (Patrick Draw Road), CR 55 (Table Rock Road), and CR 65.

Traffic volumes on I-80 near the project area are listed on **Table 3-21**. Traffic on I-80 in the vicinity of the project area has increased nearly 6 percent since 1999. The interchange at Bar X Road and I-80 is a "diamond" interchange, which should provide adequate egress from the interstate for all oil and gas development and operations vehicles. The interchange at Patrick Draw Road and I-80 is a "jughandle," with a 15-mile per hour (mph) exit speed, which could make exiting from I-80 more difficult for large vehicles and heavy equipment. Baseline Chevron traffic data from 2008 shows that, in conjunction with currently authorized activities, 2,764 light duty vehicle miles per week day were driven on unpaved roads in the project area. Table Rock Road transects the project area in a north-south direction. CR 65 and I-80 transect the project area in an east-west direction. **Figure 3-12** depicts the road network in and around the project area.

Table 3-21 Current Interstate Traffic Volume Near the Project Area

Route	1999 All Vehicles	1999 Trucks	2008 All Vehicles	2008 Trucks	2009 All Vehicles	2009 Trucks
I-80 at Patrick Draw (CR 24)	5,325	3,085	5,630	3,310	5,641	3,047
I-80 at Bar X Road (CR 21)	5,300	3,085	5,530	3,300	5,541	3,034

Source: WYDOT 2010.

Table 3-22 shows the mileage of existing roads within the project area. The majority of roads in the project area are designated as local roads, followed by Chevron access roads associated with existing extraction activities, and four-wheel drive roads. CRs and I-80 combined make up slightly under 2 percent of the total project area road mileage. There are approximately 8 miles of railway transecting the project area.

Table 3-22 Existing Project Area Road Mileage

Road Type	Approximate Miles within Project Area
Interstate	1
County Road	1
Trail	3
Chevron Access Roads	24
Local Roads	42
Total Road Mileage	**71**

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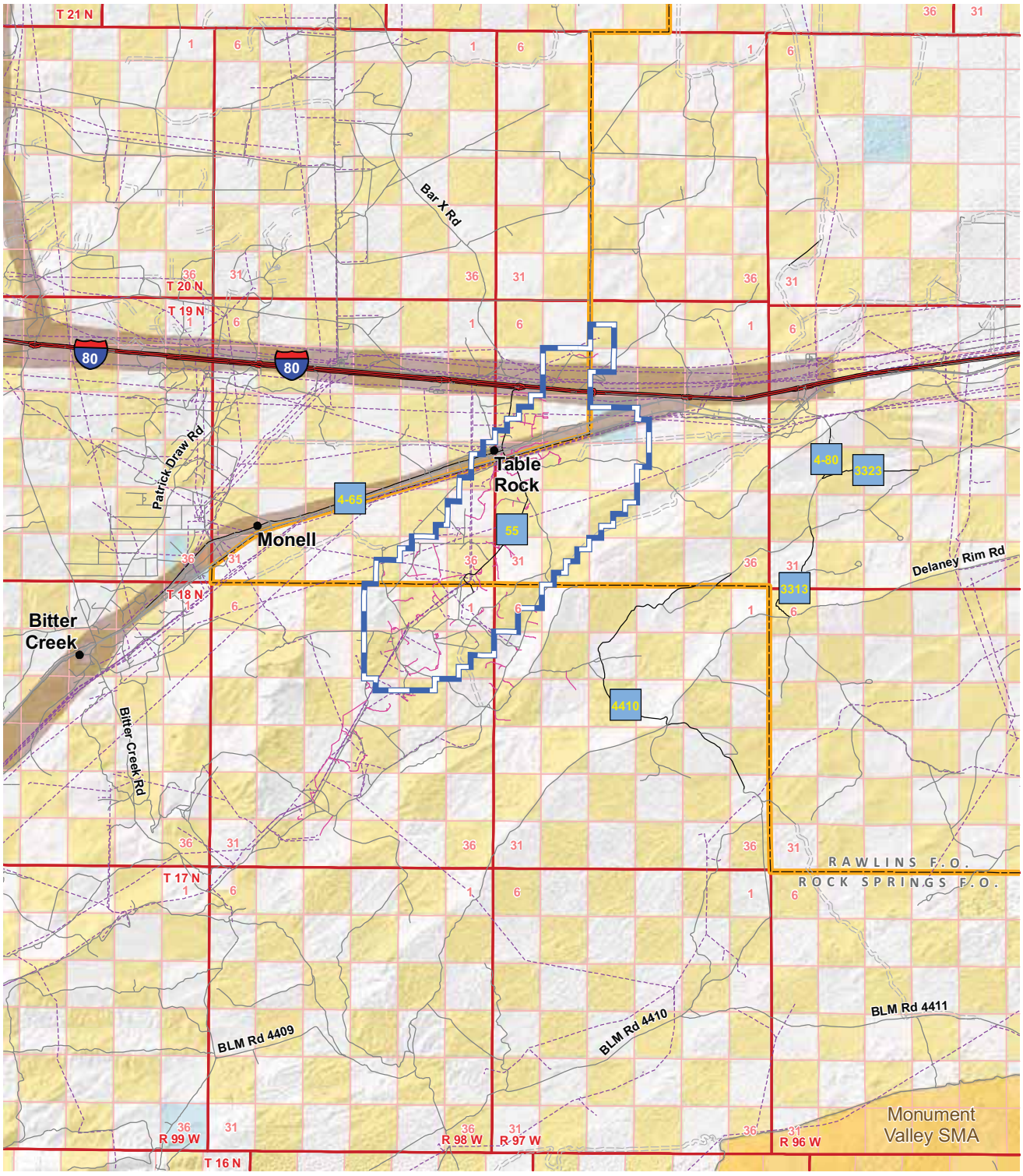

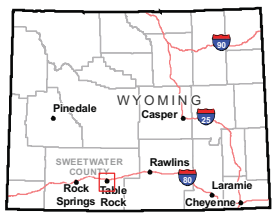

Legend

- Project Boundary
- Interstate Hwy
- County Road
- Local Road
- Chevron O&G Road
- Vehicular Trail (4WD)
- Railroad
- Pipeline
- BLM Field Office Boundary
- ROW Corridor
- Special Management Area

Land Ownership

- Bureau of Land Management
- State
- Private

Figure 3-11

ROWs and Special Designations near Project Area

0 0.5 1 2 Miles

1:200,000

N

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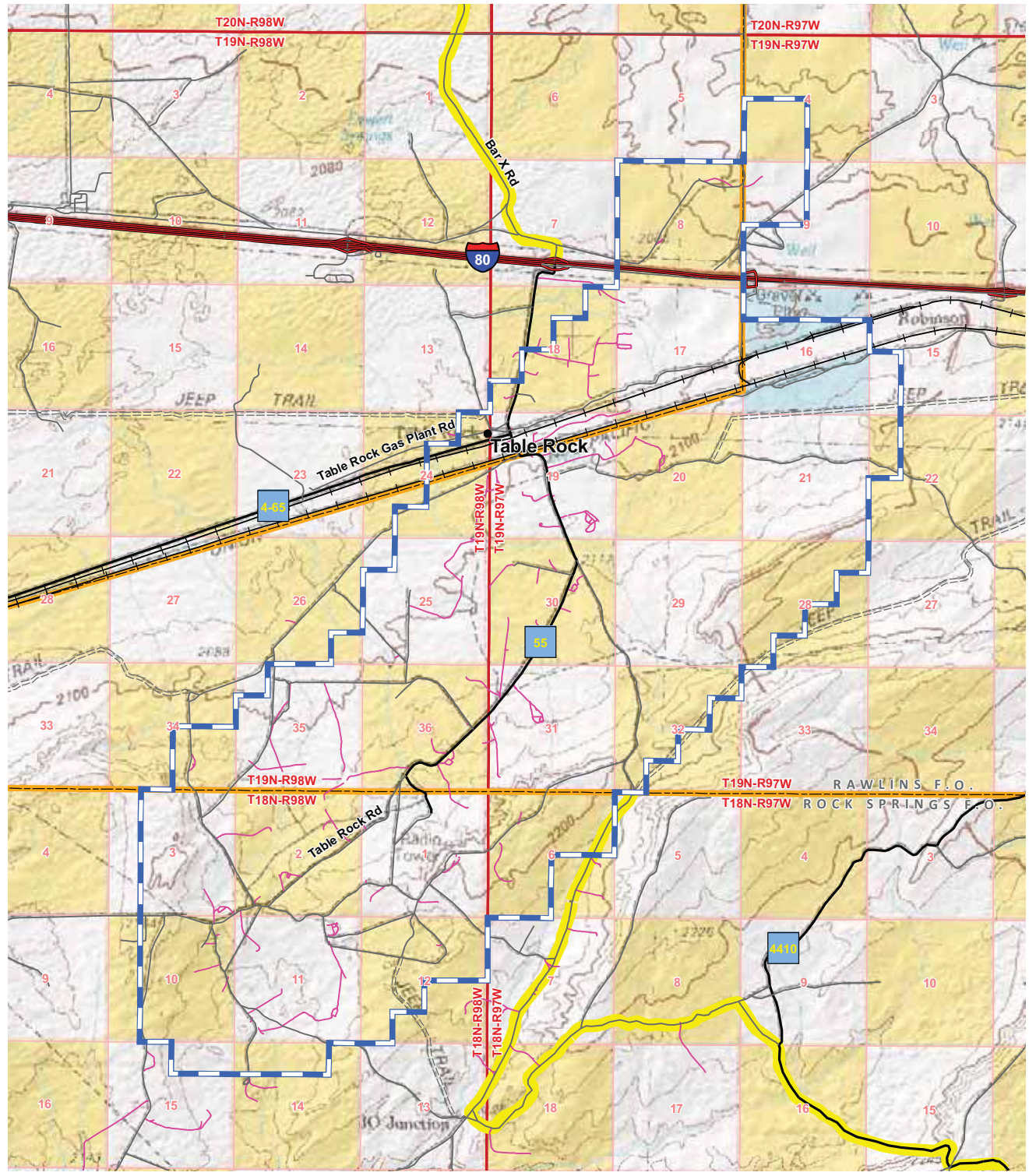

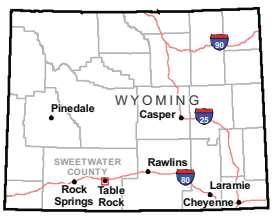

Legend

- Interstate Hwy
- County Road
- Local Road
- Chevron O&G Road
- Vehicular Trail (4WD)
- Railroad
- Backcountry Byway
- Town
- Project Boundary
- BLM Field Office Boundary

Land Ownership

- Bureau of Land Management
- State
- Private

Figure 3-12

Road Network near Project Area

0 0.5 1 2 Miles

1:75,000

N

3.12 Recreation

Recreation in the project area is currently comprised of big-game hunting opportunities, as well as photography, pleasure driving, off-road use, and hiking. The most common big-game species hunted is antelope, followed by, to a lesser extent, mule deer. All BLM administered lands in the RSFO and RFO are designated limited, open, or closed to off-highway vehicle (OHV) activities. All of the BLM-administered land in the project area is designated as limited to existing roads and vehicle routes (BLM 2008, 1997). The Ft. LaClede Loop Back-Country Byway back-country byway intersects the southeastern portion of the project area and may be used for pleasure driving. Given the checkerboard landownership pattern, the controlled nature of the property, and the availability of other more potentially appealing areas in the general area, these secondary recreational opportunities appear to receive limited use in the project area. There are no developed recreation areas within or adjacent to the project area.

The area is designated as Roaded Natural, a definition used in the Recreation Opportunity Spectrum (ROS). The typical setting for Roaded Natural is moderate to high human contact on roads, low to moderate human contact on trails, and is typically within 1 mile of improved roads. It also is characterized as a natural setting with easily noticed to dominant modifications.

3.13 Visual Resources

The project area is located in the Wyoming Basin physiographic province, which is characterized by eroded elevated plains with isolated low mountains. Vegetation is dominated by Wyoming big sagebrush, saltbrush, greasewood, and grasses. Human modifications to the natural landscape include oil and gas development, transportation ROWs, sparsely scattered ranch buildings, and unpaved roads.

The BLM is responsible for managing the public lands for multiple uses, while ensuring that the scenic values of public lands are considered before allowing uses that may have adverse visual impacts. The BLM accomplishes this through categorizing areas according to its Visual Resource Management (VRM) system, which involves inventorying scenic values, based on line, form, color, and texture, and establishing management objectives for those values. BLM then evaluates proposed activities to determine whether they conform to the management objectives and to recommend measures that minimize impacts to the viewshed.

VRM classes are based on visual ratings of inventoried lands. Each class describes the degree of modification allowed to the basic elements of the landscape. The following are the minimum management objectives for each class, based on BLM Handbook H-8410-1, Visual Resource Inventory.

- Class I: Natural ecological changes and very limited management activity are allowed. Any contrast created within the characteristic landscape must not attract attention. This classification is applied to Visual Areas of Critical Environmental Concern, wilderness areas, wild and scenic rivers, and other relatively undisturbed landscapes.
- Class II: Changes in any of the basic elements (form, line, color, texture) caused by a management activity should not be evident in the landscape. A contrast may be seen but should not attract attention.
- Class III: Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape. Contrasts to the basic elements caused by a management activity may be evident and begin to attract attention in the landscape. The changes, however, should remain subordinate in the existing landscape.
- Class IV: Contrasts may attract attention and be a dominant feature in the landscape in terms of scale. However, the changes should repeat the basic elements of the landscape.

The project area meets the definition of both Class III and IV designations, in which the level of change of the characteristic landscape can be moderate to high. Management activities may dominate the view and be the primary focus of viewer attention. However, every attempt should be made to minimize the impact of activities through careful location of facilities, minimal disturbance, and repetition of the basic landscape elements of color, form, line, and texture. Approximately 85 percent of the project area is

designated VRM Class IV, with the remainder designated Class III. **Figure 3-13** depicts the VRM Classes within the project area.

3.14 Livestock Grazing

Approximately 98 percent of the project area is currently utilized by livestock on three grazing allotments administered by the BLM under the Taylor Grazing Act of 1934, the FLPMA of 1976, and the Public Rangelands Improvement Act of 1978. Permitted livestock consists of cattle, horses, and sheep. The 2 percent of the project area not utilized as a grazing allotment is a ROW that runs through the northern portion.

The project area occupies portions of the RFO and RSFO in Sweetwater County and overlaps three grazing allotments: G.L. and Tipton (managed by the RFO) and Rock Springs (managed by the RSFO). Land ownership alternates from federal to private in a checkerboard pattern. Within the Rock Springs Allotment, approximately half of the private land is owned or leased by the Rock Springs Grazing Association. **Table 3-23** shows current information for the individual allotments (GeoCommunicator 2011; Mastny 2011). **Figure 3-14** depicts the allotments within the project area. A total of 13,395 acres of designated grazing allotments are overlapped by the project area. This area produces an estimated 1,679 animal unit months (AUMs) that would be grazed by cattle, sheep, and horses. One AUM is the amount of forage needed to feed 1 cow, 1 horse, or 5 sheep for 1 month.

Table 3-23 Grazing Allotments within the Project Area[1]

Allotment Name	Total Acres	Acres within Project Area	Average Acre/AUM[2]	AUMs in Project Area[3]	Livestock Class	Utilization Dates
G.L.	19,039	398	7.5	53	Horse	3/1 – 6/15
					Horse	10/1 – 2/28
					Cattle	3/1 – 7/15
					Cattle	9/15 – 2/28
Rock Springs	2,061,062	5,874	11.4	515	Cattle, sheep, horse	92%: 12/1 – 5/15; remaining 8%: varies
Tipton	58,201	7,074	6.4	1,109	Cattle	3/1 – 2/28
Total	**2,138,302**	**13,346**		**1,677**		

[1] Acreage data was taken from Geographic Information System (GIS) files provided by the BLM.

[2] Average acres/AUM derived from GeoCommunicator 2011.

[3] AUMs for project area based on dividing acres within project area by average acres/AUM.

Within the Table Rock Unit, the Tipton Allotment contains two livestock water wells, troughs, and other working facilities that will need to be considered during construction and operation. Information regarding vegetation types can be found in Section 3.5. Throughout most of the project area, the spread of halogeton is becoming a concern because it competes with quality livestock forage and is poisonous to livestock. Toxic amounts of sodium, potassium, and calcium oxalates contained in halogeton have the greatest affect on sheep and death can occur in less than 12 hours. Livestock operators are becoming increasingly concerned with the issue of invasive and noxious weeds due to unsuccessful reclamation efforts for past projects.

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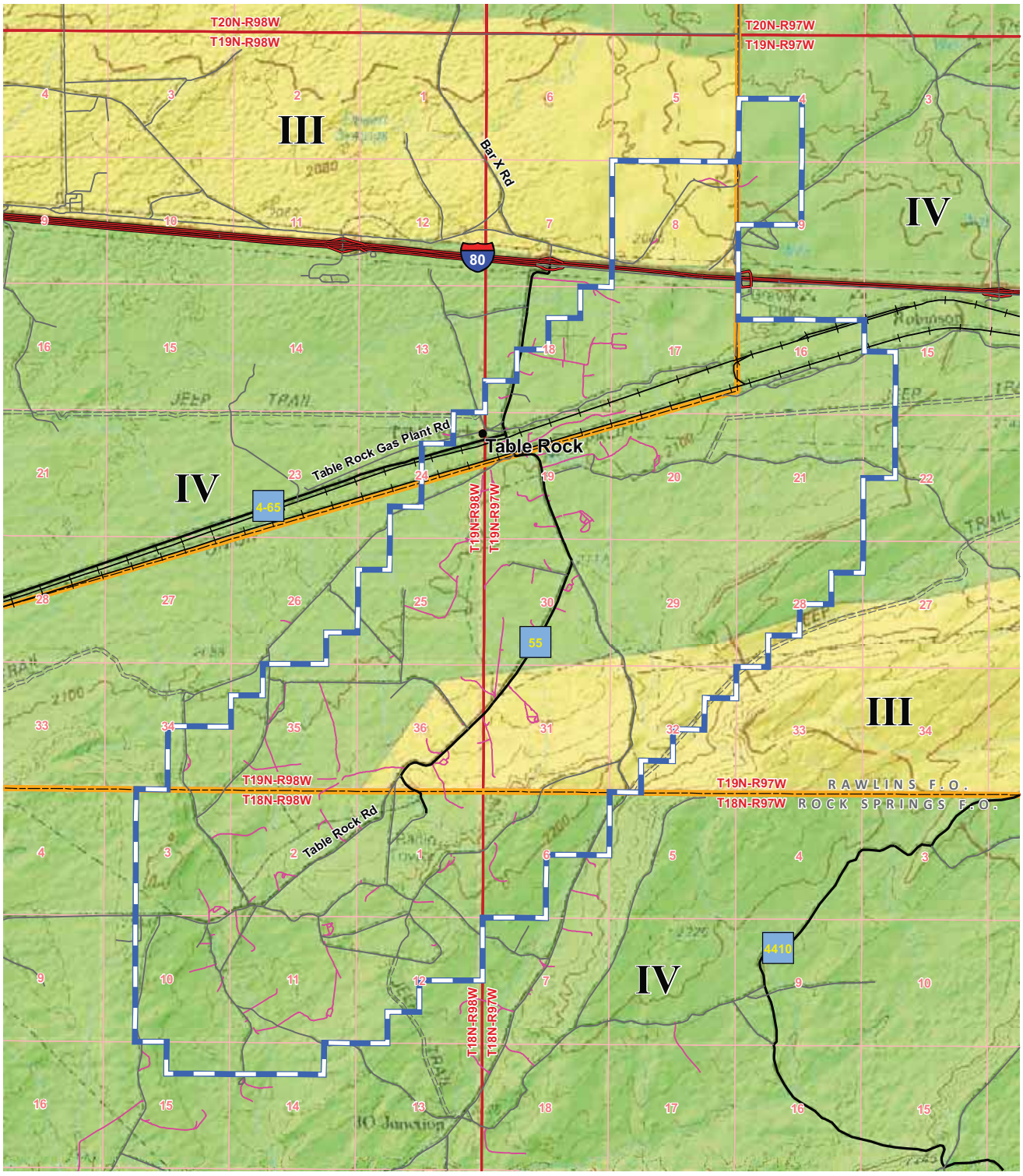

