United States Department of the Interior
Bureau of Land Management

XTO Energy's
River Bend Unit Infill Development
Environmental Assessment and Biological Assessment
EA Number UT-080-07-772

Location:

Sections 33 and 34
Township 9 South, Range 18 East

Sections 3, 4, 9, 10, 13-17, 20-24
Township 10 South, Range 19 East

Sections 2, 3, 10, 11, 14-23
Township 10 South, Range 20 East

Salt Lake Base and Meridian
Uintah County, Utah

Applicant/Address:

XTO Energy
810 Houston Street
Fort Worth, Texas 76102

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U.S. Department of the Interior
Bureau of Land Management
Vernal Field Office
170 South 500 East
Vernal, Utah 84078
Phone: (435) 781-4400
Fax: (435) 781-4410

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List of Acronyms and Abbreviations

AARC	Average Annual Rate of Change
ACEPM	Applicant Committed Environmental Protection Measures
ACGIH	American Conference of Governmental Industrial Hygienists
ACOE	Army Corps of Engineers
Al	Aluminum
amsl	Above mean sea-level
AMP	Allotment Management Plan
ANC	Acid Neutralization Capacity
AO	Administrative Office
APE	Area of Potential Effect
APD	Application for Permit to Drill
AQ	Air Quality
AQRV	Air Quality Related Value
AQS	Air Quality System
ARMS	Air Resource Management Strategy
As	Arsenic
AUM	Animal Unit Month
Bext	Extinction coefficient
B	Boron
Ba	Barium
B&A	Buys and Associates, Inc.
BACT	Best Available Control Technology
BHCA	Bird Habitat Conservation Area
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BMO	British Meteorological Office
BMP	Best Management Practices
BTEX	Benzene, Toluene, Ethylbenzene, and Xylene isomers
Ca	Calcium
CaCO3	Calcium Carbonate
CAA	Clean Air Act
CDP	Census Designated Place
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
cfs	Cubic feet per second
CIAA	Cumulative Impact Analysis Area
Cl	Chlorine
CMAQ	Community Multi-scale Air Quality
COAs	Conditions of Approval
CO	Carbon Monoxide
Cu	Copper
CWCS	Comprehensive Wildlife Conservation Strategy
DAQ	Division of Air Quality
DR	Decision Record
DEA	Demographic and Economic Analysis
DEIS	Draft Environmental Impact Statement
DEQ	Department of Environmental Quality
DWSPZ	Drinking Water Source Protection Zones
EA	Environmental Assessment

EIA	Energy Information Administration
EIS	Environmental Impact Statement
ENBB	Environmental Notification Bulletin Board
EPA	Environmental Protection Agency
ESA	Endangered Species Act
F	Fluorine
famsl	feet above mean sea level
Fe	Iron
FEIS	Final Environmental Impact Statement
FLPMA	The Federal Land Policy and Management Act of 1976
FO	Field Office
FONSI	Finding of No Significant Impact
ft/s	feet per second
FRM	Federal Reference Method
GHG	Greenhouse Gas
GNB	Greater Natural Buttes
GOED	Governor's Office of Education
GOPB	Governor's Office of Planning and Budget
gpm	Grams per milliliter
GWP	Global Warming Potential
HAPs	Hazardous Air Pollutants
HNO3	Nitric Acid
hp	Horse Power
IM	Instruction Memorandum
IMPLAN	Impact Analysis for Planning
IPCC	Intergovernmental Panel on Climate Change
Kw	Erosion Potential
K	Potassium
LAC	Levels of Acceptable Change
LOP	Life of Project
MACT	Maximum Achievable Control Technology
Mg	Magnesium
MBTA	Migratory Bird Treaty Act
MCFD	Metric Cubic Feet per Day
mcf	thousand cubic feet
MCL	Maximum Contaminant Level
MLA	The Mineral Leasing Act of 1920
MMcfd	Million cubic feet per day
MMBTU	Million British Thermal Units
Mn	Manganese
MOU	Memorandum of Understanding
mph	miles per hour
mg/L	milligrams per liter
MSDS	Material Safety Data Sheet
Na	Sodium
NAAQS	National Ambient Air Quality Standards
NASA	National Aeronautics and Space Administration
NC	Not Calculated
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act of 1966
NI	Not Impacted

NO_2	Nitrogen Dioxide
NO_3	Nitrate
NO_x	Nitrogen Oxide
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NP	Not present
NRCC	Natural Resource Coordination Council
NRCS	Natural Resource Conservation Service
NRHP	National Register of Historic Places
NTL	Notice To Lessees
NSPS	New Source Performance Standards
O_3	Ozone
OEHHA	Office of Environmental Health Hazard Assessment
OHV	Off-highway Vehicle
ORI	Overriding Royalty Interest
OSHA	Occupational Safety and Health Administration
pb	Lead
PCIF	Permanent Community Impact Fund
pH	Hydrogen ion concentrations
$PM_{2.5}$	Particulate matter less than 2.5 microns
PM_{10}	Particulate matter less than 10 microns
ppb	Parts per Billion
PSD	Prevention of Significant Deterioration
RBU	River Bend Unit
RCRA	Resource Conservation and Recovery Act of 1976
RDCC	Resource Development Coordinating Committee
REL	Reference Exposure Level
RFD	Reasonably Foreseeable Development
RIPRAP	Recovery Implementation Plan and Recovery Action Plan
RMP	Resource Management Plan
ROD	Record of Decision
ROW	Right-of-Way
RTAG	Resource Technical Advisory Group
SAR	Sodium Absorption Ratio
Se	Selenium
SHPO	State Historic Preservation Office
SiO2	Silicon
SITLA	School and Institutional Trust Lands Administration
SMA	Surface Managing Agency
SMCL	Federal Drinking Water Secondary Standard
SO_2	Sulfur Dioxide
SO_4	Sulfate
SPCC	Spill Prevention, Control and Countermeasure
Sr	Strontium
SSA	Sole Source Aquifers
SUA	Surface Use Agreements
SUWA	Southern Utah Wilderness Alliance
SWReGAP	Southwest Regional Gap Analysis Project
TCPs	Traditional Cultural Properties
TDS	Total Dissolved Solids
TLVs	Threshold Limit Values

TMDL	Total Maximum Daily Load
tpy	Total per Year
TSLs	Toxic Screening Levels
TSS	Total Suspended Solids
UBAQS	Uinta Basin Air Quality Study
ug/m^3	micrograms per cubic meter
ug/L	micrograms per liter
umhos/cm	Micromhos per centimeter
UDAQ	Utah Division of Air Quality
UDEQ-DAQ	Utah Department of Environmental Quality - Division of Air Quality
UDEQ	Utah Department of Environmental Quality
UDOGM	Utah Division of Oil and Gas Mining
UDWR	Utah Division of Wildlife Resources
UDWS	Utah Department of Workforce Services
UNHP	Utah Natural Heritage Program
UNPS	Utah Native Plant Society
USC	Utah Steering Committee
USDA	United States Department of Agriculture
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
UTAG	Utah Air Resource Technical Advisory Group
UWQB	Utah Water Quality Board
XTO	XTO Energy
VFO	Vernal Field Office
VOC	Volatile Organic Compounds
WRAP	Western Regional Air Partnership
WTPD	White-tailed Prairie Dog
WTP DEIS	West Tavaputs Plateau Draft Environmental Impact Statement
Zn	Zinc
Δdv	Deciview

1.0 INTRODUCTION

This Environmental Assessment (EA) has been prepared to analyze XTO Energy's (XTO) proposed natural gas infill development on its Federal leases located within the River Bend Unit (RBU) Project Area. This EA is a site-specific analysis of potential impacts that could result with the implementation of the Proposed Action or alternatives to the Proposed Action. This EA will assist the Bureau of Land Management (BLM) in project planning and ensuring compliance with the National Environmental Policy Act (NEPA), and in making a determination as to whether any "significant" impacts could result from the analyzed actions. "Significance" is defined by NEPA and is found in regulation 40 CFR (Code of Federal Regulations) 1508.27. An EA provides evidence for determining whether to prepare an Environmental Impact Statement (EIS) or issue a statement of Finding of No Significant Impact (FONSI). A FONSI statement documents the reasons why implementation of the selected alternative would not result in "significant" environmental impacts (effects) beyond those already addressed in the *Vernal Field Office Approved Resource Management Plan (RMP) and Record of Decision (ROD)* (BLM 2008a). If the decision maker determines that this project has "significant" impacts following the analysis in the EA, then an EIS would be prepared for the project. If not, a Decision Record (DR) may be signed for the EA approving the selected alternative, whether the Proposed Action or another alternative is selected.