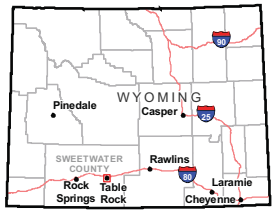

Legend

- Interstate Hwy
- County Road
- Local Road
- Chevron O&G Road
- Vehicular Trail (4WD)
- Railroad
- Town
- Project Boundary
- BLM Field Office Boundary

VRM Class

- VRM Class III
- VRM Class IV

Figure 3-13

VRM Classes within the Project Area

0 0.5 1 2 Miles

1:75,000

N

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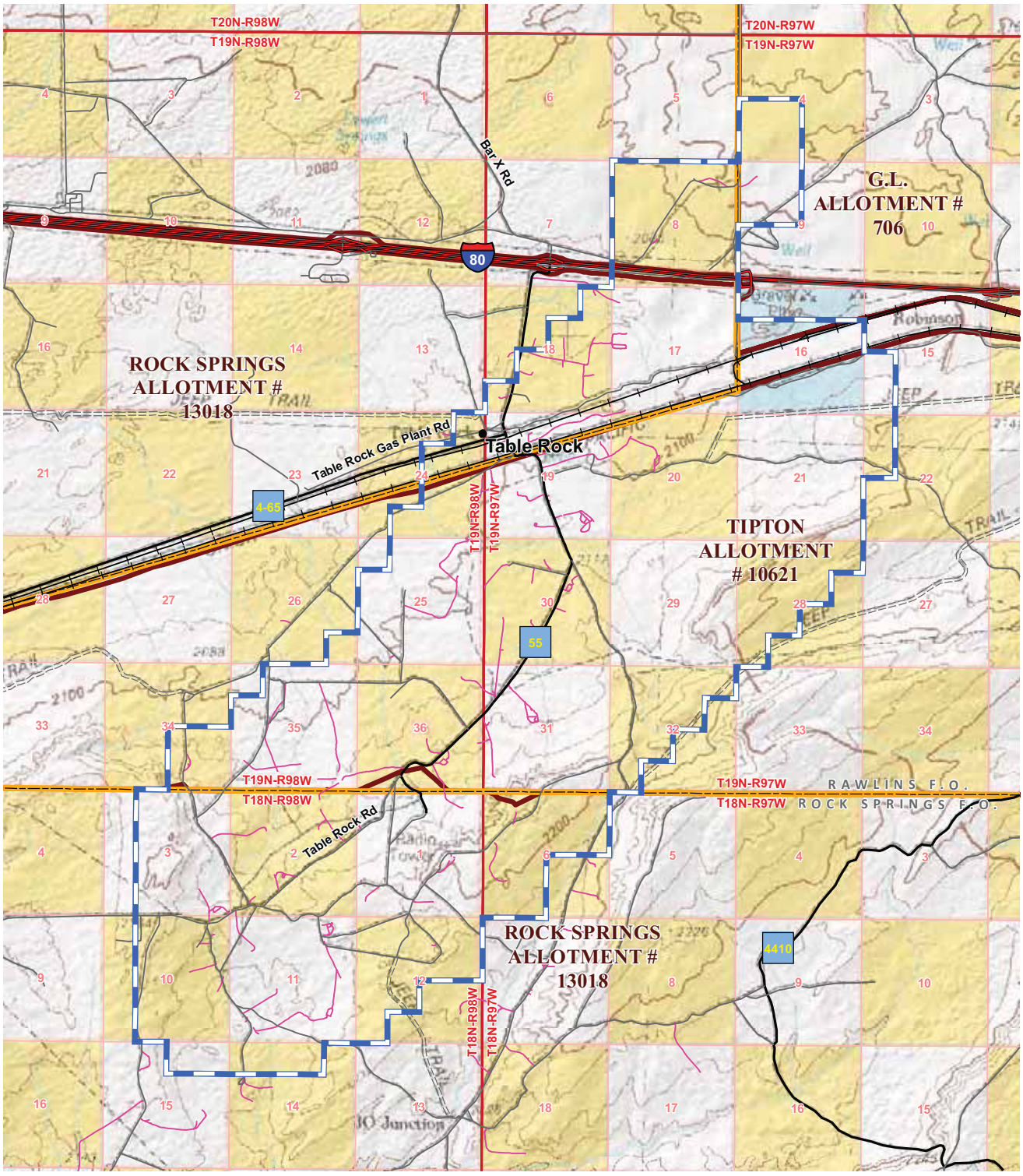

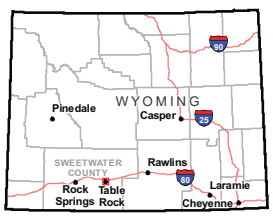

Legend

- Town
- Interstate Hwy
- County Road
- Local Road
- Chevron O&G Road
- Vehicular Trail (4WD)
- Railroad
- BLM Field Office Boundary
- Grazing Allotment Boundary
- Project Boundary

Land Ownership

- Bureau of Land Management
- State
- Private

Figure 3-14

Range Allotments

0 0.5 1 2 Miles
0 0.5 1 2 Kilometers
1:75,000
N

3.15 Cultural Resources

Section 106 of the NHPA requires that federal agencies take into account the effect of their undertakings on historic properties, and to afford the Advisory Council on Historic Preservation a reasonable opportunity to comment. Historic property refers to "any prehistoric or historic district, site, building, structure, or object included in or eligible for inclusion in the National Register of Historic Places (NRHP). For the purposes of this analysis, cultural resources eligible for the NRHP are synonymous with historic properties, and both terms may be used.

The analysis area for cultural resources is the area of potential effect (APE), which is defined as "the geographic area or areas within which an undertaking may directly or indirectly cause changes in the character or use of historic properties, if any such properties exist. Additionally, the APE is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking (36 CFR 800.16[d])." For this project, the APE for direct effects includes all proposed disturbance areas (i.e., well locations, access roads, ancillary facilities, and power lines) within the project area. The APE for visual impacts includes a 3-mile buffer around historic trail segments that contribute to the historic trail's overall eligibility and from which the project area is visible.

The Wyoming Cultural Resources Information System (WYCRIS) database was accessed in April 2011 to research the records for the APE. At that time, 262 cultural resource inventories were documented within the project area over the last 30 years. These cultural resource inventories were commissioned primarily for oil and gas development (including geophysical exploration project grids, pipelines, well pads, and access roads), and have documented the range of cultural resources known for the project area and the surrounding region. The history and prehistory of the area, including culture-area contexts, historic period themes, and notable local historic and prehistoric sites, are described at length in cultural resources reports on file at the RFO and RSFO. The majority of the prehistoric cultural resources identified within the project area are prehistoric (**Table 3-24**), and consist of habitations, open camps, lithic scatters, hearths, and a single quarry. Historic resources consist of a segment of the Table Rock Railroad, a railroad camp, several segments of the Lincoln Highway, a habitation, and a non-specified wagon road.

Table 3-24 Recorded Sites in the Project Area

Field Office	Prehistoric	Historic	Multicomponent	Total
RFO	95	19	3	**117**
RSFO	29	1	2	**32**
Both FOs	1	0	0	**1**
Total	**125**	**20**	**5**	**150**

Source: WYCRIS 2011.

Of the 150 total sites previously identified directly in the proposed project area, 47 are previously recommended eligible for the NRHP, 79 are not eligible for the NRHP (including sites that are noted as destroyed), and 24 are unevaluated (**Table 3-25**).

Table 3-25 Eligibility of Recorded Sites in the Project Area

Field Office	Recommended Eligible	Unevaluated/ Unknown	Recommended Not Eligible	Destroyed	Total
RFO	37	19	58	3	**117**
RSFO	10	5	17	0	**32**
In Both	0	0	1	0	**1**
Total	**47**	**24**	**76**	**3**	**150**

While there are several historic linear features identified in and near the project area, only segments that are intact and contribute to the overall eligibility for nomination to the NRHP are considered to retain significance. One unevaluated wagon road, which may represent a branch of the Cherokee Trail, as well as the 1917 and 1930 alignments of the Lincoln Highway and Table Rock Railroad and the 1868 alignment of the Union Pacific Railroad (UPRR), called the Table Rock Railroad in the area, are located in the APE. All unevaluated historic properties within the APE will be evaluated by the BLM. All existing site reports will be reviewed by the BLM to ensure compliance with current state and federal regulations.

The BLM will consult with federally recognized Native American tribes with traditional ties to the project area to determine if potential traditional cultural properties or other sites considered sacred, sensitive, or of interest to the tribes are located within the project area. Consultation with Native American tribes will take into account the religious and cultural significance attached to historic properties potentially affected by this undertaking.

3.16 Socioeconomics and Environmental Justice

Area socioeconomic conditions include the local economy (primarily mining and processing, and other natural resource development); population; employment and income; housing; community facilities, law enforcement, and emergency management; and local, state, and federal government fiscal conditions.

3.16.1 Population

After staying relatively flat during the 1990s, the population in Sweetwater County has accelerated rapidly in the latter part of the 2000s, now reaching over 40,000 residents. The trend of increasing population is associated with expanded natural resource extraction activities. Carbon County has seen a net decline in population from 1990 to 2009, although there was a slight increase from 2005 to 2009. **Table 3-26** summarizes the population characteristics of the State of Wyoming, Sweetwater County, and Carbon County, Wyoming, as well as the cities of Rawlins, Rock Springs, and Wamsutter, from 1990 to 2009.

Table 3-26 Population Change for Wyoming, Sweetwater County, Carbon County, and Selected Cities

Jurisdiction	1990	2000	2005 (estimate)	2009 (estimate)	Total Change in Population 1990-2009 (%)
Wyoming	**453,588**	**493,783**	**506,541**	**544,270**	**20.0**
Carbon County	**16,659**	**15,639**	**15,012**	**15,720**	**-5.6**
Rawlins	9,380	8,538	8,525	8,791	-6.3
Sweetwater County	**38,823**	**37,613**	**37,331**	**41,226**	**6.2**
Rock Springs	19,050	18,708	18,708	20,905	9.7
Wamsutter	240	261	262	310	29.2

Source: U.S. Census Bureau 2009a,b.

3.16.2 Economic Conditions

Median household income for Sweetwater County was slightly above the Wyoming state average. Carbon County was well below the Wyoming state average. **Table 3-27** summarizes the income characteristics for Carbon County, Sweetwater County, and the State of Wyoming.

Table 3-27 Income Characteristics for Sweetwater County, Carbon County, and the State of Wyoming, 2009

Parameter	Sweetwater County	Carbon County	Wyoming
Median household income, 2008	$67,210	$50,963	$63,545
Personal per capita money income, 2005-2009	$29,825	$25,606	$26,925
Persons below poverty, %	5.8	9.8	9.5
Median Hourly Wage (all industries, all occupations)	$19.20	$16.87	$16.39

Source: U.S. Census Bureau 2009a; Wyoming Department of Employment 2010.

The major source of employment in Sweetwater County is mineral and energy resource extraction and processing. Major sources of employment in Carbon County are construction, retail, services, and government. From 1990 to 2008, there were large increases in employment in the mining, retail, service, and manufacturing sectors. The majority of the mining sector growth occurred from 2000 to 2008. During the 1990 to 2008 time period in Carbon County, employment in the mining, services, and manufacturing sectors declined, while the retail sector increased. As in Sweetwater County, mining employment in Carbon County increased from 2000 to 2008. **Table 3-28** summarizes the employment characteristics by sector for Carbon and Sweetwater counties from 1990 to 2008.

Table 3-28 Employment Changes by Sector for Sweetwater and Carbon Counties

	Number of Jobs							
	Carbon County				Sweetwater County			
Employment Sector	1990	2000	2005	2008	1990	2000	2005	2008
Farm employment	538	509	375	374	220	203	222	270
Agricultural services, forestry, fishing and other	105	247	140	(D)	78	182	48	(D)
Mining (coal, metal, nonmetal, oil and gas)	940	309	(D)	621	5,031	3,692	5,158	6,717
Construction	507	689	773	1,480	1,507	1,489	2,304	3,065
Manufacturing	681	637	(D)	513	747	1,643	1,225	1,352
Transportation, Communication, and Public Utilities (TCPU)	735	594	606	694	1,981	1,779	1,492*	1,989*
Wholesale trade	171	177	232	109	645	610	(D)	(D)
Retail trade/accommodation and food services	1,667	1,709	2,073	2,211	3,689	4,385	5,257	5,582
Finance, insurance, and real estate	521	523	656	848	1,126	1,127	1,504	1,981
Services	1,820	2,113	1,642*	1,524*	3,700	4,678	4,295*	5,186*

Table 3-28 Employment Changes by Sector for Sweetwater and Carbon Counties

Employment Sector	Number of Jobs							
	Carbon County				Sweetwater County			
	1990	2000	2005	2008	1990	2000	2005	2008
Federal, civilian	249	147	213	231	262	266	238	238
Federal, military	97	89	86	94	227	215	213	241
State government	486	524	520	501	278	269	279	278
Local government	1,317	1,279	1,253	1,324	3,258	3,538	3,530	3,782
Total full-time and part-time employment	9,834	9,546	9,578	11,340	22,749	24,076	27,153	32,126

Source: U.S. Bureau of Economic Analysis (BEA) 2008a; BEA 2000a.

(D) = not shown to avoid disclosure of confidential information, but the estimates for this item are included in the totals. BEA does not provide this information.

* Data has been omitted to avoid disclosure of confidential information.

From 2000 to 2008, there were large increases in income from the construction, mining, manufacturing, service, and state and local government sectors for both Carbon and Sweetwater counties. **Table 3-29** summarizes the income characteristics by sector for Carbon and Sweetwater counties in 2000, 2005, and 2008.

Table 3-29 Income Characteristics by Sector for Sweetwater and Carbon Counties

Employment Sector	Income in $ thousands					
	Carbon County			Sweetwater County		
	2000	2005	2008	2000	2005	2008
Farm employment	5,707	6,611	6,910	629	1,142	1,408
Agricultural services, forestry, fishing and other	917	909*	157*	583	340*	(D)
Mining (coal, metal, nonmetal, oil and gas)	13,921*	(D)	37,348	264,747	403,756	602,353
Construction	15,789	24,983	96,338	49,106	100,178	194,588
Manufacturing	24,789	(D)	46,086	114,015	109,928	129,505
TCPU	28,309	30,716	42,112	95,860*	79,983*	79,983*
Wholesale trade	5,172	9,932	4,339	20,871	(D)	(D)
Retail trade/accommodation and food services	23,132	31,464	44,302	67,380	107,023	138,777
Finance, insurance, and real estate	5,536	7,170	9,266	18,085*	40,947	60,508
Services	27,125	31,148*	34,838*	78,647	107,641*	155,696*

Table 3-29 Income Characteristics by Sector for Sweetwater and Carbon Counties

Employment Sector	Income in $ thousands					
	Carbon County			Sweetwater County		
	2000	2005	2008	2000	2005	2008
Federal, civilian	8,448	14,547	17,639	16,579	18,039	19,769
Federal, military	1,342	3,356	3,998	3,226	8,320	10,256
State government	18,766	24,813	30,692	9,506	13,076	16,704
Local government	39,887	47,540	62,963	113,368	145,175	190,909

* Total does not include data that has been omitted to avoid disclosure of confidential information.

(D) = not shown to avoid disclosure of confidential information, but the estimates for this item are included in the totals. BEA does not provide this information.

Source: BEA 2008b, 2000b.

In Carbon County, the labor force has declined since 2000, from near 8,000 to slightly more than 7,700, a 4.8 percent decrease. Sweetwater County has seen the opposite trend, with the labor force growing 10.6 percent from 2000 to 2010. Unemployment has varied between 3.7 and 4.2 percent in 2000 and 2005; however, poor economic conditions have notched the unemployment rate to above 6 percent in Sweetwater County and above 7 percent Carbon County. **Table 3-30** summarizes the labor force characteristics in Sweetwater and Carbon counties, and the State of Wyoming in 2000, 2005, and 2010.

Table 3-30 Labor Force Characteristics for Sweetwater and Carbon Counties

Category	Carbon County			Sweetwater County			Wyoming		
	2000	2005	2010	2000	2005	2010	2000	2005	2010
Labor Force	8,094	7,657	7,707	20,716	22,128	23,703	265,667	278,233	293,757
Employment	7,757	7,351	7,120	19,897	21,464	22,119	255,312	267,936	273,308
Unemployment	337	306	587	819	664	1,584	10,355	10,297	20,449
Unemployment Rate (%)	4.2	4.0	7.6	4.0	3.0	6.7	3.9	3.7	7.0

Source: U.S. Bureau of Labor Statistics 2010.

Construction and mineral extraction occupations in this area typically pay more than the median hourly and annual wage for all other occupations. **Table 3-31** summarizes the median hourly and annual wage characteristics for the construction and extraction occupations as compared to all occupations in Sweetwater and Carbon counties.

Table 3-31 Wage Characteristics for Sweetwater and Carbon Counties

Hourly	Annual
2010 Median Hourly Wage for All Occupations for Sweetwater County	
$19.20	$39,947
2010 Median Hourly Wage for Construction and Extraction Occupations for Sweetwater County	
$21.42	$44,538

Table 3-31 Wage Characteristics for Sweetwater and Carbon Counties

Hourly	Annual
2010 Median Hourly Wage for All Occupations for Carbon County	
$16.87	$35,083
2010 Median Hourly Wage for Construction and Extraction Occupations for Carbon County	
$20.36	$42,337

Source: Wyoming Department of Employment 2010.

The nature of oil and gas development construction activities (relatively short-term tasks performed by contracted labor) results in a demand for temporary housing resources such as motel rooms, mobile home parks, and recreational vehicle parks. There also is the potential for new permanent employees involved with ongoing operations and maintenance of the Project facilities to seek longer-term housing resources.

As of 2011, Rock Springs has approximately 17 motels with nearly 1,500 rooms. Rawlins has approximately 10 motels with nearly 650 rooms. Both cities have numerous mobile home and recreational vehicle (RV) parks (Wyoming Tourism 2011).

Historically, population pressures associated with oil and gas activities have created demand for housing in Carbon and Sweetwater counties. During "bust" cycles, there is less demand for housing, creating vacancies. **Table 3-32** shows vacancy rates, an indication of capacity for temporary housing, for Sweetwater and Carbon counties as well as the cities of Rock Springs and Rawlins.

Table 3-32 Vacancy Rates For Sweetwater and Carbon Counties, and Rock Springs and Rawlins

Housing and Vacancies	Sweetwater County	Rock Springs	Carbon County	Rawlins
Housing units, 2005-2009	16,886	8,605	8,607	3,861
Vacant units, 2005-2009	1,391	724	2,451	582
Vacancy rate (%), 2005-2009	8.2	8.4	28.5	15.1
Housing units, 2000	15,921	8,359	8,307	3,860
Vacant units, 2000	1,816	1,011	2,178	540
Vacancy rate (%), 2000	11.4	12.1	26.2	14.0

Source: U.S. Census Bureau 2009a.