1.1 BACKGROUND

The RBU Project Area is located approximately 34 miles south of Vernal, Utah. The RBU Project Area consists of approximately 16,719 acres including parts of Township 9 South, Range 19 East; Township 10 South, Range 19 East; and Township 10 South, Range 20 East; Salt Lake Meridian, Uintah County, Utah. Surface ownership in the RBU Project Area consists of BLM land, administered by the Vernal Field Office (VFO) (12,002 acres); Uintah and Ouray Indian Reservation, administered by the Bureau of Indian Affairs (BIA) (4,075 acres); and State land administered by the School and Institutional Trust Lands Administration (SITLA) (642 acres) (**Figure 1.1-1**). Approval of drilling on state leases and state and tribal surface is outside the scope of BLM's authority, but is included as a related action in the alternatives to facilitate a complete impact analysis.

Oil and gas development in the RBU Project Area began in the 1950's. Since that time, a number of drilling plans and subsequent NEPA assessments have considered the construction and operation of a total of 805 wells, and their supporting infrastructure. The most recent proposal was Dominion's Natural Gas Development Project for the RBU and the West Willow Creek Unit Areas. In February 1998, BLM issued a DR/FONSI for Dominion's EA No. 1997-49 which proposed to drill up to 324 wells on 40-acre spacing, 108 miles of roads, and 137 miles of pipelines[1] (BLM 1998). In July 2007, XTO acquired Dominion's leases and is the current operator of record in the RBU Project Area. **Figure 1.1-1** displays existing development (i.e., well pads, roads, pipelines, and compressors) in the RBU Project Area.

XTO's federal leases contain contractual rights and obligations between XTO and the United States. XTO has proposed to further develop these leases and produce commercial quantities of natural gas by expanding their ongoing natural gas development efforts within the RBU. In addition, XTO has signed contractual agreements with pipeline companies that service the area requiring a certain amount of gas be delivered on a set schedule. Due to the declining production

[1] Electronic copies of this EA are available upon request at the BLM Vernal Field Office.

INSERT Figure 1.1-1

of the existing wells, XTO will not be able to meet those contractual agreements without the production from the proposed wells to offset their current production decline.

Announcement of the Proposed Action was posted on the Utah BLM Environmental Notification Bulletin Board (ENBB) on July 17, 2007. BLM resource specialists in the BLM VFO reviewed XTO's plan of development and conferred with the BIA, U.S. Fish and Wildlife Service (USFWS), Utah Division of Wildlife Resources (UDWR), and Uintah County to assess the type and magnitude of potential impacts to the elements of the human environment and other resources. A draft EA was prepared, and a 30-day public comment period was held from December 8, 2008 to January 6, 2009.

The U.S. Environmental Protection Agency (EPA) submitted a comment letter encompassing the XTO Riverbend EA, the Enduring Resources Southam Canyon EA, and the XTO Big Pack (Little Canyon) EA that raised questions regarding the adequacy of the air quality analysis. In the meantime, BLM's knowledge of the air quality in the Uinta Basin was rapidly expanding with the completion of three large photochemical models (the Uinta Basin Air Quality Study (UBAQS), the Gasco Study, and the Greater Natural Buttes Study), in addition to the installation and operation of air quality monitors in the Red Wash and Ouray areas.

Out of the three projects mentioned in the EPA comment letter, the Riverbend EA contained the largest amount of proposed compression. To try to determine the Riverbend EA's incremental impact to air quality in the Basin, XTO volunteered to run an air quality model. The assumptions were overly conservative so the results were much higher than expected. The Riverbend model results conflicted with the UBAQS, Gasco, and Greater Natural Buttes model results which analyzed larger drilling scenarios and resulted in smaller increments.

Upon review of the modeling results, among other situations, the BLM decided that standardization of the modeling process was necessary. Nationally, the BLM and the EPA signed a Memorandum of Understanding (MOU) that standardizes air quality modeling strategies for large and small projects. According to the MOU, mid-size projects such as the Riverbend EA are to be reviewed on a case-by-case basis to determine modeling needs. The BLM Utah State Office formed a Resource Technical Advisory Group (RTAG) out of Utah's federal land managers. The RTAG reviews projects to determine modeling needs and reviews modeling protocols to determine adequacy. In addition, the BLM Utah State Office initiated the Air Resource Management Strategy (ARMS) to standardize the modeling platform and identify mitigation effectiveness.

The Riverbend Proposed Action was reviewed by the RTAG, which determined that a photochemical model was not necessary or effective for this size project. However, to determine the relative impact of this project's alternatives, the BLM agreed to create two reduced development alternatives (250 wells and 150 wells), and conduct an Emissions Inventory comparison. To simplify the analysis, because it was substantially the same as the Proposed Action Alternative, the Surface Pipelines Alternative was dropped from the revised EA. With the addition of the new alternatives, the modeling results, and the Emissions Inventory comparison, a new public comment period was determined to be necessary. All comments that were received on the original EA have been treated as scoping comments, and have been taken into account during the revision of this EA.

1.2 PURPOSE AND NEED

The BLM's purpose is to respond to XTO's proposal and to minimize potential impacts resulting from this proposal. BLM's need for the project is to fulfill its responsibilities under federal laws for oil and gas leases to allow leaseholders to develop mineral resources to meet continuing national energy needs. The Mineral Leasing Act of 1920 (MLA), as amended and its implementing regulations allow, and essentially encourage, lessees or potential lessees to explore for oil and gas or other mineral reserves on Federally-administered lands. The Federal Land Policy and Management Act of 1976 (FLPMA) mandates that the BLM manage public lands on the basis of multiple use [43 U.S.C. § 1701(a)(7)]. Minerals are identified as one of the principal uses of public lands in Section 103 of FLPMA [43 U.S.C. § 1702(c)]. The BLM is responsible for administering activities consistent with rights associated with valid existing leases.

1.3 CONFORMANCE WITH BLM LAND USE PLANS

The management of BLM public lands and resources within the RBU Project Area is directed and guided by the *Vernal Field Office Approved Resource Management Plan (RMP) and Record of Decision (ROD)* (BLM 2008a). The ROD and RMP allow for processing of Applications for Permit to Drill (APDs) and right-of-way (ROW) grant applications in support of oil and gas operations with the impacts of construction and operation activities (e.g., drilling of wells, operation of compressor stations, etc.) to be analyzed on a case-by-case basis. The management objective of the RMP for energy resources is to meet local and national non-renewable and renewable energy needs, while protecting other resource values.