There were nearly twice as many housing units in Sweetwater County and Rock Springs in the 2005-2009 timeframe than in Carbon County and Rawlins. Carbon County and Rawlins had vacancy rates that were markedly higher than those of Sweetwater County and Rock Springs. Median house value of owner-occupied housing in Sweetwater County averaged over $155,000 during the 2000 to 2005 timeframe. Median house value of owner-occupied housing in Carbon County averaged over $117,000 during the 2005 to 2009 time period. The characteristics of housing in Sweetwater County, as compared to the State of Wyoming are summarized in **Table 3-33**.

Table 3-33 Housing Characteristics for Sweetwater County, Carbon County, and the State of Wyoming

Type and Time Period	Sweetwater County	Carbon County	State of Wyoming
Housing units, 2005-2009	16,886	8,607	243,133
Housing units, 2000	15,921	8,307	223,854
Occupied housing units, 2005-2009	15,495	6,156	208,269
Vacant housing units, 2005-2009	1,391	2,451	34,864
Housing units, net change, 2000 to 2005-2009	965	300	19,279
Housing units, percent change, 2000 to 2005-2009	6.1	3.6	7.9
Homeownership rate, 2000	75	71	70
Median value of owner-occupied housing units, 2005-2009	155,300	117,500	163,400
Households, 2000	14,105	6,129	193,608
Persons per household, 2000	2.6	2.4	2.5

Source: U.S. Census Bureau 2009a,b.

3.16.3 Community Facilities, Law Enforcement, and Emergency Management

Population in Sweetwater County and Rock Springs is slightly above historic levels found in the 1990s and the early 2000s. The population of Carbon County and Rawlins is below historic levels, so county and municipal infrastructure is, in general, adequate to serve a larger population than currently exists. The growth in population has not translated into a proportional increase in new students enrolled at local schools, as mostly single males or married males who choose not to move their families to the region are attracted by jobs in the oil and gas sector.

Law enforcement is provided by the Sweetwater County Emergency Management Agency (SCEMA), which operates under Federal Emergency Management Agency (FEMA) and USEPA guidelines. SCEMA is the agency designated by the Sweetwater County Commissioners to analyze potential hazards, assess emergency response capabilities, and mitigate the effects of emergencies or disasters. SCEMA coordinates with response agencies, industry, elected officials and volunteer agencies. Law enforcement in Carbon County is provided by the Carbon County Sheriff's Department and emergency response is coordinated by the Carbon County Emergency Management Agency.

Sweetwater and Carbon counties are served by emergency response organizations located in Rock Springs and Rawlins. Routine injuries are treated at Memorial Hospital of Sweetwater County and Memorial Hospital of Carbon County. Cases requiring specialized treatment are transported to Salt Lake City by services dispatched from Salt Lake City, Utah, or Craig or Grand Junction in Colorado.

3.16.4 Local Government Facilities and Services

The State of Wyoming does not levy a personal or corporate income tax or a tax on intangible assets such as bank accounts, stocks, or bonds either. In addition, Wyoming does not assess any tax on retirement income earned and received from another state. **Table 3-34** summarizes most local, county, and state taxes in the area.

Table 3-34 Summary of Local, County, and State Taxes (2010)

Type of Tax	Sweetwater County	Rock Springs	Carbon County	Rawlins	State of Wyoming
Real Property	12 mill	8 mill	N/A	N/A	None
Sales	1%	None	2%	None	4%
Lodging (Bed)	2%	None	2%	None	None
School	None	43.6 mills	N/A	N/A	None

N/A = Not Available.

Source: Wyoming Department of Administration and Information 2010; Wyoming Department of Revenue 2010.

Property taxes levied by Sweetwater County were approximately $197 million in fiscal year 2009 and approximately $143 million in fiscal year 2010 (Wyoming Department of Revenue 2010). Sweetwater County lodging taxes for fiscal 2010 totaled approximately $516,051, while sales tax revenues for that same period totaled approximately $56.5 million. Carbon County lodging taxes for fiscal 2010 totaled approximately $377,234, while sales tax revenues for that same period totaled approximately $15.8 million (Wyoming Department Administration and Information 2010).

Oil and gas companies pay ad valorem taxes on production and facilities. Natural gas is assessed on the previous year's production. The Sweetwater County 2009 natural gas assessed valuation was approximately $580.4 million, down from the previous year's valuation of $1,245.3 million (Wyoming Department of Revenue 2010).

3.16.5 Environmental Justice

As required by EO 12898 "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," the proposed Project must be evaluated for any disproportionately high and adverse human health or environmental effects on minority communities and low-income communities.

The environmental justice study area encompasses Sweetwater and Carbon counties.

3.16.5.1 Minority Populations

Of the total population of Carbon and Sweetwater counties, the large majority classify themselves as White. The second largest ethnic/racial group is Hispanic or Latino, followed by those who classify themselves as American Indian or Alaska Native, Black, and Asian. **Table 3-35** summarizes the racial composition and low-income populations of Carbon and Sweetwater counties.

3.16.5.2 Low-Income Populations

Approximately 9.8 percent and 5.8 percent of households fall below the poverty level in Carbon County and Sweetwater County, respectively. Carbon County's poverty level was slightly below the state average, while Sweetwater County's poverty level was substantially lower than the state average.

Table 3-35 Racial Composition and Low-Income Populations, 2009

	White (%)	Black (%)	American Indian and Alaska Native (%)	Asian (%)	Hispanic or Latino (%)	Below the Poverty Level (%)
Wyoming	93.5	1.4	2.6	0.8	8.1	9.5
Carbon County	95.2	1.0	1.5	0.9	15.2	9.8
Sweetwater County	94.5	1.5	1.3	0.8	13	5.8

Source: U.S. Census Bureau 2009b.

4.0 Environmental Effects

This chapter describes the direct, indirect, and cumulative effects of the alternatives under consideration on each resource or program that may be affected. The resource sections included are in the same order as in Chapter 3.0.

4.1 Direct and Indirect Effects

Direct effects are those that are caused by the action under consideration which occur at the same time and place. Indirect effects are those that are caused by the action under consideration but occur later in time or further away. A direct effect on one resource can be an indirect effect on another resource.

4.1.1 Geology, Geologic Hazards, and Minerals

4.1.1.1 Alternative I – No Action Alternative

Although development would continue as described for the No Action Alternative, no impacts to unique geologic features are expected. Geologic hazards present a low risk for No Action Alternative activities.

Under the No Action Alternative, oil and natural gas would continue to be produced in the Table Rock Unit from existing production and injection wells and future wells that would be drilled. However, the No Action would result in reduced recovery of the resource, with the resulting indirect monetary losses to the applicant, royalty owners (primarily the federal government), the local economy, and tax revenues to governmental entities. If the proposed additional development does not occur on federal leases, it is possible that resources could be drained from beneath federal lands resulting in loss of resource and royalties to the U.S.

The No Action Alternative would have no impact on locatable minerals and minimal impacts to saleable mineral resources.

4.1.1.2 Alternative II – Proposed Action

Under the Proposed Action, no impacts to unique geological features are expected and there is low risk for geologic hazards.

Under the Proposed Action, the additional production of oil and natural gas would be beneficial to the nation in that a resource that would otherwise be lost would be recovered plus the additional taxes, royalties and other economic benefits. However, the production of oil and natural gas would be an irretrievable commitment of resources. The Proposed Action would not interfere with the development and extraction of other mineral resources given the lack of documented mineral resources in the project area. The Proposed Action is located east of the Known Coal Recoverable Coal Resource Area (BLM 1997). Coal bed methane may be prospective within the Table Rock Unit, but potential future development of coal bed methane resources would not be precluded by the Proposed Action.

The Proposed Action Alternative would have no impact on locatable minerals and minimal impacts to saleable mineral resources.

4.1.2 Paleontological Resources

4.1.2.1 Alternative I – No Action

The Wasatch and Green River formations that underlie the project area have the potential to yield fossils of important scientific significance value in the project area. If ongoing oil and gas activities occur in undisturbed areas, direct impacts could occur to paleontological resources, if surface disturbance associated with the No Action results in exposure and destruction of important fossil resources, along with associated loss of geologic information. Indirect adverse impacts to paleontological resources may occur as the result of ongoing geological investigations and disturbance through unauthorized collecting to accessible outcrops.

4.1.2.2 Alternative II – Proposed Action

Direct and indirect impacts could occur in the same manner as described for No Action impacts where proposed development would take place in previously undisturbed areas.

The Rawlins RMP specifies that paleontological resources be managed to protect their important scientific values on a case-by-case basis. It also requires that collecting of scientifically important vertebrate fossils be performed by qualified paleontologists by permit only, and on-the-ground surveys are required prior to approval of surface disturbing activities for Class 4 and Class 5 formations (both formations in the project area are Class 5) to avoid damage on a case-by-case basis. Monitoring during surface-disturbing activities also may be required. Compliance with these federal policies and guidelines would minimize impacts to paleontological resources.

4.1.3 Soils

4.1.3.1 Alternative I – No Action Alternative

Under the No Action Alternative, the BLM would deny Chevron's proposal for development and would assume continuation of the present rate of development in the Table Rock Unit. Management of fluid mineral development would continue to be governed by current BLM policy and procedures with APDs approved on a case-by-case basis. Chevron would continue to plug and abandon wells as they have in the past. Surface disturbance associated with the drilling of one new well and abandonment of 4 wells per year, over 14 years, would impact approximately 75 acres of soil resources. Soils would be compacted and graveled, thereby reducing soil quality and productivity to these areas. Approximately 40 acres of soils would be reclaimed and revegetated to productive states after wells are abandoned. Compliance with established regulations and policies would continue to minimize erosion from disturbed areas and facilitate successful reclamation of disturbed areas.

4.1.3.2 Alternative II – Proposed Action

Two scenarios are proposed for the Proposed Action. If the pilot program is successful, the multi-well scenario would be developed. The multi-well scenario would include developing 28 directional Almond wells on 7 pads. If the pilot program is not successful, the single well scenario would be developed. The single-well scenario would develop 33 wells on single pads, including 28 water flood wells and 5 infill wells. **Table 4-1** provides the soil disturbance acreages associated with each scenario.

Table 4-1 Soil Disturbance Acreage by Scenario

Soil Map Unit	Multi-Well Scenario		Single Well Scenario	
	Initial	Long-term	Initial	Long-term
WY10	11	3	11	3
WY17	129	49	143	40
WY40	130	46	137	41
Grand Total	**270**	**99**	**291**	**85**

Note: Acreage includes new well pads, roads and pipelines, and associated facilities.

The majority of the soils disturbed for the proposed development would require aggressive mitigation measures and monitoring to ensure that erosion control and reclamation efforts are effective. Soils within the WY10 map unit are very susceptible to wind erosion. Soils in the WY17 map unit have high surface water runoff rates, which should be taken into account when planning erosion control and storm water management measures, and they tend to be unstable when trenches are excavated (i.e., to bury pipelines). Reclamation of disturbed soils within the WY40 soil map unit would require close monitoring and appropriate seed preparation and seed mixtures due to saline or sodic characteristics that make the establishment of vegetation more difficult than on other soils.

Approximately 270 to 291 acres of soils would be impacted to varying degrees as a result of proposed road construction and upgrading, construction, and operation of well pads, pipelines, utility lines, and ancillary facilities. Where surface disturbance for pipelines and power lines is kept within existing roadways, additional impacts would be minimal. Some soil mixing of surface layers with unsuitable subsurface horizons could occur. Impacts anticipated to occur on up to 7 miles of new roads include soil rutting and mixing, compaction, increased erosion potential, and loss of soil productivity. Because the running surface of new roads would be graveled, soil erosion and rutting over the long term would be minimal on new service roads. Increased vehicle traffic on existing natural surface roads may cause rutting during wet weather.

The most notable impacts to soils would occur in association with the construction of new well pads and roads. Grading and leveling would be required to construct or expand existing well pads with the greatest level of effort required on more steeply sloping areas. During construction, the soil profiles would be mixed with a corresponding loss of soil structure. Soils would be compacted as a result of construction of with compaction maintained by continued vehicle and foot traffic for operational activities. The potential for erosion would increase while soils are loose with no protective cover. Soil productivity would decrease, primarily as a result of profile mixing and compaction along with the loss in vegetative cover. A decrease in soil productivity also would occur in association with soil salvage and stockpiling activities because microbial action is curtailed, at least to some degree, in the constructed long-term stockpiles.

Indirect effects may include sedimentation from side cast materials and disruption and interception of subsurface flow of water that could alter soil moisture regimes upslope and down slope from the road. Direct and indirect adverse impacts from road construction would be minimized by complying with BLM policy for road design and construction as well as implementation of an erosion and sediment control plan and reclamation plan.

The type, intensity, and duration of the impacts associated with the installation of utility lines (electric, water, and pipeline) would be variable. Profile mixing and soil structure disruption would occur with trenching and backfilling. The linear nature of the disturbance, coupled with the presence of adjacent vegetation as described above, would serve to decrease wind and water erosion potential.

Environmental protection measures implemented in compliance with BLM policy would help to reduce the impacts to soils and maintain soil productivity to the degree possible. During construction, Chevron has committed to reclaim all disturbed areas not needed for production to reduce site impacts. Well pads and associated facility disturbances would be re-graded to their approximate original contours and revegetated following Project termination. During operations, exposed cut-and-fill slopes not needed for operations at these sites would be temporarily revegetated to reduce erosion and sedimentation potential. These actions would minimize the intensity of the impacts to soils as well as the time it would take to return the disturbed soils to a stable and productive state.

Chevron would be required to comply with all BLM COAs and RMP requirements, which would minimize impacts to soil resources. In addition, during the APD process, the RFO Instruction Memorandum No. WYD-03-2011-002 requires a site-specific, project reclamation plan for all energy-related surface-disturbing activities.

4.1.4 Water Resources

Impacts to surface water may occur during construction, and then decrease with reclamation and revegetation during the operation phase of the Project. Reclamation may take years to complete depending on weather and other factors contributing to the success of revegetation. Impacts are generally expected from surface disturbance during construction of access roads and well pads, and would be most likely to occur during construction of stream crossings for access roads and at well pad locations nearest streams. Erosion effects also may be witnessed as sediment deposits in ephemeral drainages which may subsequently be carried downstream during seasonal events to perennial drainages. In addition the increase in traffic in the area as a result of construction and operation will contribute also contribute to erosion. Erosion from roads will continue throughout the project. Water for well drilling, dust abatement, and other construction uses might temporarily impact groundwater levels through depletion during water withdrawals. Potential leaks or spills of petroleum products or other

hazardous materials from construction and operation equipment and vehicles might impact surface water or groundwater.

Groundwater levels may be drawn down from production wells or may rise from injection wells, and injected water may alter groundwater quality. Water used for well construction and the water flood operation would be obtained from oil or gas well produced water.

4.1.4.1 Alternative I – No Action Alternative

Under the No Action Alternative, the BLM would deny Chevron's new proposal for development and the present rate of development in the Table Rock Unit would continue. Management of fluid mineral development would continue to be governed by current BLM policy and procedures with APDs approved on a case-by-case basis. Approximately 115 acres would be disturbed for the initial development of new producing wells and abandonment of old wells. The increase in long-term disturbance within the project area under the No Action Alternative would be 0.2 percent, for a total of 2.9 percent. Resulting impacts to surface water and groundwater would be minimal, assuming compliance with BLM policies and guidelines for road construction, erosion and sediment control, and reclamation.

4.1.4.2 Alternative II – Proposed Action

Because the Project would largely utilize the road network currently present in the area, stream crossings due to new road construction would be minimized. Installation of culverts or other stream crossing methods across streams with streamflow at or shortly after the time of construction would result in increases of sediment available for transport by the water. Stream and drainage crossings on new roads would be installed in accordance with standards in the BLM/USFS Gold Book (U.S. Department of the Interior and USDA 2007) and BLM Manual 9113. Installations could result in elevated levels of total suspended sediment (TSS) and increases in turbidity at and downstream from the stream crossing during periods of streamflow. TSS and turbidity levels would be expected to decrease within several days of streamflow after the completion of in-stream construction activities. Although the turbidity levels would decrease, TSS and turbidity levels would be expected to remain higher than baseline due to the additional new disturbance, higher vehicle traffic, and removal of stabilizing vegetation.

Areas of disturbance adjacent to and directly upslope of streams, including access roads and well pads during operation, might also contribute to impacts of surface water through increased rates of erosion that contribute sediment to the streams during storm runoff events. Best Management Practices contained in the Storm Water Pollution Prevention Plan (SWPPP) would be utilized during construction and reclamation to minimize and mitigate these impacts. Specific areas of potential upland and streambank or channel erosion would be identified during the detailed design phase. **Table 4-2** indicates the calculated disturbance from a conceptual Project development footprint for both initial, temporary construction disturbance and for long-term, operational disturbance as compared to the existing amount of disturbance in the project area. The Project would increase long-term disturbance in the project area by approximately 0.6 to 0.7 percent, for a total of 3.2 to 3.3 percent of the area disturbed.

Table 4-2 Initial and Long-term Surface Disturbance in Project Area by Subwatershed

				Initial Disturbance		Long-term Disturbance			
	Project Area	Existing Disturbance		Multi-well Scenario	Single Well Scenario	Multi-well Scenario		Single Well Scenario	
Subwatershed	acres	acres	%	acres[1]	acres[1]	acres[1]	%[2]	acres[1]	%[2]
Lower Patrick Draw	10,396	289	2.8	223	244	83	3.6	69	3.4
Red Wash	2,557	61	2.4	47	47	15	3.0	15	3.0
Upper Salt Sage Draw	680	6	0.9	0	0	0	0.9	0	0.9
Total	**13,633**	**356**	**2.6**	**270**	**291**	**99**	**3.3**	**85**	**3.2**

[1] Acres listed are only associated with Project disturbance, and do not include existing disturbance.

[2] Percent listed is the sum considering existing disturbance and Project disturbance.

Surface water quality could be impacted from leaks or spills of petroleum products or other hazardous materials from construction or operation equipment into or near any streams or water bodies; however, protective measures would be implemented in compliance with state and federal regulations, including preparation of a Spill Prevention, Control, and Countermeasure Plan, to minimize potential leaks and require rapid clean up in the event of a spill before reaching water bodies or drainageways. Any impacts from leaks or spills would be highly dependent on the size and location of the spill and the absence or presence of streamflow at that time.

Water needs for Project development would be obtained from groundwater sources and would be disposed of according to applicable federal, state, and local regulations. The deep aquifers targeted for extraction by the production wells are the Mesaverde and the Clover aquifers, which both contain Class IV water, which may display some drawdown during extraction. The only uses of the groundwater in the project area are industrial for oil and gas production by the proponent; therefore no impacts to shallower stock wells from drawdown are expected.

Water injection for the water flood may raise water levels in the targeted water flood zones near the injection wells. The deep aquifer targeted for injection is the Mesaverde, which also is only used in the area for industrial use of oil and gas production; therefore no impacts to shallower stock wells or other permitted wells from increased water levels are expected.

Because the deeper Mesaverde and Clover aquifers targeted by the Project for both extraction and injection contain Class IV or Class V groundwater that is only suitable for industrial purposes, the injection of produced water is not expected to have an effect on the water quality of the receiving aquifer. These deep aquifers are separated from shallower aquifers by the 1,000-foot-thick Lewis Shale, which prohibits upward migration and confines the deeper aquifers. No impacts to shallower aquifers are expected.

Water used for the Project for hydraulic fracturing and water flood operations would come from produced water from existing and new Chevron wells in the area, to be supplemented by established water wells as needed. It is estimated that a total of approximately 233 to 241 acre-feet (1,807,500 to 1,871,400 barrels) of water would be used for well drilling and development activities over the 14-year period of Project development, depending on the co-location and water recycling options selected for Almond production wells. **Table 4-3** estimates the annual usage of groundwater for well drilling operations.

Table 4-3 Annual Water Needs for Well Drilling and Development

Year	Range of Water Use	
	barrels	acre-feet
2012	170,000 – 175,000	22 – 23
2013	335,000 – 340,000	43 – 44
2014	597,250 – 606,300	77 – 78
2015	430,250 – 439,300	55 – 57
2016	180,500 – 188,000	23 – 24
2017	19,500 – 27,200	3 – 4
2018	19,500 – 27,200	3 – 4
2019	19,500 – 27,200	3 – 4
2020	14,500 – 19,700	2 – 3
2021	4,300 – 4,300	1 – 1
2022	4,300 – 4,300	1 – 1
2023	4,300 – 4,300	1 – 1

Table 4-3 Annual Water Needs for Well Drilling and Development

Year	Range of Water Use	
	barrels	acre-feet
2024	4,300 – 4,300	1 – 1
2025	4,300 – 4,300	1 – 1
Total	**1,807,500 – 1,871,400**	**233 – 241**

Note: Range in values considers potential for recycled water use on co-located Almond Production Wells (multi-well scenario) and for potential conversion of Almond Injection Wells (see Section 2.2.5).

Produced water also would be utilized for the water flood during the operation of the Project. It is anticipated that there would be surplus produced water which would be disposed of at the permitted saltwater disposal facility located within the project area in Section 36, T19N, R98W.

In summary, construction impacts to surface water resources would occur primarily at or near stream or drainage crossings of access roads and pipelines. The crossings would introduce sediment to the streams due to runoff-induced erosion of initial disturbance areas. This impact would dissipate downstream of the pipeline crossing and would begin decreasing within several days of the completion of construction activities. Once reclamation occurs, increased sediment delivery is expected to be minimal, returning to near pre-disturbance amounts for all reclaimed areas.

In compliance with state and federal regulations and BLM policies, impacts to surface water would be minimized by implementation of the required environmental protection measures and applicant-committed measures listed in . Potential impacts to shallow groundwater quality due to leaks or spills of petroleum products or other hazardous materials used during construction or operations into or near any streams, water bodies, or other recharge areas would be minimized and mitigated by BMPs required spill prevention and response plans.

4.1.5 Vegetation and Noxious Weeds

The primary issues associated with vegetation resources include the long-term removal of vegetation communities and the associated loss of habitat for wildlife species, direct or indirect impacts to riparian/wetland habitats, decreased forage production in rangeland areas, and impacts associated with the introduction or spread of noxious weeds and invasive species (see specific resource section for further discussion).

4.1.5.1 Alternative I – No Action Alternative

Under the No Action Alternative, the BLM would deny Chevron's proposal for development and would continue the present rate of development in the Table Rock Unit. Management of fluid mineral development would continue to be governed by current BLM policy and procedures with APDs approved on a case-by-case basis. Impacts to vegetation resources under the No Action Alternative would result in an initial surface disturbance of approximately 75 acres, and subsequent long-term disturbance of approximately 25 acres. Approximately 40 acres (associated with plugged and abandoned wells) would be reclaimed and revegetated to productive states after wells are abandoned.

4.1.5.2 Alternative II – Proposed Action

Potential impacts to vegetation resources as a result of Project implementation can be classified as initial or long term. Initial direct impacts consist of temporary vegetation removal (i.e., vegetation and soil compaction and removal) associated with the construction of well pads, ancillary facilities, roads, and pipelines. Long-term direct impacts consist of vegetation loss associated with operation and maintenance activities of aboveground facility footprints and roads. The extent of both initial and long-term impacts would depend on factors such as the sensitivity of the species, seasonal use patterns, type and timing of Project activities, and physical parameters (e.g., topography, cover, forage). **Table 4-4**

summarizes maximum initial and long-term acreage impacts to each vegetation cover type within the project area.

Potential indirect impacts to vegetation include loss as a result of accidental spills of oil and lubricants, fugitive dust emissions, and the introduction or spread of noxious weeds and invasive species (see Noxious Weed discussion below). Fugitive dust emissions would increase from the increased traffic on existing dirt roads associated with construction and operation activities resulting in an increase in the amount of dust deposited on the leaves of plants location along roadways, leading to a decrease in plant productivity, as well as negatively impacting plant health, until the dust is removed by wind or precipitation. In compliance with established regulations and policies to minimize the potential impacts from spills, a site-specific spill prevention, containment, and countermeasures plan would be developed during the APD process. Dust control plans would be developed and implemented and new roads would be surfaced with gravel to minimize adverse impacts to vegetation from dust.

Table 4-4 Summary of Initial and Long-term Impacts per Vegetation Cover Type within the Project Area

Vegetation Cover Type	Initial Impacts (acres)[1]	Long-term Impacts (acres)[1]
Shrubland	262	90
Dune	12	4
Grassland	2	<1
Wetland/riparian	6	3
Barren	1	<1
Developed	8	2
Total	**291**	**99**

[1] Initial impact acreage based on the potential maximum surface disturbance associated with vertical drilling and single well pad development. Long-term impact acreage based on the potential maximum surface disturbance associated with directionally drilled and co-located pad development.

Reclamation of initial surface disturbance areas and upon Project completion subsequent reclamation of long-term surface disturbance areas, would be completed pursuant to site-specific reclamation plans in compliance with BLM policy. Herbaceous-dominated plant communities (i.e., grassland, barren, dune, and wetland/riparian cover types) would require a minimum of 5 years to establish adequate ground cover to minimize erosion and provide forage for wildlife species and livestock. Woody-dominated plant communities (i.e., shrubland cover type) require approximately 20 or more years for shrubs of similar stature to reestablish in the area.

Noxious Weeds and Invasive Species

The prevention of the spread of noxious weeds and invasive plant species is a high priority throughout Wyoming. Vegetation removal and soil disturbance during construction would create optimal conditions for the establishment of noxious weeds and invasive species. Unwashed construction equipment or vehicles transporting noxious weeds in soil or plant materials into previously uninfested areas, off-road driving, and improper maintenance of temporary construction areas could result in the introduction or spread of noxious weeds and invasive species. In addition, the linear nature of the road and pipeline disturbances could increase the introduction of noxious weeds and invasive species into adjacent native plant communities. Noxious weeds and invasive species generally are fast-growing and could displace native species and inhibit the reestablishment of native grass, forb, and shrub species within the disturbed areas.

To control the spread of noxious weeds and invasive species within the project area, control measures would be implemented in accordance with existing regulations, jurisdictional land management agency

requirements, and landowner agreements. Implementation of environmental protection measures (including the use of a native, weed-free reclamation seed mixture) and the development and implementation of a site-specific reclamation plan and noxious weed management plan, would minimize the potential for the establishment of noxious weeds and invasive species. These plans would be developed during the APD process.

Substantial increases in weed prevalence are not anticipated; however, despite efforts to prevent the proliferation of noxious weeds, it is possible that construction, operation, and maintenance activities would result in the spread or introduction of noxious weeds and invasive species within the project area or that weed species would be transported into areas that were relatively weed-free. Implementation of post-construction monitoring, as outlined within the noxious weed management plan, in consultation with the BLM would further minimize and mitigate the impacts associated with the introduction and/or spread of noxious weeds and invasive species.

4.1.6 Wetland and Riparian Resources

The primary issues associated with wetland and riparian resources include long-term removal and the associated loss of habitat for wildlife and avian species.

4.1.6.1 Alternative I – No Action Alternative

Under the No Action Alternative, the BLM would deny Chevron's proposal for development and would assume continuation of the rate of development in the Table Rock Unit. Management of fluid mineral development would continue to be governed by BLM policy and procedures with APDs approved on a case-by-case basis. According to BLM policy, surface disturbance within wetland and riparian areas would be prohibited; therefore, no impacts to wetland or riparian areas are anticipated as a result of implementation of the No Action Alternative.

4.1.6.2 Alternative II – Proposed Action

Potential impacts to wetland and riparian resources as a result of Project implementation can be classified as initial or long term. Initial direct impacts consist of temporary vegetation removal (i.e., vegetation and soil compaction and partial removal of aboveground plant cover) associated with the construction of well pads, ancillary facilities, and road and pipeline construction. Long-term direct impacts consist of vegetation loss associated with operation and maintenance activities of aboveground facilities and roads. The extent of both initial and long-term impacts would depend on factors such as the sensitivity of the species, seasonal use patterns, type and timing of the Project activities, and physical parameters (e.g., topography, cover, forage). **Table 4-5** summarizes the maximum acreage of potential impacts to wetland and riparian resources within the project area. Note that BLM mitigation guidelines require special mitigation measures within 500 feet of riparian areas. During the APD process, it is expected that well pads, roads, or other facilities would be moved to avoid alterations to important wetlands or riparian areas identified during the onsite review.

Table 4-5 Summary of Initial and Long-term Impacts to Wetland and Riparian Resources within the Project Area

Wetland Type	Initial Impacts (acres)[1]	Long-term Impacts (acres)[1]
Palustrine Unconsolidated Bottom	0	0
Palustrine Unconsolidated Shore	<1	0
Total	**<1**	**0**

[1] Initial impact acreage based on the potential maximum surface disturbance associated with vertical drilling and single well pad development. Long-term impact acreage based on the potential maximum surface disturbance associated with directionally drilled and co-located pad development.

Note: Given the preliminary nature of the locations of Project facilities and components, during the APD process site-specific designing would be required to avoid placement of any Project facility or component within a wetland or riparian area.

Indirect impacts to wetland and riparian resources include changes in turbidity and fluctuations in wetland hydrology, loss of vegetation cover or productivity as a result of accidental spills, the introduction of pollutant and contaminants into wetland and riparian areas, fugitive dust emissions, and the introduction or spread of noxious weeds and invasive species (see Section 4.1.5 for the information on noxious weeds and invasive species). Fugitive dust emissions would increase from the increased traffic on dirt roads associated with construction and operation activities resulting in an increase in the amount of dust deposited on the leaves of plants location along roadways, leading to a decrease in plant productivity until the dust is removed by wind or precipitation. Accidental spills of fuels, or other hazardous materials would saturate soils and adversely affect wetland form and functionality. In compliance with established regulations and policies to minimize the potential for spills, a site-specific Spill Prevention, Control, and Countermeasures Plan would be developed during the APD process. Dust control plans would be developed and implemented and new roads would be surfaced with gravel to minimize adverse impacts to vegetation from dust.

Reclamation of initial surface disturbance areas would be completed pursuant to site-specific reclamation plans in compliance with BLM policy. Herbaceous wetlands (i.e., palustrine) require a minimum of 5 years to establish adequate ground cover to minimize erosion and provide forage for wildlife species. Upon successful reclamation, direct impacts to herbaceous wetlands as a result of construction-related activities are expected to be negligible. Because no proposed permanent facilities are proposed to be located within a wetland, no long-term impacts to wetlands are anticipated. No initial or long-term surface disturbance areas are expected to be located within a riparian area; therefore, no impacts are anticipated.

4.1.7 Wildlife and Aquatic Resources

Wildlife species and related issues for this analysis were determined through consultation with the BLM, WGFD, and USFWS. The primary issues related to wildlife species include the loss or alteration of native habitats, increased habitat fragmentation or disruption, animal displacement, and direct loss of wildlife.

4.1.7.1 Alternative I – No Action Alternative

Under the No Action Alternative, the BLM would deny Chevron's proposal for development and would continue the present rate of development in the Table Rock Unit. Management of fluid mineral development would continue to be governed by current BLM policy and procedures with APDs approved on a case-by-case basis. Impacts to wildlife habitat under the No Action Alternative would result in disturbance to approximately 75 acres of wildlife habitat over 14 years. Approximately 40 acres of wildlife habitat would be reclaimed and revegetated to productive states after wells are plugged and abandoned.

4.1.7.2 Alternative II – Proposed Action

Potential impacts to wildlife species from the Project can be classified as short-term and long-term. Short-term impacts consist of temporary habitat removal and activities associated with construction, and long-term impacts consist of changes to wildlife habitats associated with operation (e.g., graveled roads and pads, buildings, vehicle traffic, etc.). The extent of both short-term and long-term impacts would depend on factors such as the sensitivity of the species, seasonal use patterns, type and timing of the Project activities, and physical parameters (e.g., topography, cover, forage).

The Project would result in both direct and indirect impacts to wildlife species. Direct and indirect impacts include wildlife mortalities or displacement related to construction and operation; habitat loss, alteration, and fragmentation; and increased levels of noise, activity, and human presence.

A total of six habitat types, which correspond to the vegetation cover types described in Section 3.5, are found within the project area. Project construction would result in the disturbance of up to 291 acres of wildlife habitat over the 14-year period of Project development, including 2 acres of grassland, 262 acres of shrubland, 12 acres of dune, 6 acres of riparian/wetland, 1 acre of barren, and 8 acres identified as developed lands. This habitat disturbance would be reclaimed following completion of wellfield development activities (i.e., plugging and abandonment of wells).

Big Game Species

Impacts to big game species, primarily mule deer and pronghorn, include the short-term loss of potential forage and cover (native vegetation and previously disturbed vegetation) and an increase in habitat fragmentation within the project area. Due to the arid climate of southwestern Wyoming, the loss of available woody/shrubby vegetation would likely take 20 years or more to recover. However, herbaceous species may become established within 3 to 5 years, depending on reclamation success, weather conditions, and grazing management practices in the project area. In most instances, suitable habitat adjacent to disturbed areas would be available for big game species until grasses and woody vegetation were reestablished within the disturbance areas.

Additional impacts to big game species would result from increases in noise levels and human presence during construction and development activities. Studies have shown that big game species tend to move away from areas of human activity and roads, therefore, reducing habitat utilization near disturbance areas (Cole et al. 1997; Sawyer et al. 2009, 2006; Ward 1976). Mule deer and pronghorn appear to be more tolerant of human activity than elk. For mule deer, displacement distances ranged from 330 feet to 0.6 mile, depending on the presence of vegetative cover (Ward 1976). However, disturbance associated with construction activities would be short-term, and it is assumed that animals would return to the area following the completion of Project construction and drilling activities. This is especially true for pronghorn within the project area because due to the existing level of activity within the project area, most animals have been acclimated to the relatively low level of human activity associated with oil and gas operations.

To avoid direct impacts to big game species during sensitive periods in compliance with established regulations and policies, Chevron would be required to avoid surface use activities within crucial winter/yearlong range from November 15 to April 30. Based on this environmental protection measure, impacts to big game species would be minimal, limited primarily to displacement from areas of human activity and habitat alteration.

In addition to direct impacts to big game species, implementation of the Project may result in indirect impacts to sensitive big game seasonal habitat (pronghorn crucial winter range). These impacts would include the loss of potential cover and forage consisting or primarily woody/shrubby vegetation such as sagebrush, bitterbrush, and winterfat. Loss of available forage (e.g., woody shrubs, such as sagebrush) may affect wintering big game species, particularly pronghorn. Project construction would result in 8 acres of disturbance (including 3 acres of long-term disturbance) to pronghorn crucial winter/yearlong range. Pronghorn crucial winter/yearlong range is important to maintain pronghorn populations in Wyoming, especially during harsh winters. However, this disturbance acreage represents a relatively small percentage of the crucial winter/yearlong range available in the project region.

Small Game Species

Direct and indirect impacts to small game include wildlife mortalities or displacement related to construction and operation; habitat loss, alteration and fragmentation; and increased levels of noise, activity and human presence. Project construction would result in the incremental loss of up to 291 acres of potential habitat, until reclamation has been completed and vegetation is reestablished. However, in most instances, suitable habitat adjacent to disturbed areas would be available for small game species until grasses and woody vegetation become reestablished within the disturbance areas.

Fragmentation impacts on some small game species have been shown to adversely impact populations. Small game, especially upland game birds, may experience increased mortality rates due to increased vehicle traffic as a result of new and improved roads (Holbrook and Vaughan 1985). Vehicular traffic may injure or kill individuals, and local populations may experience higher levels of hunting and poaching pressure due to improved public access (Holbrook and Vaughan 1985). These temporary losses would reduce productivity for that breeding season. However, due to the large amount of suitable habitat in the surrounding project region, direct impacts to small game species are expected to be low.

Due to the lack of water bodies within the project area, no impacts to waterfowl are anticipated as a result of the proposed Project.

Nongame Species

Direct and indirect impacts to nongame species include wildlife mortalities or displacement related to construction and operation; habitat loss, alteration and fragmentation; and increased levels of noise, activity and human presence. Project construction would result in the incremental loss of up to 291 acres of potential habitat, until reclamation has been completed and vegetation is reestablished. Construction activities may result in mortalities of less mobile or burrowing nongame species (e.g., small mammals, and reptiles) within the project surface disturbance area, as a result of crushing from construction vehicles and equipment.

Impacts also may include temporary displacement of more mobile species (medium sized mammals, adult birds) from the project area, due to the short-term loss of vegetation. The temporary displacement of some species would result until herbaceous vegetation returns to pre-construction conditions (approximately 3 to 5 years). For those species dependent on the sagebrush-steppe habitat, displacement would occur until sagebrush shrubs become reestablished (greater than 20 years).

A number of raptor species (golden eagle, ferruginous hawk, prairie falcon, red-tailed hawk, Swainson's hawk, and burrowing owl) seasonally occupy the habitats within the project area. Impacts to raptor species can result from the loss or alteration of habitat, reduction in prey base, and increased human disturbance. The loss of native habitat to human development has resulted in declines of hawks and eagles throughout the West (Boeker and Ray 1971; Schmutz 1984). In some cases, habitat changes have not reduced numbers of raptors but have resulted in shifts in species composition (Harlow and Bloom 1987). Impacts to small mammal populations due to habitat loss and fragmentation can result in a reduced prey base for raptors, resulting in lower raptor densities. Thompson et al. (1982) and Woffinden and Murphy (1989) found that golden eagles and ferruginous hawks had lowered nesting success where native vegetation had been lost and was unable to support jackrabbit (prey) populations. Furthermore, raptors have a high potential of being disturbed from nests and roosts, thereby leading to displacement and reduced nesting success (Holmes et al. 1993; Postovit and Postovit 1987; Stalmaster and Newman 1978). Noise levels and human activity also can preclude otherwise acceptable raptor habitat from use.