Of the Federal leases, all except one were issued prior to FLPMA, and the VFO RMP, (BLM 2008a). Therefore, most leases do not contain stipulations other than the standard lease terms at the time of issuance. One Federal lease, U-76500, contains notices pertaining to prevention of severe soil erosion, seasonal restrictions during antelope fawning season (May 15 through June 20), and protection of a plant species (*Schoenocrambe argillacea)* listed as threatened under the Endangered Species Act (ESA) of 1973, as amended. As the RMP recognizes valid existing rights of previously existing oil and gas leases, and as development of lease U-76500 would meet the management objective of the RMP, the Proposed Action and Alternatives would be in conformance with the ROD and approved RMP.

1.4 RELATION TO STATUTES, REGULATIONS, AND OTHER PLANS

The Project Area lands were leased for oil or gas development under authority of the MLA, as modified by FLPMA, the Federal Onshore Oil and Gas Leasing Reform Act of 1987 and the Energy Policy Act of 2005. A lessee operator has the right to explore for oil and gas on its leases as specified in 43 CFR 3101.1-2, and if a discovery is made, to produce oil and/or natural gas for economic gain, so long as those operations are conducted in accordance with the lease terms and 43 CFR 3160. All right-of-way development would be conducted in compliance with 43 CFR 2800.

There are no comprehensive State of Utah plans covering the Project Area. The State of Utah SITLA has leased much of the State land within the Project Area for oil and gas production. Because the objectives of SITLA are to produce funding for the State school system, and because production on federal leases could further interest in drilling on State leases in the area, it is assumed that the Proposed Action and alternatives analyzed in this EA are consistent with the management objectives of the State.

There are no comprehensive energy management plans for the Uintah and Ouray Reservation. The Tribe reviews and approves all oil and gas permitting on the Reservation and all ROW applications on Tribal surface. Because the objectives of the Tribe are to develop mineral resources in a manner that maximizes their best economic interests and minimizes any adverse environmental impacts resulting from such development, it is assumed that the Proposed Action and alternatives analyzed in this EA are consistent with the management objectives of the Tribe.

1.5 IDENTIFICATION OF ISSUES

A BLM interdisciplinary team reviewed the proposed action and identified the following resources as being potentially impacted by implementation of the proposed action. The Interdisciplinary Team Analysis Record Checklist in **Appendix A** documents all resources considered, including those resources which were determined to be "Not Present" (NP) or "Not Impacted" (NI), with a rationale for that determination.

1.5.1 Air Quality

Issue 1: Potential effects from fugitive dust emissions.

Issue 2: Potential effects from emissions of criteria pollutants and hazardous air pollutants (HAPs).

Issue 3: Surface-disturbing activities could increase ozone concentrations in the Uinta Basin.

Issue 4: Potential effects from Nitrogen Oxide (NO_2) emissions.

1.5.2 Cultural Resources

Issue 1: Surface-disturbing activities could result in damage to, or destruction of, cultural resources.

1.5.3 Fish and Wildlife including Special Status Species

Issue 1: Potential effects from removal or disturbance to certain wildlife habitats.

Issue 2: Potential effects from displacement of some wildlife species.

1.5.4 Livestock Grazing

Issue 1: Potential effects from decrease in vegetative productivity and available forage for livestock and wildlife.

Issue 2: Potential effects from displacement of livestock.

1.5.5 Paleontological Resources

Issue 1: Surface-disturbing activities could result in damage to, or destruction of, paleontological resources.

1.5.6 Soil Resources

Issue 1: Potential effects from mixing of soil horizons and soil compaction to increased

susceptibility of the soils to wind and water erosion.

1.5.7 Vegetation including Special Status Plant Species and Invasive or Noxious Weeds

Issue 1: Potential effects from removal of vegetation.

Issue 2: Potential effects from weed invasion and establishment.

Issue 3: Potential impacts to populations and habitat of special status plant species.

1.5.8 Water Resources

Issue 1: Potential effects to surface and groundwater resources from surface water run-off, soil erosion, and sediment yield.

Issue 2: Potential effects to surface and groundwater resources from chemical spills that could be yielded to RBU Project Area drainages.

Issue 3: Potential effects to surface and groundwater resources from water depletions.

Issue 4: Potential effects to floodplains and riparian areas from increased sediment yield, contamination of petroleum products, fuels, and other chemicals, and surface disturbance.

2.0 DESCRIPTION OF ALTERNATIVES

Based on BLM's review of XTO's Proposed Action (Alternative A) and the type and magnitude of potential impacts to air quality the RBU Project Area, Alternatives B – D were developed to assess the magnitude of air quality impacts from the project based on an Emission Inventory comparison. It is important to note that the following alternatives consider development on State and Tribal leases as a related action to this project. While the BLM does process the APDs for Tribal leases after Tribal concurrence is received, the BLM does not have management authority over development on State or Tribal land or leases.

- **Alternative A – Proposed Action:** This alternative outlines the action XTO proposes to take in order to expand and fully develop natural gas resources from their Federal leases in the RBU Project Area. This would include the construction of necessary infrastructure to directionally and vertically drill up to 484 wells.

- **Alternative B – No Action Alternative:** Under this alternative, no new Federal wells would be authorized in the RBU Project Area. However, the remaining wells assessed in the 1997-49 EA could be drilled and developed. In addition, wells and associated infrastructure could be developed on State of Utah and Tribal leases.

    - **Alternative C – Agency Preferred Alternative:** This alternative outlines a scenario that includes the construction of necessary infrastructure to directionally and vertically drill up to 250 wells from XTO's Federal leases in the RBU Project Area, which represents a 52 percent reduction from Alternative A – Proposed Action.

- **Alternative D – Resource Protection Alternative:** This alternative outlines a scenario that includes the construction of necessary infrastructure to directionally and vertically drill up to 150 wells from XTO's Federal leases in the RBU Project Area, which represents a 69 percent reduction from Alternative A – Proposed Action.

These alternatives are discussed in detail in **Sections 2.1, 2.2, 2.3, and 2.4**. Alternatives that were considered but eliminated from detailed analysis are summarized in **Section 2.6**.

2.1 ALTERNATIVE A - PROPOSED ACTION

XTO proposes to expand and fully develop gas production in the existing RBU Project Area through the use of vertical and directional drilling to attain 20-acre well spacing. **Figure 2.1-1** illustrates the locations of the proposed and existing well pads, and approximates the locations of the new well pads that would be utilized in the RBU Project Area under the Proposed Action. Due to the extensive amount of pre-existing development via vertical drilling in the RBU Project Area, XTO has gained an intricate understanding of the sub-surface formations and associated pay zones. Based upon this knowledge, XTO is able to target additional pay zones via directional drilling in a technically and economically feasible manner, with lower risks for missing these targets. As such, full field development in the RBU Project Area would include the drilling of up to 484 additional wells, of which, 410 would be directionally drilled. Specifically, XTO's Proposed Action includes the following primary components:

- Vertical drilling of up to 74 natural gas wells from 74 new well pads;
- Directional drilling of up to 32 wells from the 74 new well pads;
- Directional drilling of up to 378 natural gas wells from existing well pads (well pads would

INSERT Figure 2.1-1

be expanded by up to 0.5 acre per well);

- Construction of 12 miles of new co-located road, gas lines, and produced water lines;
- Depending upon well production, installation of up to 99 miles of replacement gas lines that would transport gas produced from both existing and proposed wells to the main gathering lines, and;
- Construction of one new compressor station and expansion of eight existing compressor stations that would increase field compression and dehydration to 8,520 horsepower and 100 million cubic feet per day (MMcfd).