In compliance with established regulations and policies to minimize the potential impact to nesting raptors and their habitat, raptor nest sites identified within the areas of disturbance would be avoided to prevent their removal. Because a number of variables (e.g., nest location, species' sensitivity, breeding, phenology, topographical shielding) determine the level of impact to a breeding pair, appropriate protection measures, such as seasonal constraints and establishment of buffer areas, would be implemented at active nest sites on a species-specific and site-specific basis, in coordination with the jurisdictional agencies (e.g., BLM, WGFD, or USFWS). As a result of these protection measures, construction-related impacts to raptor species are anticipated to be low and no damage to individuals is expected as a result of the proposed Project

Other avian species that may be impacted by construction activities and drilling operations include nesting passerines or songbirds that use the various habitats within the project area. According to the Wyoming Partners in Flight Bird Conservation Plan (Nicholoff 2003), the important dates for most breeding grassland bird species in Wyoming are May 15 to June 30. Direct and indirect impacts to other avian species, especially during the breeding season, include mortalities or displacement related to construction and operation; habitat loss, alteration and fragmentation; and increased levels of noise, activity and human presence. However, the Table Rock Field has been developed fairly extensively in recent years and levels of noise and human presence are currently at moderate to high levels. Nonetheless, Project construction would result in the incremental loss or alteration of up to 291 acres of potential habitat. In addition to habitat loss, reductions in bird population densities in open grasslands and woodlands also may be attributed to a reduction in habitat quality due to elevated noise levels (Reijnen et al. 1997, 1995). Although increased visual stimuli in open landscapes may add to density effects at relatively short distances, the effects of noise appear to be the most critical factor because breeding birds of open grasslands (threshold noise range of 43 to 60 decibels on the A-weighted scale [dBA]) and woodlands (threshold noise range of 36 to 58 dBA) respond very similarly to disturbance from traffic (Reijnen et al. 1997). Reijnen et al. (1996) determined a threshold effect for bird species to be 47 dBA, while a New Mexico study in a pinyon-juniper community found that impacts of gas well compressor noise on bird populations were strongest in areas where noise levels were greater than

50 dBA. However, moderate noise levels (40 to 50 dBA) also showed some effect on bird densities in this study (LaGory et al. 2001). However, due to existing development activities in the field, the extent of suitable habitat adjacent to the disturbed areas, and the temporary nature of Project construction, impacts to other avian species are expected to be minimal. In addition, migratory bird nests would be identified prior to surface disturbing activities during the APD process and avoided.

Similar to the other nongame species, impacts to reptiles and amphibians as a result of the Project would include mortalities or displacement related to construction and operation and habitat loss, alteration, and fragmentation. Construction activities may result in direct mortalities as a result of crushing of burrows from vehicles and equipment. However, due to the extent of suitable habitat adjacent to the disturbed areas and the temporary nature of Project construction, impacts to these species are expected to be minimal.

Aquatic Resources

Due to a lack of suitable habitat (i.e., perennial water sources) within the project area, no impacts to aquatic resources are expected to occur.

4.1.8 Special Status Species

This section focuses on the impact analyses of federally listed, federal candidate, and BLM sensitive wildlife species that were identified for the Project by the BLM, USFWS, WGFD, and WYNDD. Special status wildlife species information presented in this section is based on available habitat and results of surveys conducted within and near the project area (AECOM 2011a; WYNDD 2011a). This section also addresses the impact analyses for two special status plant species that may be affected based on agency consultation, species range, known distribution, and the presence of potentially suitable habitat within the project area.

4.1.8.1 Alternative I – No Action Alternative

Under the No Action Alternative, the BLM would deny Chevron's proposal for development and would continue the present rate of development in the Table Rock Unit. Management of fluid mineral development would continue to be governed by current BLM policy and procedures with APDs approved on a case-by-case basis. Impacts to special status animal species habitat under the No Action Alternative would result in disturbance to approximately 75 acres of habitat over 14 years. Approximately 40 acres of habitat would be reclaimed and revegetated to productive states after wells are plugged and abandoned.

Potential impacts to special status plant species from surface disturbance-related activities may include the loss of individuals as a result of crushing or uprooting from construction vehicles and equipment. Because surface disturbance would be localized within a small geographic area, population-level impacts are not anticipated. Long-term direct impacts consist of suitable habitat loss associated with operation and maintenance activities of aboveground facility footprints and roads.

4.1.8.2 Alternative II – Proposed Action

Potential impacts to special status species from the Project can be classified as short-term and long-term. Short-term impacts consist of temporary habitat removal from activities associated with construction, and long-term impacts consist of changes to special status species' habitats associated with operations (e.g., roads and pads, buildings, vehicle traffic, etc.). The extent of both short-term and long-term impacts would depend on factors such as the sensitivity of the species, seasonal use patterns, type and timing of the Project activities, and physical parameters (e.g., topography, cover, forage).

The Project would result in both direct and indirect impacts to specials status animal species. Direct and indirect impacts include mortalities or displacement related to construction and operation; habitat loss, alteration, and fragmentation; and increased levels of noise, activity, and human presence.

Potential impacts to special status plant species from surface disturbance-related activities may include the loss of individuals as a result of crushing or uprooting from construction vehicles and equipment. Because surface disturbance would be localized within a small geographic area, population-level

impacts are not anticipated. Long-term direct impacts consist of suitable habitat loss associated with operation and maintenance activities of aboveground facility footprints and roads.

Federally Listed and Candidate Wildlife Species

Black-footed Ferret (Federally Endangered)

Impacts to prairie dogs and their burrows may indirectly impact black-footed ferrets due to loss of habitat and prey. However, the proposed Project would disturb less than 1 acre of white-tailed prairie dog colonies within the project area. In addition, a majority of the project area has been cleared for black-footed ferrets by the USFWS while a small area in the southwest portion of the Project has not been block-cleared (**Figure 3-4**). Field surveys were conducted in 2011 to document the extent of white-tailed prairie dog colonies within the non block-cleared portion of the project area. Based on the survey results and the lack of suitable white-tailed prairie dog colonies within the project area, there is a low likelihood of black-footed ferrets existing within the project area and surveys are not required. Therefore, the proposed Project would result in a "No Effect" determination for the black-footed ferret.

Greater Sage-grouse (Federal Candidate, BLM Sensitive)

Impacts to greater sage-grouse, if present, would result in the disturbance of 39 acres of potentially suitable breeding habitat. Impacts to greater sage-grouse habitat include increased fragmentation and disruption as a result of increased noise levels and human presence causing avoidance of habitat, potential dispersal of noxious weeds and invasive plant species, and dust from unpaved road traffic. Impacts also would include increased collision potential associated with power lines and vehicle traffic, as well as possible increased predation by raptors, corvids, and coyotes.

Recent studies on greater sage-grouse show that development can negatively impact populations as a result of increased noise and human disturbance (Holloran 2005; Walker et al. 2007). Greater sage-grouse have been observed to abandon lek sites in areas with increased road development (Braun 1986; Holloran 2005; Walker et al. 2007). Greater sage-grouse hens that utilized nesting habitats further from roads had higher brood survivorship than those hens utilizing habitat near roads (Lyon and Anderson 2003). As described in Section 3.8, no greater sage-grouse leks occur within the project area, although 1,338 acres of suitable breeding habitat is present in the southern portion of the project area. In accordance with BLM Instruction Memorandum 2010-012 and the Green River and Rawlins RMPs, no surface disturbing and/or disruptive activities are allowed within 2 miles of any occupied or undetermined lek between March 1 and July 15 to protect nesting greater sage-grouse. Based on the implementation of these environmental protection measures, the lack of active leks within the project area, and the small amount of greater sage-grouse breeding habitat potentially affected by the proposed Project, impacts to greater sage-grouse are anticipated to be low.

BLM Sensitive Wildlife Species

Bat Species

A number of BLM sensitive bat species also may be impacted by Project construction. Three sensitive bat species including fringed myotis, spotted bat, and Townsend's big-eared bat may potentially occur within the project area. No impacts to communal roosts (e.g., hibernacula, nursery colonies, bachelor roosts) would be anticipated from the Project construction or operation, based on review of bat literature for Wyoming (WGFD 2010) and the lack of suitable roost trees, underground structures, or mines within the project area. The Project construction would result in the disturbance of 291 acres of potentially suitable foraging habitat for these bat species until reclamation has been completed and the plant communities have been reestablished. Therefore, impacts to these three bat species are anticipated to be low.

Pygmy Rabbit

Impacts to the pygmy rabbit may result in direct mortalities of individuals, as a result of crushing from construction activities, vehicles, and equipment. Additional impacts may result from increased habitat fragmentation, human presence, and noise. The extent of likely habitat disturbance as a result of the proposed Project is presented in **Table 4-6**.

Table 4-6 Pygmy Rabbit Habitat Potentially Impacted by the Project

WYNDD Habitat Category[1]	Estimated Surface Disturbance (acres)[2]
Low	0
Moderate	11
High	277
Very High	3

[1] Based on the WYNDD habitat probability model for Wyoming (WYNDD 2008a).

[2] Based on the maximum surface disturbance possible under the Proposed Action.

Given the extent of suitable sagebrush habitat in the surrounding region and the existing level of development within the project area, activities associated with the proposed Project within suitable pygmy rabbit habitat may impact individuals but are not anticipated to adversely affect the local population of this species. In addition, the BLM requires that pygmy habitat be identified prior to surface disturbing activities and habitat disturbance minimized or avoided during the APD process. Therefore, impacts to the pygmy rabbit are anticipated to be low.

White-tailed Prairie Dog

Impacts to the white-tailed prairie dog may result in direct mortalities of individuals, as a result of crushing from construction activities, vehicles, and equipment. Additional impacts may result from increased habitat fragmentation, human presence, and noise. Based on the results of the field surveys, a total of four white-tailed prairie dog colonies occur within the project area. Under the Proposed Action, less than 1 acre of white-tailed prairie dog colonies would be impacted by construction activities. Based on the small amount of white-tailed prairie dog colonies potentially impacted by the proposed Project, impacts to the white-tailed prairie dog are anticipated to be low. Habitat disturbance in surrounding areas may encourage future colonization in the short-term, based on the availability of disturbed soils that would occur within the project area subsequent to the Project-related construction.

Wyoming Pocket Gopher

Impacts to the Wyoming pocket gopher may result in direct mortalities of individuals, as a result of crushing from construction activities, vehicles, and equipment. Additional impacts may result from increased habitat fragmentation and human presence and noise. Habitat disturbance as a result of the proposed Project is presented in **Table 4-7**.

Table 4-7 Wyoming Pocket Gopher Habitat Potentially Impacted by the Project

WYNDD Habitat Category[1]	Estimated Surface Disturbance (acres)[2]
Absent	0
Low	81
Moderate	210
High	0

[1] Based on the WYNDD habitat probability model for Wyoming (Griscom et al. 2010).

[2] Based on the maximum surface disturbance possible under the Proposed Action.

It is not anticipated that construction activities would permanently alter Wyoming pocket gopher habitat within the project area, following successful reclamation. In fact, habitat disturbance may encourage future colonization in the short-term, based on the availability of disturbed soils that would occur within the project area subsequent to the Project-related construction. In addition, the BLM requires Wyoming pocket gopher surveys prior to surface disturbing activities. During the APD process, trapping Wyoming pocket gophers would be required in order to determine which species of pocket gopher is present. Habitat surveys and trapping would be in accordance with BLM approved methods and if Wyoming pocket gophers are identified during trapping efforts, suitable habitat would be avoided. Therefore, impacts to the Wyoming pocket gopher are anticipated to be low.

Ferruginous Hawk

Impacts to ferruginous hawks generally would be the same as that described for raptors in Section 4.1.7. Impacts specific to ferruginous hawks, if present, would result in the incremental loss of 291 acres of potentially suitable habitat. Additional impacts such as displacement and avoidance also would result from increased noise and human presence associated with construction activities. Because a number of variables (e.g., nest location, species' sensitivity, breeding, phenology, topographical shielding) would determine the level of impact to a breeding pair, appropriate protection measures, such as seasonal constraints and establishment of buffer areas for avoidance (e.g., 0.75-mile and 1-mile Controlled Surface Use [CSU] nest buffer during the breeding season within the RFO), would be implemented at active nest sites (determined by the BLM wildlife biologist) on a species-specific and site-specific basis, in coordination with the jurisdictional agencies (e.g., BLM, WGFD, or USFWS) in compliance with established regulations and policies. As a result of these protection measures, construction-related impacts to the ferruginous hawk are anticipated to be low and no take is expected as a result of the proposed Project.

Burrowing Owl

Impacts to burrowing owls generally would be the same as described for raptors in Section 4.1.7. Impacts specific to burrowing owls, if present, would result in the incremental loss of less than 1 acre of potentially suitable habitat (i.e., prairie dog colonies) within the project area. Additional impacts such as displacement and avoidance also would result from increased noise and human presence associated with construction activities. In compliance with established regulations and policies, Chevron would be required to conduct nesting surveys during the breeding season (April 1 to September 10) during the APD process. If a nest is found, an 820-foot no surface occupancy (NSO) buffer must be applied in addition to a 0.50-mile CSU buffer during the breeding season. Therefore, impacts to burrowing owls are anticipated to be low.

Mountain Plover

Impacts to mountain plovers, if present within the project area, would occur as a result of the disturbance of potentially suitable nesting habitat (**Table 4-8**). Additional impacts such as displacement and avoidance also would result from increased noise and human presence associated with construction activities.

Table 4-8 Mountain Plover Habitat Potentially Impacted by the Project

WYNDD Habitat Category[1]	Estimated Surface Disturbance (acres)[2]
Low	13
Medium	126
High	152

1 Based on the WYNDD habitat probability model for Wyoming (Keinath et al. 2010).

2 Based on the maximum surface disturbance possible under the Proposed Action.

However, it is not anticipated that construction activities would permanently alter mountain plover habitat within the project area, following successful reclamation. Habitat disturbance may encourage future use of the project area, subsequent to Project construction, given the decreased vegetation height and density. In compliance with established regulations and policies, Chevron would be required to conduct mountain plover nesting surveys within suitable habitat between April 10 and July 10. If an active nest is located, a 0.25-mile buffer would be established to protect the nest from disturbance until the young fledge. As a result, impacts to nesting mountain plovers are anticipated to be low.

Long-billed Curlew

Impacts to long-billed curlews, if present, would occur as a result of the disturbance of 2 acres of potentially suitable grassland habitat within the project area. Additional impacts such as displacement and avoidance also would result from increased noise and human presence associated with construction activities. In compliance with established regulations and policies, However, due to the extent of suitable habitat adjacent to the disturbed areas and the temporary nature of Project construction, impacts to this species are expected to be minimal. In addition, migratory bird nests would be identified prior to surface disturbing activities during the APD process and avoided.

Brewer's Sparrow, Loggerhead Shrike, Sage Sparrow, Sage Thrasher

Impacts to Brewer's sparrow, loggerhead shrike, sage sparrow, and sage thrasher generally would be the same as described for migratory birds in Section 4.1.7. Impacts specific to Brewer's sparrow, loggerhead shrike, sage sparrow, and sage thrasher would occur as a result of disturbance to 291 acres of potentially suitable habitat within the project area. Additional impacts such as displacement and avoidance also would result from increased noise and human presence associated with construction activities. However, due to the extent of suitable habitat adjacent to the disturbed areas and the temporary nature of Project construction, impacts to these species are expected to be minimal. In addition, migratory bird nests would be identified prior to surface disturbing activities during the APD process and avoided.

Great Basin Spadefoot

Potential impacts may include direct mortalities of individuals from construction activities, ground compaction, and vehicle traffic within suitable habitat. Impacts also may result from the incremental long-term reduction of 291 acres of potential habitat until reclamation is completed and vegetation has been re-established. The Project may impact individuals but would not likely cause a trend towards federal listing or loss of viability. This species has a broad geographic range in Wyoming and impacts would be considered negligible based on the amount of suitable habitat present in the project vicinity.

Plants

Based on the results of detailed habitat modeling for the dune wildrye and the persistent sepal yellowcress, it is unlikely that individuals and their associated suitable habitat are present within the project area. During the APD process, where suitable habitat is identified via ground truthing, species-specific surveys would be conducted to determine the presence/absence and areal extent of the dune wildrye and persistent sepal yellowcress. If species or their associated suitable habitats are identified, avoidance and minimization measures would be determined through consultation with the BLM, in compliance with current policies and guidelines.

4.1.9 Air Quality and Climate Change

4.1.9.1 Alternative I – No Action Alternative

Under the No Action Alternative, the existing Table Rock Unit would continue to operate at the current rate of development.

4.1.9.2 Alternative II – Proposed Action

Criteria Pollutant Emissions

Emissions of criteria pollutants associated with the Proposed Action would be generated from 1) construction equipment and fugitive dust, 2) drilling and completion activities, and 3) operation of fully producing wells with maintenance vehicle traffic. The details of the emission inventory development are documented in the Emissions Inventory Report (AECOM 2011b).The annual emissions associated with drilling and construction will vary based on the number and type of wells being drilled in a given year based on the schedule shown in **Table 2-3**, and in general the maximum emissions year will be the year with the most wells being drilled. The annual emissions associated with production would vary based on how many wells are active at any given time with total maximum emissions occurring when the greatest number of wells are in production. To produce a conservative estimate of the emissions associated with this Project the emissions for each project year were calculated based on the proposed Project schedule and the maximum emissions for each pollutant were selected. Total source emissions for the Proposed Action are listed in **Table 4-9** as well as the projected maximum impact year for each pollutant. The maximum impact year is dependent on whether the pollutant is more heavily emitted during the year with the most wells being constructed and drilled (2014) or the year where the highest number of wells are in production (2025).

Table 4-9 Source Emissions for Proposed Action

Pollutant	Maximum Emissions (tons)	Maximum Emissions Year
NO_X	264	2014
CO	160	2014
SO_2	2	2025
PM_{10}	41	2014
$PM_{2.5}$	16	2014
VOC	333	2025

NO_X = oxides of nitrogen.

To assess the potential impacts from the Proposed Action, it is reasonable to compare proposed emissions to recent actual emission levels in the same area. This comparison considers the results from the 2008 Baseline Modeling for the CD-C project (ENVIRON 2011). The Table Rock Unit is contained within the CD-C project area and the actual emissions from existing Table Rock Unit operations were included in this study. The 2008 actual emissions for the Table Rock Unit are listed in **Table 4-10**. The conservative estimates for the emissions from the Proposed Action are of the same magnitude as 2008 emissions for all criteria pollutants. The overall scale of the Proposed Action, 88 new wells, is less than 5 percent the size of the existing CD-C development of 2,450 wells (Environ 2011).

Table 4-10 2008 Emissions for Table Rock Unit

NO_X	CO	SO_2	PM	VOC	Total HAPs
(tpy)	(tpy)	(tpy)	(tpy)	(tpy)	(tpy)
207	232	95	22	229	42

While modeled impacts from a study like that done for the CD-C project do not linearly scale with emissions from other projects, the level of impacts for the Project were qualitatively assessed using the CD-C analysis. Because of the similarity in location and source types between those sources associated with the Proposed Action and those in the existing Table Rock Unit development, it is reasonable to

assume that modeled impacts related to the Proposed Action and the existing Table Rock Unit development would be similar in spatial and temporal patterns.

In the baseline modeling study, both CD-C project and non-CD-C-project area emissions (including 2008 emissions for the Table Rock Unit) were found to have no major impact on exceedences of any criteria pollutant (O_3, SO_2, CO, PM_{10}, $PM_{2.5}$). The maximum non-CD-C project contribution to high observed and modeled 8-hour O_3 in the modeling domain was 0.2 parts per billion (ppb), less than 1 percent of the current NAAQS of 75 ppb. The impacts from CD-C project contributions were slightly higher. The baseline study report did not go into the same degree of detail for the other criteria pollutants. The report did not provide a break out of the impacts from the non-CD-C project area emissions for pollutants other than O_3 and only evaluated the impacts from the CD-C project emissions where an exceedence was modeled. The baseline emissions from the CD-C project area were not found to be a major contributor to any exceedence.

The scale of the impacts from the existing Table Rock Unit sources identified in the CD-C study would indicate that the emissions increase represented by the Proposed Action would not change the conclusions of the CD-C modeling study. Therefore, the Proposed Action is not anticipated to have any major impacts on the attainment status of the region for any of the criteria pollutants.

Hazardous Air Pollutants (HAPs)

Source emissions of formaldehyde, benzene, toluene, ethyl benzene, xylene, and n-hexane for the Proposed Action are listed in **Table 4-11** as well as their maximum predicted emissions year. No individual HAP would be emitted in a quantity greater than the major source limit of 10 tpy and the combination of HAP emissions would be less than the major source limit of 25 tpy; therefore, the proposed Project would not constitute a major HAP source.

Table 4-11 Hazardous Air Pollutants from Proposed Action

Pollutant	Maximum Emissions (tons)	Maximum Emissions Year
Benzene	2	2020
Toluene	4	2025
Ethylbenzene	0	2025
Xylenes	4	2025
Formaldehyde	7	2014
n-Hexane	5	2025

AQRVs

AQRVs that are commonly evaluated in air quality impact studies include visibility, soil and lakes. FLMs report (FLAG 2010) provides a screening analysis to determine if a proposed Project is exempt from AQRV impact review based on its annual emissions (Q) and distance (D) from a Class I area.

A Q/D screening analysis was performed to evaluate the impact of the Proposed Action on AQRVs in the closest Class I area or sensitive Class II area, Dinosaur National Park (**Figure 4-1**). In this analysis the Q/D ratio defined as the ratio of applicable Project emissions in tpy and distance in kilometer (km) to the selected area is compared to the FLMs AQRVs Workgroup (FLAG) threshold of 10. The pollutants which were considered in this analysis are SO_2, NO_X, and PM_{10}. A complete review would also require analysis of sulfuric acid (H_2SO_4). Sulfuric acid emissions were not quantified as part of this effort but are expected to be much lower than those of SO_2, NO_X, and PM_{10}.

Based on an approximate distance of 95 km to Dinosaur National Park and the total Project emissions listed in **Table 4-9**, the results of this screening analysis indicate that the Proposed Action is exempt from further AQRV impact review.

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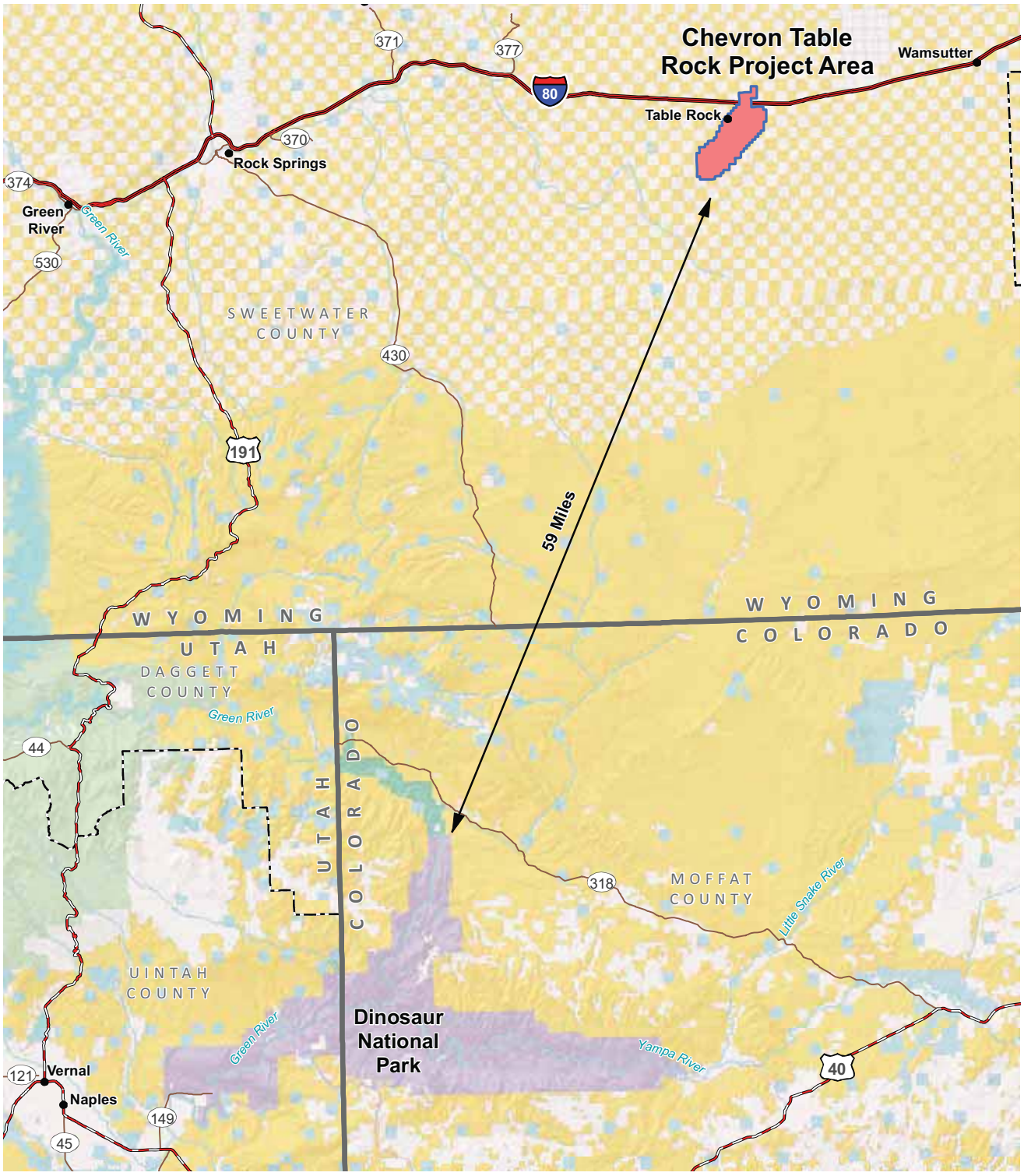

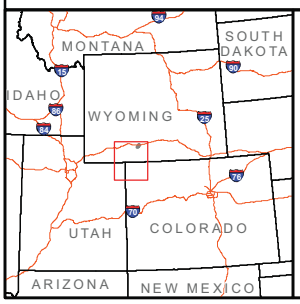

Legend

- City or Town
- Limited Access
- Highway
- Major Road
- Project Boundary
- State Boundary
- County Boundary

Land Owner

- Bureau of Land Management
- Bureau of Reclamation
- Fish & Wildlife
- Forest Service
- National Park Service
- Private
- State

Figure 4-1

Distance of Project Area to Dinosaur National Park

0 5 10 15 Miles

1:800,000

N

Climate Change

Climate change analyses are comprised of many factors, including GHGs, land use management practices, the albedo effect, etc. The tools necessary to quantify climatic impacts from this small-scale Project are presently unavailable. Therefore, climate change analysis for the purpose of this document is limited to accounting and disclosing factors that contribute to climate change.

The GHG Protocol categorizes direct and indirect emissions into three broad scopes:

- Scope 1: All direct GHG emissions.
- Scope 2: Indirect GHG emissions from consumption of purchased electricity, heat or steam.
- Scope 3: Other indirect emissions.

Both direct (Scope 1) and indirect (Scope 2) emissions were estimated for the Proposed Action. Source emissions for the Proposed Action are listed in **Table 4-12**.

Direct emissions of GHGs result from a variety of activities associated with the oil and gas industry including the combustion of fossil fuels and fugitive releases of methane. Indirect emissions of GHG from electricity consumption also are associated with the oil and gas industry.

Emission Scope	CO_2	CH_4	N_2O	CO_2e
	(tpy)	(tpy)	(tpy)	(tpy)
Scope 1	63,023	1,685	0.3	94,283
Scope 2	748	0	0	752
Total	63,771	1,685	0	95,036

In Wyoming, the total GHG emissions from all sources was approximately 56 million metric tons of CO_2e (Center of Climate Strategies [CCS] 2007) in 2005. In comparison, the total direct emissions of GHG from the Proposed Action are approximately 94 thousand tons or less than 0.2 percent of the Wyoming budget. Impact assessment of specific Project-related activities cannot be determined.

4.1.10 Land Use and Special Designations

4.1.10.1 Alternative I – No Action Alternative

Under the No Action Alternative, oil and gas development activities would continue within the project area at the current rate, resulting in minor changes to lands and realty beyond the currently authorized activities. Short-term and long-term impacts of approximately 75 acres and 25 acres, respectively, would occur due to construction of oil and gas well pads and ancillary facilities over 14 years. There would be slight changes to land uses, as lands currently used for grazing and recreational opportunities, are developed for fluid mineral extraction.

4.1.10.2 Alternative II – Proposed Action

The proposed Project and alternatives would affect lands managed by the BLM and other private landowners. Although State of Wyoming lands are within the project area, no wells, associated facilities, new roads or pipelines are proposed on state land. As portrayed in **Table 4-13**, under the multi-well scenario, approximately 270 acres of land would be disturbed initially (94 acres on federal and 176 acres on private), the majority of which would be from well pads. Only 6 percent of the initial disturbance would be attributed to roads. Long-term disturbance would drop to approximately 99 acres over the life of the Project (34 acres on federal and 65 acres on private), of which the majority would be associated with well pads.

Under the single well scenario, initial disturbance would increase to 291 acres, while long-term disturbance would decrease to 85 acres, relative to the multi-well scenario. Under each scenario, most of the development, approximately 64 percent, would take place on private land. Up to 7 miles of roads and

pipelines would be constructed. Additionally, 2 miles of new power lines would be constructed within existing or newly established road ROWs. Once oil and gas production operations are completed, reclamation and revegetation would return the land to its pre-disturbance uses.

As a result of the Proposed Action, land ownership would not change and no areas of special designation would be affected. Current land uses would continue with additional emphasis on oil and gas development in existing leases, which would further reduce livestock grazing, wildlife habitat, and recreation opportunities. The Project related land uses would be compatible with the RMPs and other policies, plans, and regulations for the project area. Therefore, land use impacts would be considered minor under the Proposed Action.

Table 4-12 Initial and Long-term Surface Disturbance by Landowner

Landowner/ Manager	Facility	Multi-Well Scenario		Single Well Scenario	
		Initial	Long-term	Initial	Long-term
BLM	Wells	88	30	98	24
	Roads	6	4	6	4
BLM Total		94	34	104	28
Private	Wells	166	59	177	51
	Roads	10	6	10	6
Private Total		176	65	187	57
Total		**270**	**99**	**291**	**85**

4.1.11 Transportation

4.1.11.1 Alternative I – No Action Alternative

Under the No Action Alternative, oil and gas development activities would continue within the project area at the current rate, resulting in minor changes to the road network beyond the currently authorized ROWs. Approximately 7 miles of new roads to facilitate the Proposed Action would not be constructed, nor would an elevated level of vehicle trips occur. There would be slight changes to the road network and vehicle traffic as leases are developed for fluid mineral extraction.

4.1.11.2 Alternative II – Proposed Action

New roads would be constructed as needed to provide access to the proposed new wells. Each proposed new producing well would require an average of 0.13 mile of new road construction. In addition to the approximately 71 miles of roads already in place to service existing oil and gas facilities, up to 7 miles of new roads would be necessary to access the new wells under the Proposed Action.

Transportation resources would be slightly affected by the additional vehicle trips required for construction, drilling, and maintenance activities. These would be greatest during the construction, drilling, and completion phases of the Project, spread over the 14-year period of development. The projected maximum daily increase in trips per day for the Proposed Action Alternative is expected to occur in 2014. The daily increase in trips per day would be 0.6 heavy duty vehicle trips and 15 light duty vehicle trips for all 15 wells being drilled during drilling and completion. This would result in an additional traffic volume of 16 total round trips a day during peak well completion. Annual additional daily heavy duty vehicle trips and light duty vehicle trips during drilling and completion would be 202 and 5,391 trips, respectively. Traffic volume for construction is expected to increase by 0.8 daily heavy duty vehicle trips and 1 daily light duty vehicle trips for peak Project traffic in 2014. This would result in peak annual heavy duty and light duty vehicle trips of 278 and 436 trips, respectively. Chevron's baseline 2008 mileage data was converted into estimated round trips and compared against the Proposed Action Alternative peak traffic estimates, the results were a 2 percent increase in combined heavy and light duty vehicle round trips from the baseline 2008 data. Table Rock Road (CR 55) would

experience the largest increase in Project traffic. No interruption of traffic would occur on I-80 during. Any slight change to interstate traffic would be the result of construction vehicles merging on and off the interstate.

While the greatest impact to transportation would be increased traffic in and near the project area and the use of new and existing roads during construction, the current traffic to, from, and within the project area is relatively light, so increased traffic levels would be within the capacity of the access roads.

4.1.12 Recreation

4.1.12.1 Alternative I – No Action Alternative

Under the No Action Alternative, oil and gas development activities would continue within the project area at the current rate, resulting in minor changes to recreation opportunities into the future. Authorized activities would result in a negligible effect to recreation resources, due to the long-term nature of disturbance and relatively slow rate of development in the project area.

4.1.12.2 Alternative II – Proposed Action

Surface disturbance generated by construction would potentially have minor impacts on recreation activities such as hiking and hunting for big game. Construction activities and drilling operations would generate increased noise and traffic primarily during the day, which may temporarily diminish hiking, hunting, and other recreational activities. The presence of new aboveground facilities would potentially slightly diminish the hunting and wildlife viewing experience by displacing habitat as well as increasing noise and human presence. Pleasure drivers utilizing the Ft. LaClede Loop Back-Country Byway also would experience a reduced recreational experience resulting from changes in the visual landscape due to the new aboveground facilities.

These impacts would likely be minor due to users being accustomed to existing mineral development and operations within the project area. Following completion of construction and drilling operations, noise, and traffic would return to near pre-construction levels. Additionally, impacts to recreation uses would be considered minor because the Project would not affect developed recreational facilities or sites, measures would be implemented to minimize the visual effects of the Project, the checkerboard ownership pattern and controlled nature of the property reduces accessibility for public recreation, and the other more appealing areas are located in the general vicinity. Project disturbance is expected to be within the ROS designation of Roaded Natural.

4.1.13 Visual Resources

4.1.13.1 Alternative I – No Action Alternative

Under the No Action Alternative, oil and gas development activities would continue within the project area at the current rate, resulting in minor changes to visual resources beyond the currently authorized activities. Authorized activities would result in continued short-term visual impacts due to construction, drilling, and completion activities of previously approved wells, and long-term visual impacts resulting from well pads and associated ancillary facilities.

4.1.13.2 Alternative II – Proposed Action

The Proposed Action would modify public lands managed for VRM Class III and Class IV objectives. The majority of the project area, approximately 85 percent, is managed as VRM Class IV. Short-term visual impacts due to construction, drilling, and completion activities would occur from new well pads and facilities on federal and private lands. The existing landscape of these lands would be slightly to moderately modified by additional lines, colors, forms, and textures from proposed new Project structures, such as new well pads, facilities, roads, and pipelines. The new Project facilities would be visible from public roads including I-80, Table Rock Road (CR 55), and the Ft. LaClede Loop Back-Country Byway.

The predominant characteristic landscape is that of oil and gas development and transportation. The proposed Table Rock Unit facilities and activities would blend with the natural topographic diversity and existing industrial development that occur in the area and would not dominate the view of the casual

observer. Therefore, the Proposed Action would not attract the attention of the casual observer and would continue the basic elements of form, line, color, and texture of landform, vegetation, structures and sky that currently exist in the project area landscape.

4.1.14 Livestock Grazing

Direct impacts to rangeland resources within the project area would primarily be in the form of soil and vegetation disturbance and displacement due to the construction of well pads and associated roads. Indirect impacts could include fugitive dust emissions from construction and road use, spread of noxious weeds, vehicle collision with livestock, and damage to rangeland improvements. To comply with RMP requirements of the region, Chevron will identify and correct problems with improved roads, which affect water flowss and soil erosion. In addition reclamation practices will be implemented to minimize bare ground and exposed to wind and water erosion as a result of oil and gas drilling activities.

4.1.14.1 Alternative I – No Action

Under the No Action Alternative, Chevron would continue to develop their existing mineral leases and impacts to livestock grazing would be based on current rates of fluid mineral development, well abandonment, operations, and maintenance activities. Impacts to forage for livestock would be similar to that described for Vegetation in Section 4.1.5. Because the new well locations would be permitted on a case-by-case basis, it is unknown which grazing allotments would be affected.

4.1.14.2 Alternative II – Proposed Action

Surface disturbance within the project area would vary depending on whether the multi-well scenario or single well scenario is implemented. Initial and long-term disturbances for the two different options by allotment are shown in **Table 4-14**. The G.L. Allotment would not be affected by surface disturbance related to the placement of well pads or associated roads. Both the Tipton and Rock Springs allotments would lose less than 0.5 percent of the total acreage as a result of initial or long-term disturbance under either scenario. The maximum AUM loss within the project area also would be less than 0.5 percent for both allotments combined. Total AUM losses and the percentage of decrease within the project area are shown on **Table 4-15**. Approximately 7 miles of new roads would be created to access new wells by the Project's end. Two miles of new power lines would be constructed within existing ROWs and would not need to be graded. Seven miles of pipelines would be co-located with roads and are included in the initial disturbance in **Table 4-14**. All disturbed areas would be reclaimed according BLM standards.

Table 4-13 Projected Surface Disturbance by Grazing Allotment

Field Office	Allotment Name	Acres within Project Area	Initial Disturbance	Long-term Disturbance
Multi-well Scenario[1]				
Rawlins	Tipton	7,099	138	54
Rock Springs	Rock Springs	5,898	132	45
	Total		**270**	**99**
Single Well Scenario[1]				
Rawlins	Tipton	7,099	154	43
Rock Springs	Rock Springs	5,898	137	42
	Total		**291**	**85**

[1] Acreage for new roads associated with the well pads is included in the surface disturbance numbers.

Table 4-14 AUM Reductions by Allotment

Allotment Name	AUMs Total (within Project Area)	Multi-well Scenario AUM Loss		Single Well Scenario AUM Loss	
		Initial Disturbance	Long-term Disturbance	Initial Disturbance	Long-term Disturbance
Tipton	9,094 (1,109)	22 2% within the PA	8 <1% within the PA	24 2% within the PA	7 <1% within the PA
Rock Springs	180,234 (515)	13 1% within the PA	5 <1% within the PA	13 1% within the PA	4 <1% within the PA
Total	**189,328(1,677[1])**	**35 3% within the PA**	**13 1% within the PA**	**37 3% within the PA**	**11 1% within the PA**

[1] Includes AUMs for G.L. Allotment not affected by Proposed Action.

Construction activities and unpaved road use and construction may result in the accumulation of dust on vegetation. Broad horizontal leaves would be more susceptible to deposition than narrow vertical leaves or blades. This could result in reduced palatability and a reduction of photosynthetic capabilities in affected vegetation. The degree to which dust deposition may reduce forage palatability would depend on several factors such as the frequency and effectiveness of dust control measures, frequency and timing of precipitation events to wash dust from the affected vegetation, wind conditions, type and general condition of the affected plants, and availability of palatable forage elsewhere within the allotments. In addition to the effects to vegetation, dust deposition also can have negative physical effects in livestock, particularly in young animals. Increased wear on teeth and bronchial pneumonia in livestock have been associated with increased dust deposition (Newberry 2010). Airborne dust is a respiratory irritant and can lead to pneumonia. In cattle this is commonly known as bovine respiratory disease. The result of this can range from medical costs incurred by the operator to fatal illnesses. Calves are the most susceptible and operators that are running cow/calf operations may find that they need to alter their grazing systems in order to avoid using pastures that are experiencing high volumes of construction or operational activities on unpaved roads. These physical effects also could extend to wildlife as well. The overall effect would be directly related to the extent of vehicle traffic on natural surface roads and the length of time between surface disturbance and successful stabilization of soils through revegetation or gravel surfacing. Some unpaved roads may not be targeted for dust abatement but could still experience increased use.