XTO proposes to drill between 37 and 93 wells per year until the resource base is fully developed. Under this drilling scenario, construction, drilling, and completion of all proposed 484 wells would occur for approximately 8 years. The total number of wells drilled and would depend largely on production success, engineering technology, reservoir characteristics, economic factors, commodity prices, rig availability, and lease stipulations. The anticipated life of an individual well is 20 to 30 years, and the anticipated time it would take for field abandonment and final reclamation is 5 years. Therefore, the anticipated life of the project under the Proposed Action would be up to 43 years.

Development assumptions and surface disturbance anticipated under the Proposed Action is shown in **Table 2.1-1**. Initial surface disturbance for well pads, access roads, pipeline ROWs, and other surface facilities would equal approximately 1,075 acres. Those portions of the well pads, access road ROWs, pipeline ROWs, and other facilities not needed for production operations would be reclaimed within one to two growing seasons. Residual surface disturbance would be approximately 663 acres which would remain for the life of the well(s).

Specific details of project activities, specific design features, and surface disturbance summaries for the Proposed Action are described below in the following sections.

2.1.1 Well Pad Construction and Expansion

All well pad construction and expansion would be conducted using guidelines described in the "Gold Book," *Surface Operating Standards for Oil and Gas Extraction and Development 4th Edition* (BLM and USFS 2007), as appropriate. Construction or expansion of a typical well pad would involve the use of heavy equipment, but equipment needs would vary depending on the site-specific conditions. All surface-disturbing activities would be supervised by a qualified company representative who is familiar with the terms and conditions in the approved EA and site-specific permits.

The existing topsoil and vegetation would be cleared and topsoil would be stockpiled along the side of the proposed well pad. All cut and fill slopes would be constructed to maintain stability for the life of the well(s). As determined necessary on a site specific basis, best management practices (BMPs) to prevent erosion (i.e., energy dissipaters such as straw bales and silt fences) would be installed and maintained until the disturbed slopes have revegetated and stabilized.

A new reserve pit would be excavated on each new well pad or a previously utilized reserve pits would be re-opened and enlarged on existing well pads. The reserve pit would be lined with 16-millimeter thick synthetic reinforced material. If rock is encountered during excavation, the pit would be lined with a felt liner pad to protect the liner from punctures. The pit liner would overlap the pit walls and be covered with dirt and/or rocks to secure it in place. The pit liner would be resistant to deterioration by hydrocarbons. The reserve pit would be fenced to prevent access by wildlife and unauthorized personnel. The reserve pit fencing would be installed on three sides during drilling operations and on the fourth side when the rig moves off location and until the pit is backfilled.

Table 2.1-1. Surface Disturbance Under the Proposed Action

Project Feature	Number or Miles	Size (disturbance width [feet] or acres/facility)	Initial Surface Disturbance (acres)	Residual Surface Disturbance (acres)[1]
Well Pads				
Proposed New Vertical Well Pads	74	2.5 acres	185	111
Proposed Directional Wells From Existing Well Pads	378	0.5 acres	189	125
Proposed Directional Wells From New Well Pads	32	0.5 acres	16	11
Subtotal	**484**	**--**	**390**	**247**
Access Roads				
New Roads Co-located with Pipelines	12 miles	40 feet[2]	58	58
Existing Roads with New Pipelines	99 miles	10 feet[3]	120	120
Subtotal	**111 miles**	**--**	**178**	**178**
Gas and Water Pipelines				
Pipelines Co-located with New Roads	12 miles	35 feet[2]	51	22[4]
Pipelines Co-located with Existing Roads	99 miles	35 feet[3]	420	180[4]
Subtotal	**--**	**--**	**471**	**202**
Central Facilities				
Compressor Stations (New and Upgrades)	9[5]	4 acres average	36	36
Subtotal	**9**	**--**	**36**	**36**
Total New Disturbance	**--**	**--**	**1,075**	**663**

[1] Residual disturbance calculations are based on the assumption that interim reclamation will be successful.
[2] Initial disturbance assumes that a 75-foot wide disturbance corridor would be needed for construction, 40 feet of which would be utilized for new road construction, and 35 feet of which would be utilized for pipeline installation.
[3] Initial disturbance assumes that a 45-foot wide disturbance corridor would be needed for construction, 10 feet of which would be utilized for general road improvements, and 35 feet of which would be utilized for pipeline installation.
[4] Residual disturbance assumes that 20 foot wide portion of the original 35-foot wide disturbance corridor would be reclaimed leaving a 15-foot wide corridor for the long-term pipeline corridor.
[5] Includes the construction of one new and the expansion of eight existing compressor stations.

On average, each newly constructed well pad would initially occupy approximately 2.5 acres. Each existing and proposed well pad utilized for proposed directional drilling would be expanded by 0.5 acre for each additional directional well. This acreage would include reopening previously utilized reserve pits (i.e., 0.4 acre), and expanding the existing pads to accommodate drilling equipment and additional well heads and production facilities (i.e., 0.1 acre).

Once all of the proposed directional wells have been drilled from a single well pad location, the rig would be dismantled and moved to another location, and the reserve pit would then be drained and emptied of drilling fluids within 90 days of final well completion. If a well is productive, the reserve pit and areas not required for production would be reclaimed. Topsoil previously stockpiled adjacent to the well pad would be re-spread across the disturbed areas, and each of these areas would then be seeded with a seed mixture approved by the AO of the appropriate SMA. If a well is unproductive, all areas not required for production of existing wells would be reclaimed following well plugging and abandonment. In the case of either a productive or unproductive well, reclamation activities would take place within 180 days of final drilling activities, weather permitting.

2.1.2 Access Roads

Primary access into the RBU Project Area would be via State Highway 88 to Seep Ridge Road. Two primary access roads enter the RBU Project Area from Seep Ridge Road: Wild Horse Bench Road and Willow Creek Road. Existing roads would be utilized to the extent possible to minimize new surface disturbance and upgrades to those roads would occur on an as-needed basis to facilitate access to each drilling location. Analysis in this EA assumes that 10 feet of additional surface disturbance could occur along existing roads where site-specific upgrades such as expansion or modification are necessary. All road maintenance activities implemented by XTO on county roads would be coordinated with the Uintah County Public Lands Department. Utilized roads would be maintained in good repair during all drilling, completion, and testing operations. No road improvements would be made by XTO within other entities' existing road ROWs without prior written approval from the ROW owner. All required road upgrades would follow guidelines described in *Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development* "Gold Book" 4th Edition (BLM and USFS 2007), as appropriate.

New access roads would be built in accordance with the *Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development* "Gold Book" 4th Edition (BLM and USFS 2007), as appropriate. A 40-foot width would be utilized for new road construction. To ensure operational safety during drilling and completion, no roads would be constructed through the middle of well pads. In an effort to reduce erosion, vegetation removed during construction would be windrowed or scattered over adjacent disturbance as directed by the AO of the appropriate SMA based on site-specific review. New access roads would be crowned (2 to 3 percent), ditched, and constructed to meet the standards of the anticipated traffic flow and all weather requirements and to provide a well-constructed and safe road. Surface materials would consist of native soil whenever possible. If additional surfacing materials are required, they would be purchased from a local contractor having a permitted source of materials. Prior to construction, the ground would be allowed to dry completely, and no road construction would take place when soils are frozen.

If deemed necessary by the ACOE, XTO would prepare stream alteration permits for associated drainage crossings.

Timing of new road construction would depend on the drilling schedule, topographic constraints, and weather conditions. Roads would generally be constructed two to three weeks prior to well pad construction. All roads would have a design speed of approximately 20 miles per hour (mph).

2.1.3 Natural Gas Pipelines

Natural gas produced at existing wells is currently transported via 137 miles (723,360 feet) of 2- to 20-inch surface gas lines which extend throughout the RBU Project Area. Construction-related activities associated with previous pipeline construction have created approximately 494 acres of residual surface disturbance.

Where existing gas lines are in place, the current system would be used to transport gas to market as feasible. For example, existing 10- to 20-inch pipelines would continue to be utilized for transport. However, as the proposed vertical and directional wells come on-line and pipeline capacities of existing 2- to 8-inch surface pipelines start to maximize, they would be replaced with larger diameter (4- to 12-inch) buried gas lines, depending upon well production. These replacement gas lines would be buried immediately adjacent to the existing pipelines and roads in a 35-foot disturbance width. Following installation, 25 feet of the initial 35-foot wide disturbance corridor for pipelines would be reclaimed; leaving a 15-foot width for long-term operation and maintenance.

To transport gas from newly constructed well locations where gas line infrastructure is not currently in place, construction and installation of new pipelines would be needed. These collection gas lines would be constructed of 4- to 12-inch outer diameter pipe. Each gas line would be welded at its associated well pad and would then be pulled down the well's access road using a dozer or backhoe. Each gas line would then be buried adjacent to the access road; a 35-foot width would be utilized for the installation of pipelines. Following installation, 25 feet of the initial 35-foot wide disturbance corridor for pipelines would be reclaimed; leaving a 15-foot width for long-term operation and maintenance.

2.1.4 Produced Water and Produced Water Pipelines

Currently produced water and condensate is decanted into external steel tanks that are located on each existing well pad. Containment dikes constructed either of compacted subsoil or metal barriers surround these facilities and can hold 110 percent of the capacity of the largest tank. Each tank is pumped periodically as needed, and water is transported to existing water injection wells located in the RBU Project Area or disposed of in certified evaporative disposal sites. The majority of the produced water (~93 percent) will be dispose of via an injection well.

As additional wells come online in the RBU Project Area, the amount of water produced from downhole formations would increase. To decrease the amount of truck traffic that would be needed to transport and dispose of such water, XTO proposes to install produced water lines from existing and proposed well pads to two existing (RBU 13-11F–EPA Permit Number UT20961-06292; RBU 16-19F–EPA Permit Number UT2721-03787) and one proposed (RBU 4-22F-EPA Permit Number UT21123-07612) water injection facilities. All proposed produced water lines would be buried within the 35-foot pipeline construction width described in **Section 2.1.3**.

2.1.5 Compressor Station Construction

Currently there are eight existing compressor stations located in the RBU Project Area (see **Figure 2.1-1**). If the proposed wells are productive, natural gas would be transported from each wellhead via gathering gas lines to the existing compression and treatment facilities. To support the proposed development, one additional compressor station (Black Bridge) would be constructed and installed in Section 14, T10S, R20E (refer to **Figure 2.1-1**), and all eight existing compressor stations would be expanded. The expansion of existing compressor stations would occur on previously disturbed areas that currently house existing compressor facilities, and construction and development of the Black Bridge compressor would occur at the existing RBU 14-14F well pad. Each of these areas would be expanded to support the

additional compression facilities. Total surface disturbance associated with expansion of the eight existing and construction of the one new compressor station would be approximately 36 acres. Details regarding the surface disturbance associated with each facility are presented below in **Table 2.1-2**.

Table 2.1-2. Surface Disturbance Associated with Compressor Facility Expansion and Construction

Facility Name	Proposed Disturbance (acres)
TAP-1	3.3
TAP-2	4.5
TAP-3	4.7
TAP-4	4.7
TAP-5	3.0
HCU	4.4
11-18	3.3
9-17E	3.3
14-14F[1]	5.0
Total	**36.2**

[1]New facility

2.1.6 Drilling Operations

Once construction or expansion of an individual well pad is completed, drilling equipment would be moved onto the new well pad. Wells would be drilled utilizing a conventional, mechanically-powered mobile drilling rig. The exact type and size of drilling rig would be dependent upon rig availability at the time of project implementation. XTO anticipates that no more than twelve drilling rigs would be operating in the RBU Project Area at any one time. Each well would take approximately 14-21 days to drill. XTO expects to drill between 37 and 93 wells per year (**Table 2.1-3**).

Table 2.1-3. Estimated Drilling Schedule

Year	Number of Wells	
	Annual[1]	Cumulative Total
1	46	46
2	60	106
3	93	199
4	57	256
5	66	322
6	64	386
7	61	447
8	37	484

[1]Assumes up to 12 drill rigs operating annually.

The proposed wells would target sandstone intervals within the Mesaverde Group, and the average depth of each well would be approximately 8,500 feet. Drilling operations would consist of drilling the hole, running and cementing intermediate casing, drilling the production hole, and running and cementing production casing. Any shallow water zones or near surface aquifers encountered during drilling would also be isolated by both casing and cement as directed by *BLM Utah Instruction Memorandum 2010-055*.

The casing and cementing program would also be designed to isolate and protect the shallower formations encountered in the well bore and to prohibit pressure communication or fluid migration between zones. The cement would protect the well by preventing formation pressure from damaging the casing, and by retarding corrosion by minimizing contact between the casing and formation fluids. The type of casing used and the depth to which it is set would depend upon the physical characteristics of the formations that are drilled. All casing would be new or reconditioned and tested in accordance with applicable regulations. Site-specific descriptions of drilling procedures would be included in the APD and the COAs for each well.

Drilling operations would utilize an open-loop circulation system with reserve pits. Construction of the reserve pits was discussed previously in **Section 2.1.1**. As several directional wells would be drilled from individual well pads, a reserve pit may be utilized for more than one well. Once all of the proposed directional wells have been drilled from a single location, the rig would be dismantled and moved to another location, and the reserve pits would then be drained and emptied of drilling fluids within 90 days of final well completion as required by *Oil and Gas Onshore Order No. 7*.

2.1.7 Well Completion and Production

If testing indicates economic potential, completion operations would set production casing to the total drilled depth, perforate the casing in target production zones, and hydraulically fracture (fracing) the productive formation under high pressure. The fracing material would likely contain sand or other proppant material to keep the fractures open, thereby allowing hydrocarbons to flow more freely into the casing. The next phase would be to flow and test the well to determine rates of production. Completion and testing would take approximately 7 to 10 days.

Should testing suggest the potential for commercial production, facilities including a wellhead, pumping unit, separator, dehydrator, condensate tanks, and gas meter would be installed at each well location. All permanent (on site for 6 months or longer) structures constructed or installed would be painted a flat, non-reflective, earth tone color using one of the standard environmental colors, as determined by the AO of the appropriate SMA. All facilities would be painted within 6 months of installation.

Periodically, a workover or recompletion on a well may be required to ensure that efficient production is maintained. Workovers can include repairs to the well bore equipment (casing, tubing, rods, or pump), the wellhead, or the production facilities. These repairs would usually be completed in 7 days per well, during daylight hours. The frequency for this type of work cannot be accurately projected because workovers vary by well; however, an average work time may be one workover per well per year after about 5 years of production. In the case of a recompletion, where the wellbore casing is worked on or valves and fittings are replaced to stimulate production, all byproducts would be stored in tanks and hauled from the location. For workover operations, it may be necessary to rework the surface location to accommodate equipment. At the completion of the work, the surface location would be re-graded and reclaimed to pre-existing conditions.

2.1.8 Water Requirements

Water required for the drilling and completion of the proposed gas wells would be hauled by truck from a combination of the permitted water sources described in **Table 2.1-4**.