Any surface disturbing activities have the potential to spread noxious or invasive weeds if they are present. Known populations include Russian knapweed, musk thistle, Canada thistle, whitetop, halogeton, and black henbane. All of these species would compete with desirable forms of livestock forage vegetation. The spread of noxious weeds would be minimized through implementation of weed management plans in compliance with established BLM policy.

Road construction and increased vehicle traffic during well development could result in more livestock-vehicle collisions. Cow/calf pairs would be the highest at risk. The remote monitoring of producing wells would minimize vehicular traffic and compliance with speed limits would reduce risk to livestock.

The increase in roads in the project area may result in damage to fencing and gates from increased public access. Enhanced access into previously remote areas could result in intentional or unintentional trespass.

4.1.15 Cultural Resources

4.1.15.1 Alternative I – No Action Alternative

Under the No Action Alternative, oil and gas development would continue at the present rate in the Table Rock Unit. Management of fluid mineral development would continue to be governed by current BLM

policy and procedures with APDs approved on a case-by-case basis. Projected surface disturbance that may affect cultural resources would be less than under the Proposed Action, with an initial surface disturbance of approximately 75 acres. Compliance with state and federal laws, policies, and regulations would avoid or mitigate adverse impacts to eligible cultural resources.

4.1.15.2 Alternative II – Proposed Action

Development of the proposed Project could affect NRHP-eligible cultural resources if they are present in areas of surface disturbance for well pads, roads, pipelines, and other ancillary facilities. Potential direct impacts to NRHP-eligible cultural resources include, but are not limited to physical destruction or damage to all or part of the site, alteration of a site, and removal of the site from its original location. Indirect effects may include a change of the character of the site's use or setting that contribute to its historic significance and the introduction of visual or audible changes that diminish the integrity of the site's features.

Increases in surface-disturbing activities and number of workers during construction may increase the potential for adverse impacts at archaeological sites. Human activities and increased public access could result in harmful effects to these fragile resources due to illegal collecting and inadvertent destruction. In compliance with federal laws such as the NHPA, Governing Regulations, and 36 CFR 800, Wyoming State Protocol (BLM/State Historic Preservation Office [SHPO] 2006), and other BLM policies and guidelines for cultural resource protection. Cultural resource inventories would be completed for areas that have not had previous cultural inventory, and all existing inventory reports must be reviewed to ensure compliance with current state and federal regulations. Avoidance or mitigation of potential adverse effects is required for NRHP listed sites and sites identified as eligible for nomination to the NRHP. The cultural resource inventory and determination of site-specific cultural resource protection measures would be performed during the APD process when the locations of new proposed facilities are known. For contributing segments of eligible properties where setting is a component of eligibility, inventories and Visual Contrast Rating worksheets will be completed in order to avoid cumulative damage to the setting of those properties.

Segments of the 1917 and 1930 variants of the Lincoln Highway and the 1868 UPRR alignment are within the APE. If needed, visual contrast ratings and viewshed analyses will be conducted for these properties on a project specific basis to ensure that the visual setting of the contributing segments of these properties are not being adversely affected.

Native American consultation would be initiated with those tribes that have been recognized as having a potential past or present affiliation with features, sites, or landscapes within the project area. Sites deemed sensitive, or of traditional cultural importance, to tribes identified as having interest in the area would trigger Native American consultation and receive the appropriate level of protection or recovery by implementing mitigation measures, treatment plans, or compliance actions. At any time, if human remains, or artifacts likely to be associated with a human burial are discovered, construction must stop immediately, and the AO or BLM archaeologist must be immediately notified of the discovery, and the person who made the discovery must provide written confirmation to the responsible federal official, according to the provisions of the Native American Graves Protection and Repatriation Act.

4.1.16 Socioeconomics and Environmental Justice

4.1.16.1 Alternative I – No Action Alternative

Under the No Action Alternative, increases in Project fueled sales, lodging, property, and severance tax revenue, as well as local gains in employment and service industries, would continue at the current rate of oil and gas development, which is slower than the rate anticipated under the Proposed Action. Local, state, and federal governments would still receive revenue from existing and projected future oil and gas production within the project area.

4.1.16.2 Alternative II – Proposed Action

To determine whether the existing local infrastructure and services are adequate, impacts to socioeconomic resources were analyzed to determine whether:

- The total population of the county would increase by 10 percent or more;
- The Project-related demand would cause the vacancy rate for temporary housing to fall to less than 5 percent; or
- The estimated demand for public services would exceed the existing capacities of available public services.

Population and Communities

Construction of the proposed Project would require approximately 15 to 20 workers per well all hired from the local workforce. The total number of workers on site at any given time would be less than this amount. An average of 6 wells to be drilled annually (includes both production and injector wells) for 14 years, would result in a population workforce of approximately 90 to 120 workers per year. Given that the populations of Sweetwater and Carbon counties are approximately 41,000 and 15,000, respectively, the local communities would be able to supply the estimated number of workers or accommodate new employees moving to the area.

Temporary Housing

The influx of non-local workers would generate increased short-term demand for temporary housing in the Rock Springs and Rawlins area. It is anticipated that non-local workers would primarily use trailers for temporary housing and would seek spaces in RV parks or campgrounds in the local area. A small percentage would seek hotel/motel room or rental accommodations. Availability of temporary housing at some locations may be limited because of tourist activity during the summer months, and competition for temporary accommodations could displace some tourists. This displacement is anticipated to be minimal.

Community Services and Facilities

The influx of workers to area communities would incrementally increase demand for local services such as law enforcement, fire protection, medical services, and school services. However, because of the limited amount of population increase, it is anticipated that increased demand could be adequately absorbed and accommodated by existing services and no new local expenditures for labor or capital would be required.

Tax Revenues and Public Finance

Construction of the Project would increase sales tax revenues for state and county governments for the duration of the construction period. Sales tax revenues would result from the spending of workers' wages and Chevron's purchases of goods and services in the local and regional economy. For the purposes of estimating tax revenues from employee wages, approximately 20 percent of the total wages (up to an average of 105 annual workers multiplied by the combined Sweetwater and Carbon county average annual wage for construction and extraction occupations [$38,710] for 14 years) are projected to be spent locally. The average combined sales tax of Sweetwater and Carbon counties of 1.5 percent on $11,380,740 would result in revenues between Sweetwater and Carbon counties of over $170,711 over the course of 14 years.

In addition, the Project would provide increased Sweetwater County property tax revenues in the form of ad valorem taxes, severance taxes, federal royalties, and other taxes on facilities and production. Industrial properties assessed by the State are taxed at 12 mills on 11.5 percent of their assessed value. Property taxes are a primary source of county and school district revenue, and the contributions from the proposed Project would benefit local government operations. Property tax payments would decrease over time as the infrastructure depreciates. For every $1 million worth of pipeline and facilities would result in approximately $1,380 in taxes in the first year, depreciating over time. Based on a total value of new wells and facilities of approximately $2.25 million per producing well and an average of 4 producing wells drilled per year, the tax revenues would be approximately $12,420 in the first year and gradually depreciating over time for each well. If the total Project is approved and water flood is successful, the total well value projected cost for 53 producing wells is $119 million and the tax revenue would be $164,220 for the first year, depreciated thereafter.

The ad valorem tax rate for Sweetwater County is approximately 6.2 percent, and is applied to the previous year's production. For every $1 million in revenue, approximately $62,000 in revenue would be generated for Sweetwater County. If the average production over 20 years was $5 million annually, approximately $6.2 million in revenue would be generated. Severance taxes on natural gas production are 6 percent. For every $1 million worth of production would generate $60,000 in severance tax revenue. If the average production over 20 years were $5 million annually, approximately $6 million in revenue would be generated.

Abandonment of the wells and facilities would decrease the tax base of Sweetwater County to pre-project conditions for each plugged and abandoned well. At the time of BLM-approved abandonment, tax receipts would be reduced from the wells and associated facility's in-service date to depreciation. Total decreases in tax receipts cannot be quantified at this time.

In summary, impacts from the proposed Project on socioeconomic resources would be considered minor for the following reasons: 1) the influx of non-local Project-related employees would result in a temporary population increase in surrounding communities of less than 1 percent; and 2) the demand for public services would not exceed existing capacities of affected public services. A beneficial impact of increased tax revenues would result from the operation of the proposed Project, compared to the lower development and production quantities under the No Action Alternative. Tax revenues would return to pre-project levels at the time of abandonment.

Environmental Justice

As required by EO 12898 "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," the proposed Project was evaluated for any disproportionately high and adverse human health or environmental effects on minority communities and low-income communities within the context of NEPA. Sweetwater County does not contain a minority population that is meaningfully greater than the state average. Carbon County has a Hispanic minority population meaningfully greater (1.5 times as a percentage) than the Hispanic minority population of the state. Ultimately, however, the Project would generate income within the Carbon County if it supplies workers and services, potentially benefiting minority communities. Moreover, because the proposed Project is not located in large communities or urban areas, there is no evidence that the Project would have a disproportionately high adverse human health or environmental effect on minority and low-income populations. No low-income communities are located within the project area or would be adversely affected by the Project.

4.2 Cumulative Effects

In its Regulations for Implementing NEPA (40 CFR Parts 1500-1508), the Council on Environmental Quality (CEQ) defines a cumulative impact as follows in Section 1508.7:

> *"Cumulative impact" is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.*

The relevant past and current actions within the project area contributed to the current conditions described as the affected environment in Chapter 3.0. The impacts of the proposed Project and the reasonably foreseeable future actions (RFFAs), along with the effects of the past and current activities that affect the same resources, would combine to have a cumulative impact on the environment in the region.

The geographic scope of cumulative effects analysis varies depending on the resource evaluated. For example, cumulative effects on surface water would be evaluated by watershed, while the cumulative effects study area (CESA) for air quality would extend to the nearest sensitive areas. The temporal scope of cumulative effects analysis is the life Project development, or 14 years.

The activities and proposed projects listed in **Table 4-15** are reasonably foreseeable in the vicinity of the project area. The activities and projects listed in **Table 4-16** are ongoing efforts that were begun within

the last 10 years in or near the project area. The two tables includes actions that are likely to affect the same resources that are analyzed for direct and indirect effects.

Table 4-15 Reasonably Foreseeable Future Actions in or near Project Area

Project	Brief Description	Approximate Location
1. CD-C Natural Gas Development Project	• Proposal to drill, develop up to 8,950 wells • Approximately 1.1 million acres, much of the project area in a "checkerboard" surface ownership pattern • 15-year construction period; 30- to 40-year project life	• Sweetwater and Carbon counties, Wyoming. • Eastern boundary of the project area approximately 25 miles west of Rawlins, Wyoming; western boundary extends into the Project area.
2. Monell Enhanced Oil Recovery (EOR) Project	• Up to 126 wells drilled and developed over 20- to 25-year project life; development ongoing since 2006 • 10,120 acre project area • EOR using CO_2 flooding • Additional 79 wells completed by 2004; 146 conventional wells developed prior to 2004	• Patrick Draw Field Monell Unit. • Eastern boundary is approximately 3 miles west of Project area in Sweetwater County, in T18–19N, R98–99W.
3. Gateway South Transmission Project	• 500 kilovolts transmission line, approximately 400 miles in length • From Medicine Bow, Wyoming to Mona, Utah • 140-foot to 190-foot structures • Approximately 4 to 5 structures per mile • 250-foot-wide ROW	• Alternative routes located north-south near U.S. 30 east of Project area and east-west south of I-80 through Project area.
4. TransWest Express Transmission Project	• Extra-high voltage direct current transmission system in 250-foot-wide, approximately 725-mile-long ROW • Extends between south-central Wyoming and southern Nevada • Deliver approximately 3,000 megawatts of electric power from renewable energy resources	• Alternative routes in and near the Project area parallel the routes for Gateway South.
5. Sweeney Ranch Wind Park	• Proposed wind development project • 9,700-acre project area • Up to 119 wind turbine generators and associated infrastructure	• Approximately 15 miles southeast of Rock Springs, Wyoming. • Approximately 18 miles west of Project area.

Table 4-16 Past Projects in or near Project Area

Project	Brief Description	Approximate Location
1. Monell CO_2 pipeline	• Pipeline to transport CO_2 gas from Shute Creek Distribution Pipeline System to the Monell Unit Oil Field • Final EA February, 2003	• Sweetwater County, Wyoming. • Ends approximately 6 miles west of the project area.
2. Pioneer Pipe Line Expansion Project	• Decision Record published January 2000 • New 12-inch pipeline for transport of petroleum products parallel to existing 8-inch pipeline • 262 miles long (230 miles in Wyoming) • 50-foot permanent ROW	• Sinclair, Wyoming, to Croydon, Utah. • In Wyoming, passes through Carbon, Sweetwater, and Uinta counties just north of I-80 in the northernmost part of the project area.
3. Continental Divide/Wamsutter II Natural Gas Project	• ROD published May, 2000 • Up to 2,130 wells at 2,130 well locations and associated infrastructure • Approximately 550 miles of new or upgraded access road and pipelines • 36 water wells • 1,061,200 acre project area	• Eastern Sweetwater and southwestern Carbon counties, Wyoming. • T15 N–T 23N, R91 W–R99W, on 3 sides (North, east, south) of the project area.
4. Plugged and Abandoned (P&A) Wells	• Since 2000, there have been 56 P&A wells in the project area • Average of 4 P&A wells per year • Assume reclamation takes 4 years to be successful • Within project area, if 16 wells are successfully reclaimed during the 14-year development period, 40 acres would be reclaimed and subtracted from overall surface disturbance from new development	• project area.

4.2.1 Geology, Geologic Hazards, and Minerals

The CESA for geology, geologic hazards, and mineral resources covers an area roughly bounded by T17N to T21N and R95W to R100W. The rationale for the area is that it encompasses adjacent and existing nearby oil and gas developments and includes the RFFAs listed in **Table 4-15**.

There would be no cumulative impacts to unique geologic features or from geologic hazards under either alternative. The Proposed Action would add another 88 wells in addition to the 186 wells that have been drilled in the project area and based on the abandonment rate over the analysis period, would result in a net gain in active wells in the field during the analysis period. The wells to be drilled under the Proposed Action represents a very small increase compared to the thousands of wells that would be drilled in the CD-C Natural Gas Development Project and the 126 wells that are expected to be developed in Monell EOR Unit (part of the Greater Patrick Draw field). Therefore, the oil and gas development under the

Proposed Action would contribute a small incremental increase in oil and gas development and a minor cumulative effect on the extraction of oil and gas resources in the region.

4.2.2 Paleontological Resources

Cumulative impacts to paleontological resources would result from surface disturbance related to industrial developments (e.g., oil and gas, electrical transmission lines, and wind energy), unauthorized collection, and natural erosion processes in the analysis area. With the implementation of the required environmental protection measures in compliance with state and federal regulations and policies, the proposed Project, when added to past, present, and RFFAs would not be expected to greatly contribute to cumulative impacts to paleontological resources in the CESA.

4.2.3 Soils

The CESA for soils is the project area boundary**.** Past, present, and reasonably foreseeable would contribute incremental changes to soil resources in the analysis area primarily due to surface disturbance related to grazing, recreation, oil and gas development, pipelines, roads, and other natural and human activities. The Pioneer Pipe Line Expansion Project disturbed soils along the ROW north of I-80. Depending on the routes selected for implementation, the TransWest Express and Gateway South proposed transmission lines may increase soil disturbance and alter natural soils near I-80. The construction associated with past development of oil and gas wells and associated infrastructure in the project area contributed to cumulative impacts including removal of vegetation, exposure of the soil, mixing of soil horizons, soil compaction, and loss of topsoil productivity. These impacts could increase runoff and lead to increased susceptibility of the soil to erosion and sedimentation. The proposed new development of all RFFAs combined may increase the surface disturbance in the CESA by about 30 percent, compared to existing disturbance. Some of the previously developed wells would be plugged, abandoned, and reclaimed, reducing the acreage of unproductive soils. However, it may take many years for the reclaimed sites to have naturally productive soils. The proposed Project would incrementally add to the surface disturbance in the CESA, but the total area disturbed would be less than 10 percent (approximately 1,300 acres) of the total area. Compliance with BLM reclamation requirements would minimize adverse impacts to soils from oil and gas development.

Where public and private lands are grazed, soils may experience an increase in compaction and a decrease in vegetative cover, especially in areas where cattle concentrate (e.g., water sources, salt licks). This may result in accelerated runoff and erosion and a reduction in soil quality, especially on sensitive soils or steep slopes.

With implementation of BLM requirements and applicant committed measures, the proposed Project, when added to past, present, and RFFAs is not expected to result in adverse cumulative impacts to soil resources.

4.2.4 Water Resources

The CESA for water resources is the project area. Water resources could be impacted for the cumulative ground disturbance from this and other current or proposed projects. Related projects within the CESA include the Pioneer Pipe Line Expansion Project, CD-C Project, Gateway South Transmission Project, and TransWest Express Transmission Project, each of which might add to surface disturbance. However, the CESA has an existing road network in place; therefore additional development would rely on this network, minimizing ground disturbance. Further expansion of this network to accommodate additional resource development may have adverse impacts, including temporary increases in storm water runoff and increases in suspended and dissolved solids concentrations in the runoff during construction and reclamation when ground disturbance is occurring. Each new project will be required to obtain a construction storm water discharge permit, and to prepare and adhere to an approved SWPPP. Once reclamation of disturbed ground is complete, the effects to water resources are expected to be minimal.

4.2.5 Vegetation and Noxious Weeds

The CESA for vegetation resources and noxious weeds encompasses the entirety of the project area. The cumulative analysis for vegetation resources and noxious weeds focuses on five past, present, and

RFFAs that are likely to affect vegetation primarily due to surface disturbance and vehicle traffic, including the CD-C Natural Gas Development Project, Gateway South Transmission Project, TransWest Express Transmission Project, Pioneer Pipeline Expansion Project, and the Table Rock P&A wells as presented in **Tables 4-15** and **4-16**.

Surface disturbance under the Proposed Action, combined with the RFFAs would contribute small, incremental changes to vegetation cover within the CESA that would be scattered throughout the project area at any particular time. New roads added to service wells, transmission lines, and pipelines potentially would contribute to the establishment of noxious weeds and invasive species. It is assumed that portions of past disturbances have been reclaimed, and ongoing reclamation of P&A wells and associated roads would add vegetation cover over time. Overall, vegetation recovery is anticipated to be long-term over the majority of CESA due to reclamation constraints (e.g., soil alkalinity or salinity) and low regional annual precipitation rates; however, vegetation would become reestablished and increase in abundance as a result of interim and final reclamation and natural recolonization. Based on the proposed reclamation and revegetation activities within the CESA implemented in compliance with federal and state regulations and policies, including the development and implementation of site-specific reclamation plans and noxious weed management plans, extensive cumulative effects to vegetation resources are not anticipated.

4.2.6 Wetland and Riparian Resources

The CESA for wetland and riparian resources encompasses the entirety of the project area. The cumulative analysis for wetland and riparian resources focuses on five past, present, and RFFAs including the CD-C Natural Gas Development Project, Gateway South Transmission Project, TransWest Express Transmission Project, Pioneer Pipeline Expansion Project, and the Table Rock P&A wells as presented in **Tables 4-15** and **4-16**.