The needed water volume would depend on the depth of the well and any losses that might occur during drilling. Based on previous experience with wells drilled in the area, approximately 21,000 barrels (2.7 acre-feet) of water would be needed to drill and complete each well. In addition to water for drilling and completion, approximately 775 barrels (0.1 acre-feet) of water per well pad would be utilized for dust

abatement each year during the drilling phase. **Table 2.1-5** displays the estimated annual water consumption based on XTO's proposed drilling schedule.

Table 2.1-4. Water Sources Utilized for the Proposed Action

Water Right Number	Filing Date	Source	Location	Allowed Annual Withdrawal (acre-feet)
43-11053	July 14, 2000	Underground Water Well	N 20 ft.; W 1,310 ft. from E4 corner, Section 5, T7S, R20E	217
43-11976	August 9, 2007	Underground Water Well	N 1,160 ft; W 500 ft from E4 corner, Section 9, T8S, R20E	Unevaluated
49-367	June 19, 1980	Underground Water Well	S 1,980 ft.; W 660 ft. from N4 corner, Section 17, T10S, R20E	5
49-1645	April 10, 2000	Underground Water Well	N 481 ft.; E 2,176 ft. from W4 corner, Section 9, T8S, R20E	50
49-2166	August 8, 2003	Underground Water Well	N 501 ft.: E1,676 ft. from W4 corner, Section 09, T8S, R20E	50
49-2189	October 6, 2004	Green River	S 570 ft.; W 3,150 ft. from NE corner Section 33, T8S, R20E	20
49-2290	July 28, 2008	Underground Water Well	N 4,515 ft.; W 3,200 ft. from SE corner, Section 33, T8S, R20E	20
49-2291	October 31, 2018	Underground Water Well	N 1,458 ft.; E 1,990 ft. from SW corner, Section 10, T11S, R20E	20
Tribal Resolution 06.183	August 15, 2006	Willow Creek	NE ¼ NW¼ NE¼ Section 22, T10S, R20E	Not Specified
T37495	October 13, 2012	Unnamed Spring	S 1,320 ft.: W1, 425 ft. from NE corner, Section 32, T6S, R20E	4.7

Following drilling and completion activities, water usage would be primarily limited to dust abatement for the remainder of the project life. While a portion of the water used for drilling and completion of wells would be recycled from other XTO wells (e.g., produced water), the majority of water used would be fresh water hauled to the wells from the sources listed in **Table 2.1-4** above.

2.1.9 Spill Procedures

As each new well is completed on existing pads, XTO would update all existing Spill Prevention Control and Countermeasure (SPCC) plans. New SPCC plans would be developed for all proposed well pads. If spills of condensate, produced water, or other fluids were to occur in reportable amounts, as defined in BLM Notice to Lessees (NTL) 3A, XTO or their contractors or sub-contractors would immediately contact the BLM and any other regulatory agencies (e.g., EPA National Response Center, State of Utah) as required by law or regulation. Strict cleanup efforts would be initiated immediately.

Table 2.1-5. Estimated Annual Water Consumption During Drilling Phase

Drilling Year	Estimated Number of Wells	Estimated Annual Water Use for Drilling (acre-feet)	Estimated Annual Water Use for Dust Abatement (acre-feet)	Total Water Use per Year (acre-feet)
1	46	124.2	4.6	128.8
2	60	162.0	6.0	168.0
3	93	251.1	9.3	260.4
4	57	153.9	5.7	159.6
5	66	178.2	6.6	184.8
6	64	172.8	6.4	179.2
7	61	164.7	6.1	170.8
8	37	99.9	3.7	103.6
Total	**484**	**1,306.8**	**48.4**	**1,355.2**

2.1.10 Hazardous Materials and Solid Wastes

Drilling fluids, including salts and chemicals, would be contained in the reserve pits. Liquid hydrocarbons produced during completion operations would be placed in test tanks on the well locations and subsequently trucked offsite and sold or disposed of at a permitted disposal facility. Upon well completion, any residual hydrocarbons in the pit would be removed in accordance with 43 CFR 3162.7-1. Upon termination of drilling and completion operations, the liquid contents of the reserve pits would be used at the next drill site or would be removed and disposed of at an approved waste disposal facility within 90 days, weather permitting.

Self-contained, chemical portable toilets would be provided for human waste disposal. Upon completion of operations, or as needed, the toilet holding tanks would be pumped and the contents disposed of in the nearest approved sewage disposal facility.

Garbage, trash, and other waste materials would be collected in portable, self-contained, fully enclosed trash cages during operations. Accumulated trash would be disposed of at an authorized sanitary landfill. Trash would not be burned on location.

All debris and other waste materials not contained in the trash cage would be cleaned up and removed from the location promptly after removal of the completion rig (weather permitting).

2.1.11 Reclamation

To assure surface reclamation would occur on Federal leases at the end of the productive life of each well, XTO would maintain a reclamation bond with the BLM. Bonding is required for oil and gas lease operations in order to indemnify the U.S. government against losses from failure to meet royalty obligations, wells plugged improperly and abandoned on lease, and/or surface restoration and clean-up on abandoned operations (BLM and USFS 2007).

Site preparation and reclamation activities on BLM lands would follow the *Green River District Reclamation Guidelines for Reclamation Plans* (BLM 2009a) and XTO Energy's Reclamation Plan for Roosevelt and Orangeville, Utah (2010).

Construction Phase

Prior to construction of new well pads, roads and pipelines, or the expansion of existing well pads, XTO would conduct a noxious weed inventory in accordance with the *VFO Surface Disturbance Weed Policy* (BLM 2009b). Once baseline conditions have been documented, up to 12 inches of topsoil material (if present) would be stripped and stockpiled for future reclamation efforts. Placement of the topsoil would be noted on the location plat attached to the site-specific APD. Topsoil would be stockpiled separately from subsoil materials. If previously utilized reserve pits have been reclaimed, topsoil salvaged from these areas would be removed and stockpiled separately near the reserve pit.

Production Phase

Upon well completion, the well locations and surrounding area(s) would be cleared of all unused tubing, materials, trash, and debris not required for production. In accordance with *Oil and Gas Onshore Order Number 1*, after completion activities have been finalized for the last proposed well on the well pad, XTO would reduce the size of the well pad to the minimum surface area needed for production facilities and adequate room for trucks to turn around, while providing for reshaping and stabilization of cut and fill slopes. Reseeding would be completed in accordance with the timeframe outlined in the Green River District Reclamation Guidelines. Reclamation activities would take no more than 30 days.

Prior to backfilling the reserve pits, the fence surrounding the pits and all debris in the pits would be removed, and the reserve pits would be as dry as possible. The pit liners would be folded into the pit prior to backfilling. After backfilling, salvaged topsoil (if any) would be placed on top of the backfill material. After the reserve pits have been reclaimed, no depressions in the soil covering the reserve pit would be allowed. The objective is to keep seasonal rainfall and runoff from standing or pooling over the reserve pit and seeping into the soil. Diversion ditches and water bars would be used to divert surface runoff from the reserve pit area, if needed.

Upon completion of backfilling and leveling, the stockpiled topsoil would be evenly spread over the portion of the well pads not required for production, the reserve pits, and access road cuts and shoulders. These disturbed areas would then be reseeded with the SMA approved seed mixture. Reclamation would not be deemed successful until approved by the AO of the appropriate SMA.

Final Reclamation of Project Facilities at the End of Project Life

For dry holes, final reclamation of surface disturbances would take place within 180 days after the well is plugged. At the end of the productive lives of successful wells, all production equipment and surface pipelines (if any) would be removed and the well locations, access roads, and other disturbed areas would be restored to their approximate original condition. Road reclamation would be coordinated with Uintah County or other ROW holder as appropriate.

At final abandonment, all well casings would be cut off and capped according to SMA requirements as directed by the AO. The cap would be welded in place and the well location and identity would be permanently inscribed on the cap. The cap would also be constructed with a weep hole. If requested, GPS coordinates of the cap would be provided to the SMA.

Well locations, associated roads that would no longer be used, and other disturbed areas would be restored as near as practical to their original condition. All disturbed areas would be re-contoured to the approximate natural contours. Road reclamation would be coordinated with Uintah County or other ROW holder as appropriate.

2.1.12 Applicant Committed Environmental Protection Measures

XTO has committed to the following measures that are designed to reduce impacts to existing resources, and are integral to this alternative.

2.1.12.1 Air Quality

- XTO would comply with all applicable local, State, and Federal air quality laws, statutes, regulations, standards, and implementation plans.
- As required by the U.S. EPA Region 8, XTO would obtain all necessary air quality permits to construct, test, and operate facilities.
- All glycol dehydrators located at central stations would be controlled by Maximum Achievable Control Technology (MACT) standards (95 percent control).
- All engines greater than 500 horsepower (hp) at compressor stations would be controlled by MACT levels to reduce Carbon Monoxide (CO) and formaldehyde emissions.
- To reduce NO_X emissions, XTO would only use Tier II drill rig engines.
- New pump unit engines would be New Source Performance Standards (NSPS) compliant.
- Low-bleed pneumatic controls would be installed on all new equipment to reduce potential volatile organic compounds (VOC) emissions, taking safety issues into consideration
- XTO would comply with the Vernal RMP NO_X emissions limitation of 1.0 g/hp-hr for field engines rated greater than 300 hp, and NO_X emissions limitation of 2.0 g/hp-hr for field engines rated less than 300 hp.
- Flaring would be utilized to minimize emissions related to vented gas.
- Gas Chromatography would be used to minimize length of venting periods.
- Remote telemetry would be used to reduce pumper truck trips to the well locations.
- Temporary housing for users would be used to reduce commuting traffic vehicle emissions.
- XTO would apply water or other BLM-approved dust suppression at construction sites and on roads, as necessary, to abate fugitive dust.
- XTO would not allow any open burning of garbage or refuse at well sites or other facilities.
- All internal combustion equipment would be kept in good working order.

2.1.12.2 Cultural Resources

- A Class III inventory would be conducted in all areas proposed for surface disturbance. These surveys would be conducted on a site-specific basis prior to the initiation of construction activities. At each proposed well and compressor station location, a 10-acre square parcel would be defined, centered on the well pad center stake. The 10-acre parcel would be examined for cultural resources by an archaeologist walking parallel transects spaced no more than 30 feet apart. All access, gas line, and water line routes would be surveyed to a width of 200 feet.
- Whenever feasible, prehistoric and historic sites documented during the Class III inventory as eligible for listing on the National Register of Historic Places (NRHP), as well as areas identified as having a high probability of significant subsurface materials, would be avoided by development. Specifically, well pad locations and access/gas and water line routes would be altered or rerouted as necessary to avoid impacting NRHP-eligible sites.

- If avoidance is not feasible or does not provide the required protection, adverse effects would be mitigated (e.g., data recovery through excavation).
- If cultural resources are uncovered during surface-disturbing activities, XTO would suspend operations at the site and immediately contact the AO, who would arrange for a determination of eligibility in consultation with the SHPO, and, if necessary, recommend a recovery or avoidance plan.
- XTO would inform their employees, contractors, and subcontractors about relevant Federal regulations intended to protect archaeological and cultural resources. All personnel would be informed that collecting artifacts is a violation of Federal law and that employees engaged in this activity would be subject to disciplinary action.

2.1.12.3 Fish and Wildlife Including Special Status Fish and Wildlife Species

- As required by the ESA, no activities would be permitted that would jeopardize the continued existence of threatened or endangered fish and wildlife species.
- As required by *Oil and Gas Onshore Order No. 1,* XTO would remove any visible accumulation of oil from the reserve pit immediately upon release of drilling rig to prevent exposure of migratory birds and other wildlife to petroleum products.
- To minimize wildlife mortality due to vehicle collisions, XTO would advise project personnel regarding appropriate speed limits in the RBU Project Area.
- The County would be contacted regarding the presence of carrion within or along roadways.
- Employees and contractors would be educated about anti-poaching laws.
- If wildlife law violations are discovered, the offending employee would be subject to disciplinary action by XTO.
- For any surface-disturbing activities proposed between January 1 and September 31, a BLM-approved contractor would survey proposed development sites for the presence of raptor nests. The survey area would be determined on a site-specific basis by the AO of the appropriate SMA. On BLM lands, if occupied/active raptor nests are found, construction would not occur during the nesting season for that species within the species-specific buffer described in "Best Management Practices for Raptors and Their Associated Habitats in Utah." As specified in the Raptor BMPs, modifications of these spatial and seasonal buffers for BLM-authorized actions would be permitted, so long as protection of nesting raptors was ensured (see Appendix A of the ROD and Approved RMP) (BLM 2008a).
- To avoid entrainment pumping would occur from an off-channel location – one that does not connect to the river during high spring flows. The infiltration gallery would be constructed in a USWFS approved location.
- Pump heads located in the river channel would be located in areas of high water velocity, avoiding low-flow or no-flow area as these habitats tend to concentrate larval fishes.
- Pumping would be limited to the greatest extent possible during that period of the year when larval fish may be present (April 1 to August 31).
- Pumping would be limited to the greatest extent possible during the midnight hours (10pm to 2 am), to avoid impacts to larval fish populations, and conducted at dusk as larval drift abundance is lowest during this time.
- All pump intakes would be screened with 3/32 inch mesh material.
- Approach velocities for intake structures would follow the National Marine Fisheries Service's document "Fish Screening Criteria for Anadromous Salmonids", and would not exceed 0.33 feet per second (ft/s).
- Any fish impinged on the intake screen or entrained into irrigation canals would be reported to the USFWS or the UDWR.

- To prevent the potential contamination of fish habitat from spills of petroleum products, XTO would utilize closed-loop drilling techniques for all proposed wells located in the 100-year floodplain of Willow Creek and in all named drainages within five miles of the Green River.

2.1.12.4 Soil Resources

- During project construction, surface disturbance and placement of gas and water lines would be limited to the approved location and access routes.
- No oil, lubricants, or toxic substances would be drained onto the ground surface.
- Areas used for soil storage would be stripped of topsoil before soil placement.
- Appropriate erosion control and revegetation measures would be employed.
- In areas with unstable soils where seeding alone may not adequately control erosion, grading would be used to minimize slopes and water bars would be installed on disturbed slopes.
- Erosion control efforts would be monitored by XTO and, if necessary, modifications would be made to control erosion.