The extent of impacts to wetlands and riparian areas from past and present projects within the CESA is unknown. Because the number and acreage of wetlands and riparian areas within the CESA is very low and scattered, it is likely that projects have avoided direct alterations to these sensitive areas. RFFAs most likely would be sited to avoid the few wetland and riparian areas within the CESA, as would the wells, roads, and other facilities in the Proposed Action. In compliance with federal and state regulations and permits related to alteration of wetlands and policies requiring minimal changes to riparian areas, cumulative effects to wetland and riparian resources are anticipated to be negligible.

4.2.7 Wildlife and Aquatic Resources

The CESA for wildlife and aquatic resources encompasses WGFD's pronghorn herd units 414 and 615. These herd units cover an area of approximately 4,003,281 acres in southwest Wyoming and were chosen for the wildlife and aquatics CESA based on the geographic coverage of the surrounding area and vegetation types present (e.g., sagebrush shrubland and grassland).

As with all other resources, the cumulative analysis for wildlife and aquatic resources focuses on past, present, and RFFAs presented in **Tables 4-15** and **4-16** and the proposed Project assuming that: 1) human use of the CESA would increase with the implementation of the proposed Project, 2) wildlife habitats currently are at their respective carrying capacities in and adjacent to the project area, and 3) the overall region has been previously affected by at least some level of historic and current development activities and will be affected by reasonably foreseeable actions.

Cumulative impacts to wildlife resources would be directly related to habitat loss, habitat fragmentation, animal displacement, and direct mortalities. Long-term surface disturbance incrementally adds to wildlife habitat losses, overall habitat fragmentation, and animal displacement. In areas where development has occurred, habitat fragmentation may have resulted in the disruption of seasonal patterns or migration routes. Historic, current, and future developments in the CESA 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. Surface disturbance in the CESA primarily results from oil and gas development, including pipelines and seismic exploration, and transmission lines and wind energy development. However, other activities such as livestock grazing, development of recreational facilities, and growth of Wyoming communities also contribute to cumulative impacts on wildlife and their habitats.

Big game, especially pronghorn, would be most susceptible to these impacts since encroaching human activities associated with development activities have resulted, or would result, in habitat loss and fragmentation and animal displacement. These impacts may be more pronounced in areas designated as crucial habitat (e.g., crucial winter habitat, parturition areas), which may lead to declines in local big game populations. Other wildlife species, such as raptor species, also would be susceptible to these cumulative impacts since encroaching human activities in the CESA resulted, or would result, in habitat loss and fragmentation and animal displacement in areas that may 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 CESA 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. A portion of the cumulative disturbance surface area has been, or would be, reclaimed or has recovered. The reclaimed areas and areas associated with habitat conversion would be capable of supporting wildlife use; however, species composition and densities likely would change.

4.2.8 Special Status Species

Special status animal species would be cumulatively impacted by past, present, and RFFAs and the resulting direct impacts would generally be the same as discussed in Section 4.2.7, Cumulative Impacts for Wildlife and Aquatic Resources; however, on BLM-managed lands (and private lands in many cases), surveys typically are required in potential or known habitats of threatened, endangered, or otherwise special status animal species. These surveys would help determine the presence of any special status animal species or extent of habitat, and protective measures generally would be taken to avoid or minimize direct disturbance in these important areas.

The CESA for special status plant species encompasses the entirety of the project area. The cumulative analysis for special status plant species focuses on five past, present, and RFFAs including the CD-C Natural Gas Development Project, Gateway South Transmission Project, TransWest Express Transmission Project, Pioneer Pipeline Expansion Project, and the Table Rock P&A wells as presented in Tables 4.2-1 and 4.2-2.

Special status plant species or habitat may be cumulatively impacted by past, present, and RFFAs due to surface disturbance that alters plant communities; however, on BLM-managed lands (and private lands in many cases), species-specific surveys are required in potential or known habitats for special status plant species. These surveys would help determine the presence of any special status plant species or extent of habitat, and protective measures would be taken to avoid or minimize direct disturbance to species and their associated habitats. The cumulative impact from all projects within the CESA, would therefore be minor.

4.2.9 Air Quality and Climate Change

Cumulative impacts to air quality would include impacts from the proposed Project emissions and existing Table Rock Unit operations in combination with impacts from background emission sources, which reflect emissions associated with the past and present actions, as well as proposed future actions. The CESA for criteria pollutants is the area within the 4 km modeling grid of the CD-C baseline modeling study which covers most of southwestern Wyoming.

4.2.9.1 Criteria Pollutants

Ambient air quality data for the region currently reflects impacts of existing Table Rock Unit operations in the airshed. Air quality in the region meets applicable standards and would be expected to remain in compliance under existing Table Rock unit operations. As discussed above, the Project emissions are not expected to have any clearly attributable impacts on NAAQS exceedences in the CESA. Evaluating the cumulative impacts of the Proposed Action on the CESA can best be done by comparing the scale and nature of the development to relevant existing and proposed developments and the impacts those projects are predicted to have.

The closest sources relevant to an analysis of cumulative impacts are those associated with the CD-C development. The overall scale of the Proposed Action, 88 new wells, is two orders of magnitude smaller than the proposed CD-C expansion of 8,950 new wells and less than 5 percent the areal size of the

existing CD-C development of 2,450 wells (Environ 2011). The CD-C baseline modeling study discussed previously is a cumulative analysis of the impacts from all existing sources including the Table Rock Unit existing sources. The conclusions of that study were that the CD-C development would not result in major NAAQS exceedences in the CESA. Given the small scale of the Proposed Action in relation to the existing CD-C development it is reasonable to conclude that the Proposed Action would not contribute to large adverse cumulative impacts when existing sources are considered.

The impacts of the proposed CD-C expansion are currently being assessed. The contribution of the Proposed Action to cumulative impacts would be minor compared to the impacts from the proposed CD-C expansion.

4.2.9.2 HAPs

The Proposed Action is not a major source for HAPs and is not expected to greatly increase adverse cumulative impacts from HAPs.

4.2.9.3 AQRVS

The Q/D analysis performed for the Proposed Action above indicates that the Project is exempt from a more thorough review of the impacts on AQRVS because it is not anticipated to greatly add to cumulative impacts at the nearest sensitive area.

4.2.10 Climate Change

The tools necessary to quantify climatic impacts from this small-scale project are presently unavailable. Therefore, climate change analysis for the purpose of this document is limited to accounting and disclosing factors that contribute to climate change. Both direct and indirect emissions of GHGs were estimated for the Proposed Action above, and the total of these emissions from the Proposed Action represent a small contribution, 0.2 percent, to the Wyoming GHG budget (CCS 2007).

4.2.11 Lands and Realty

The CESA for lands and realty is the project area and the immediate surrounding area. Resource development has been prominent on the landscape in and around the project area for many years, and projections indicate this trend is likely to continue. The addition of up to 88 wells over 14 years, will add incremental surface disturbance relative to the future actions of the CD-C Natural Gas Development Project (proposal to drill 8,950 wells), the Monell EOR Project (up to 126 approved wells), and the ongoing operation of 100 wells and a gas processing plant by Chevron within the Table Rock Unit. Reclaimed surface disturbance would be subtracted from the total surface disturbance as approximately four wells per year are P&A, and the disturbed acreage is reclaimed. Unnecessary service roads also may be reclaimed at that time, resulting in some scattered additional land available for other uses. Development within the CESA would result in new ROWs, which may open up access to the public where none previously existed and may affect existing and future land uses; however, because the predominant use of the CESA is mineral development, cumulative impacts to land use and realty are expected to be minimal as the current land uses would continue.

4.2.12 Transportation

The CESA for transportation is the project area and primary access roads to the area. Related projects within the CESA include the Monell EOR Project (up to 126 approved wells), existing Chevron oil and gas activities (ongoing operation of 100 wells and a gas processing plant), and the proposed Gateway South and TransWest Transmission Projects. The CESA has an existing road network in place, which may be slightly reduced following reclamation of P&A wells if they are located on service roads that are no longer needed. Further expansion of this network to accommodate additional resource development may have adverse and beneficial impacts. Adverse impacts would include an increase in traffic within the CESA and primary access roads, as well as greater maintenance needs on new and existing roads as heavy truck traffic increases. A potential benefit would include a larger maintained road network that may be utilized by recreational and other land uses. The projects in the CESA and the Proposed Action have relatively low numbers of daily trips and are not expected to have much impact on local access routes and overall transportation patterns.

4.2.13 Recreation

The CESA for recreation is the project area with a 2-mile buffer outside the boundary. Within the CESA, the Proposed Action would add up to 88 wells to the project area over 14 years, in addition to ongoing Chevron oil and gas operations. Existing and past oil and gas operations have contributed a considerable amount to surface disturbance within the CESA. Adverse cumulative impacts to recreational resources within the CESA include access closures (mostly short-term), increased noise and activity associated with resource development, and a reduction in dispersed camping opportunities. Due to previous oil and gas development, the existing road network has reduced the value of primitive recreational values in the area. Additional roads for mineral development would provide increased access to motorized recreational users. This increase in human activities from mineral development and motorized vehicles is likely to continue to have a long-term impacts on recreational users such as hunters and hikers who tend to avoid areas that have been heavily developed. While a substantial portion of the CESA would be affected by industrial activities from the proposed Project in combination with other proposed and approved activities, there would be minimal overall impact to recreational activities within the CESA.

4.2.14 Visual Resources

The CESA for visual resources is the project area, as well as the viewshed of the proposed Project. This is the area within which public users (travelers on roads, hunters, OHV users, and hikers) would see potential changes in the landscape. The visual environment within the project area and surrounding region has existing alteration from oil and gas development, roads and railroad corridors. Past, present, and foreseeable future resource development in the CESA would have both direct and indirect cumulative impacts to visual resources from emissions, ancillary facilities, and the general upsurge of human activities. As wells are P&A, unnecessary service roads also may be reclaimed at that time, resulting in scattered changes to the visual landscape. RFFAs, such as the Gateway South and TransWest Express Transmission Projects, both have alternative corridors in and near the CESA, potentially resulting in increased cumulative visual impacts from power pole structures along the already disturbed I-80 corridor. The Proposed Action would further alter the visual environment, but would correspond to BLM VRM III and IV classifications and related management objectives in the area.

4.2.15 Livestock Grazing

The CESA for livestock grazing is the project area. Previous well development activities in the project area have contributed approximately 315 acres of long-term surface disturbance to the three affected allotments (128, 182, and 5 acres in the Tipton, Rock Springs and G.L. allotments, respectively). As a whole this represents approximately 2 percent of the allotment acreage within the project area; however, individual allotment disturbance ranges from 1 percent (G.L. Allotment) to 3 percent (Rock Springs Allotment). Other past and present projects that contribute to cumulative impacts within the project area include the Pioneer Pipeline Expansion Project, the Continental Divide/Wamsutter II Natural Gas Project, and several P&A wells that are reclaimed annually (average of four per year). Reclamation of P&A wells and any unneeded service roads would eventually add forage in scattered locations where it is currently unavailable. RFFAs that may affect forage production include the CD-C Natural Gas Development Project and potential alternate routes for the Gateway South Transmission Project and the TransWest Express Transmission Project. These projects would partially overlap or pass through a portion of the project area and contribute to the surface disturbance that would reduce forage availability for livestock grazing. The CD-C Natural Gas Development Project would impact the Tipton Allotment. As a whole approximately 2.7 percent of the Tipton Allotment is impacted by surface disturbance; however much of the disturbance would be concentrated in the Table Rock pasture and could elevate the level of surface disturbance in this area from the current 7 percent to as high as 10 percent (Newberry 2010). This particular pasture has been frequently disturbed and reclamation efforts have been unsuccessful. Continued disturbance could make it unsuitable for livestock grazing.

Construction activities would create additional surface disturbance, fugitive dust emissions, and increase the potential for the spread of noxious weeds, livestock/vehicle collisions, and potential damage to rangeland improvements. Construction of the Gateway South and TransWest Express Transmission projects would occupy relatively small surface areas and construction within a given allotment would

proceed quickly (typically 2 to 4 weeks to construct through an area). The cumulative impacts on grazing allotments from the CD-C Natural Gas Development Project would depend on the extent of overlap with the project area, which is approximately 1 percent of the area proposed for the CD-C project.

4.2.16 Cultural Resources

The CESA for cultural resources includes the project area of the Table Rock Unit plus an area that extends 5 miles beyond the Project boundary. Numerous Class III cultural resources inventories have been conducted in the CESA and various prehistoric and historic sites have been identified. The majority of prehistoric sites are open camps, lithic scatters, habitations, hearths, or quarries. Historic sites include, but are not limited to, debris scatters associated with ranching or stock herding activities, roads, ditches, trails, and trash scatters related to historic habitation and utilization of the area. Disturbance that has or would occur on federal lands is subject to laws and regulations that protect cultural resources, especially those eligible for the NRHP.

Past projects permitted by BLM in the CESA have been surveyed for cultural resources prior to implementation. For RFFAs, Class III inventories would be completed for all federal undertakings, including actions on non-federal lands that operate under federal license, permit, or funding, thereby decreasing potential impacts on cultural resources. By complying with federal and state laws, regulations, and policies, the potential for incremental increases in cumulative impacts would be avoided.

Multiple oil and gas development projects, in addition to new pipelines and major transmission lines would contribute to the potential changes in the setting for cultural resources in the CESA. The major transmission lines, if implemented, would be along I-80, an already disturbed corridor. Increased public access from new roads may increase vandalism, requiring careful enforcement of state and federal laws. With implementation of BLM requirements and ACMs, the proposed Project, when added to past, present, and RFFAs is not expected to result in adverse cumulative impacts to cultural resources.

4.2.17 Socioeconomics and Environmental Justice

The CESA for socioeconomics and environmental justice is defined by the boundaries of Sweetwater and Carbon counties. The cumulative effects of past and current development in the region are evident in the existing settlement patterns, physical development and infrastructure, fiscal structures, and social setting and networks in the region. Such development and related activities, events, and people associated with it, provide the area with its rich heritage and cultural history. Absent the area's energy resources, the region likely would be much less developed and populated than it is today.

The collective cumulative activity has contributed to past growth and development, and underlies important economic and social conditions and trends in the area. Increases in oil and gas activities over a short period of time can cause noticeable increase in housing demand, employment, and income, which can lead to changes in population trends that could potentially have detrimental effects to community services, social structures, and lifestyles. For example, the additional population gained through employment in the oil and gas sector could intensify law enforcement problems, although a proven link has not been established in this area. Boom and bust cycles of oil and gas development can lead to short-term pressures on existing social and physical infrastructure when can lead to development of infrastructure that may no longer be necessary during bust cycles, and can create a drain on local revenues when the population and incomes decline during a bust cycle. Given the relatively small amount of employment and infrastructure required by this project, the Project is not expected to add to the need for new infrastructure, but would generate revenue that could improve local infrastructure.

The Project would contribute a relatively small amount to the cumulative impacts of socioeconomics in Sweetwater and Carbon counties, but its effect would be to generate more funds that would be available to improve the local physical and social infrastructure.

4.3 Mitigation Measures Considered

Mitigation measures are those actions or structures that may be taken to avoid or minimize impacts that would otherwise be significant. The impact analysis assumed compliance with applicant committed measures, as well as compliance with federal laws like the CWA and CAA, and implementation of

applicable BLM policies and guidelines, such as the requirements of the RRMP, GRRMP, and Wyoming BLM reclamation measures. Monitoring is required to ensure the implementation of these measures.

In addition to the measures previously described, a mitigation measure for wildlife species are described below. These mitigation measures are designed to minimize impacts to greater sage-grouse and raptors as a result of constructing new power line segments.

WAR-1 New power lines within 2 miles of an occupied greater sage-grouse lek will either be buried or outfitted with raptor anti-perching devices based on guidance from the BLM wildlife biologist during the APD process. If burying new power lines is not feasible, new power line segments would be designed and constructed in accordance with applicable guidelines to minimize raptor perching, nesting, electrocution, and collision potential. To minimize raptor perching and nesting, BLM-approved raptor deterring devices would be installed on horizontal cross bars. To minimize electrocution of raptor species attempting to perch on the lines, standard safe designs as outlined in Suggested Practice for Raptor Protection on Power Lines (Avian Power Line Interaction Committee [APLIC] 2006) would be incorporated, as applicable. To minimize collision potential for foraging raptors, standard safe designs as outlined in Mitigating Bird Collisions with Power Lines (APLIC 1994) would be incorporated, as applicable.

4.4 Residual Effects

Residual effects are any adverse direct, indirect, and cumulative effects that remain after all environmental protection and mitigation measures have been applied. For this project, implementation of the ACMs, required federal and state laws, regulations, and policies, and mitigation measure WAR-1 are projected to be adequate.

5.0 List of Preparers and Reviewers

The people listed in **Table 5-1** prepared the EA under the guidance of the BLM staff listed in **Table 5-2**. The people listed in **Table 5-2** provided oversight, information, and review of the EA.

Table 5-1 List of Preparers, AECOM

Resource/Responsibility	AECOM Team Member	Education and Experience
Project Manager	Ellen Dietrich	BA Anthropology; Graduate Study Soil Science 32 years experience
Assistant Project Manager	Lindsey Hart	BS Anthropology-Zoology and English 5 years experience
Geology and Minerals, Paleontology	William Berg	MS Geology 31 years experience
Water Resources	David Fetter	BS Watershed Science 9 years experience
Soils	Terra Mascareñas	BS Soil and Crop Science 13 years experience
Air Quality, Climate Change	Linsey DeBell	MS Geochemical Systems 9 years of experience
Vegetation, Special Status Plants, Wetlands/Riparian Areas	Allison Grow	BS Rangeland and Ecosystem Science and Soil and Crop Science 11 years of Experience
Wildlife and Fish, Special Status Animals	Matt Brekke	BS Wildlife and fisheries 5 years of experience
Rangelands/Livestock Grazing	Chris Dunne	BS Natural Resources Management 6 years experience
Lands and Realty, Transportation, Recreation, Socioeconomics, Environmental Justice, and Visual Resources	Steve Graber	BS Natural Resources Management; BA Economics 6 years experience
Cultural Resources	Caryn Berg	PhD Archaeology 18 years experience
Geographic Information Systems	Brent Read	BS Physical Geography 7 years experience

Table 5-2 BLM Interdisciplinary Team

Resource/Responsibility	BLM Team Member
Rock Springs Field Office	
Project Lead/Senior Natural Resource Specialist	Douglas Linn
Asst. Field Manager, Minerals and Lands	Joanna Nara-Kloepper
Petroleum Engineer	Trisha Cartmel
Geologist	Daniel Thomas
Hydrologist	Dennis Doncaster
Archeologist	Jessey Dowdy
Botanist	Jim Glennon
Riparian Specialist	John Henderson
Range Management Specialist	Cherette Mastny
Supervisory Wildlife Biologist	Jeromy Caldwell
Recreation/VRM Specialist	Jo Foster
Realty Specialist	Stephanie Anderson
GIS Specialist	Douglas Kile
Rawlins Field Office	
Natural Resource Specialist	John Sjogren
Civil Engineer	Bruce Estvold
Geologist	Mark Newman
Soil Scientist	Susan Foley
Hydrologist	Jennifer Fleuret
Archaeologist	James MacNaughton
Range Management Specialist	Cheryl Newberry
Wildlife Biologist	Mary Read
Outdoor Recreation Planner	David Hullum

Table 5-2 BLM Interdisciplinary Team

Resource/Responsibility	BLM Team Member
BLM State Office	
Air Quality, Climate Change	Melissa Hovey
Wyoming Department of Game and Fish	
Wildlife Biologist	Jerry Gregson

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