2.1.12.5 Vegetation Including Special Status Plant Species and Invasive or Noxious Weeds

- As required by the Endangered Species Act of 1973 (ESA), as amended, no activities would be permitted that would jeopardize the continued existence of threatened or endangered plant species.
- As required by the Noxious Weed Act of 1974 as amended and Executive Order 13112-1999, noxious weeds would be controlled in the Project Area by the XTO on all disturbances associated with their existing well pads, road, and pipeline routes as well as infestations that would occur as a result of the project.
- Removal and disturbance of vegetation would be kept to a minimum through construction site management (e.g., using previously disturbed areas and existing easements where feasible, placing pipelines adjacent to roads, limiting well pad expansion, etc.). In addition, all areas not utilized for the operational phase of the project would be reclaimed.
- In an effort to ensure that project activities do not increase the existence of invasive or noxious weeds in the RBU Project Area, XTO would prepare a Weed Control Plan. Specific components of the plan would include:
  a. Conducting individual noxious weed inventories on a well by well basis prior to construction activities. The inventories would include examination of all proposed surface disturbance (i.e., roads, pipelines, and well pads) associated with each well. The results of these inventories would include GPS locations indicating the type and size of each infestation. This data would be formulated into a report and submitted with the associated APD.
  b. Preparation of a Pesticide Use Proposal.
  c. Following the construction phase and drilling phase for each well, all disturbed surface would be monitored annually for the presence of noxious weeds. If monitoring shows increases in presence of noxious weeds, XTO would be responsible for treating these areas. Noxious plant control measures (mechanical, cultural, chemical) would be conducted before seed set annually. Monitoring and treatment would be conducted annually until reclamation and weed ratification was deemed successful by the AO of the appropriate SMA.
  d. All herbicide Chemical control will be in conformance with national and local guidance, including approved chemicals, rates, and appropriated best management practices.
  e. To prevent further spread of noxious weeds, all vehicles and equipment would be power washed at designated washing locations to remove seed and plant materials before entering the RBU Project Area from outside of the Uinta Basin.

- Prior to any surface-disturbing activities on federal and non-federal lands that contain potential habitat for the Uinta Basin hookless cactus and clay-reed mustard, a BLM-approved botanist would survey proposed development sites plus a 300-foot avoidance buffer. If individuals of these species are present, XTO would implement appropriate avoidance or mitigation measures, including relocation of the proposed well pad construction/expansion or pipeline and/or design modifications to limit the potential impacts to these plant and their habitat. Specific details regarding avoidance and mitigation measures are included in **Appendix B** – Conservation Measures for Special Status Plant Species. All surveys would be conducted within the proper seasonal timeframe, as determined by the AO of the appropriate SMA and USFWS.
- Prior to any surface-disturbing activities on BLM lands that contain suitable habitat for BLM Sensitive plant species, a BLM-approved botanist would survey proposed development sites plus a 150-foot avoidance buffer. If any BLM Sensitive plant species are present, XTO would implement appropriate avoidance or mitigation measures, including relocation of the proposed well pad construction/expansion or pipeline and/or design modifications to limit the potential impacts to the plants and their habitat. Specific details regarding avoidance and mitigation measures are included in **Appendix B** – Conservation Measures for Special Status Plant Species. On non-BLM lands, the appropriate SMA would determine survey needs and methodologies. All surveys would be conducted within the proper seasonal timeframe, as determined by the BLM AO.

2.1.12.6 Water Resources

- As required under 40 CFR 112.3(e), XTO would revise and update all existing SPCC plans for each new directional well drilled on a well pad.
- XTO would prepare SPCC plans for all new proposed well pads.
- XTO would maintain a copy of the newly created or revised SPCC plan at each facility, if the facility is normally attended at least 8 hours per day, or at the nearest field office if the facility is not so attended. XTO would also implement and adhere to SPCC plans in a manner such that any spill or accidental discharge of oil or condensate would be reported and remediated.
- XTO would inform their employees, contractors and subcontractors of the potential impacts that can result from accidental spills, as well as the appropriate actions to take if a spill did occur.
- XTO would utilize closed-loop drilling techniques for all proposed wells located in the 100-year floodplain of Willow Creek and in all named drainages within five miles of the Green River.
- Newly constructed gas and water lines would be pressure tested to evaluate structural soundness and reduce the potential for leaks.

2.1.12.7 Health and Safety/Hazardous Materials

- XTO would institute a Hazard Communication Program for its employees and require the subcontractor to operate in accordance with Occupational Safety and Health Administration (OSHA) (29 CFR 1910.1200).
- As required by OSHA, XTO would place warning signs near hazardous areas and along roadways.
- In accordance with 29 CFR 1910.1200, a Material Safety Data Sheet (MSDS) for every chemical or hazardous material brought on-site would be kept on file in XTO's field office.
- XTO would transport and/or dispose of any hazardous wastes, as defined by the Resource Conservation and Recovery Act of 1976 (RCRA), as amended, in accordance with all applicable Federal, State, and local regulations.
- All storage tanks that contain produced water, or other fluids which may constitute a hazard to public health or safety, would be surrounded by a secondary means of containment for the entire

contents of the tank, plus freeboard for precipitation, or 110 percent of the capacity of the largest tank. Production facilities that have the potential to leak produced water, or other fluids which may constitute a hazard to public health or safety, would be placed within appropriate containment and/or diversionary structure to prevent spilled or leaking fluid from reaching groundwater or surface waters.

- Notice of any reportable spill or leakage, as defined in BLM NTL 3A, would be immediately reported by XTO to the AO of the appropriate SMA as required by law. Oral notice would be given as soon as possible, but within no more than 24 hours, and those oral notices would be confirmed in writing within 72 hours of any such occurrence.
- XTO would provide portable sanitation facilities at drill sites, place trash cages at each construction site to collect and store garbage and refuse, and ensure that all garbage and refuse is transported to a State-approved sanitary landfill for disposal.

2.1.12.8 Livestock Grazing

- XTO would repair or replace any fences, cattleguards, gates, drift fences, and natural barriers that are damaged as a result of the Proposed Action. Cattleguards or gates would be installed for livestock control on roads when fences are crossed and these structures would be maintained by XTO for the life of the road.

2.1.12.9 Paleontological Resources

- Because of the potential for fossil resources to occur in the Uinta Formation in the RBU Project Area, paleontological surveys would be conducted by an SMA-approved paleontologist prior to any surface disturbance.
- If significant fossils are encountered during the survey, the paleontologist would assess and document the discovery, and either collect the fossils or recommend the area be avoided so as not to destroy the resource.
- The AO of the SMA would determine the need for further monitoring of the area or mitigation of the site during ground-disturbing activities.
- If fossils are encountered during excavation, construction would be suspended, and the AO of the SMA would be notified. Construction would not resume until the fossils are assessed by the AO of the SMA, and appropriate mitigation measures are developed and implemented.

2.1.12.10 Visual Resources

- To reduce visual impacts to recreationists utilizing the Green River, low profile tanks would be used at all well pads located within 0.5-mile or line of sight (whichever is less) of the Green River.
- No new surface disturbance will occur in the Lower Green River suitable Wild and Scenic River.

2.2 ALTERNATIVE B – NO ACTION ALTERNATIVE

Under the No Action Alternative, the proposed natural gas infill development project on public land surface and/or federal mineral estates as described in the Proposed Action would not be implemented. However, proposed gas well development would likely continue on State, Tribal, and private lands within the RBU Project Area, subject to the approval of UDOGM or the appropriate private land owner. Reasonable access across BLM-administered surface to proposed well pads and facilities on State, Tribal, and private lands could also occur under the No Action Alternative, as allowed by Federal regulations. Development, production, and maintenance activities for wells approved under the 1997-49 EA for Dominion's Natural Gas Development Project for the RBU and the West Willow Creek Unit Areas would also continue on BLM-administered lands.

Under the No Action Alternative, approximately 16 oil and gas wells would be developed on State and Tribal lands in the RBU Project Area. This alternative would allow XTO to hold on to their existing Federal, Tribal and State leases, and continue production, but would not meet XTO's objective to maintain or increase production of natural gas resources from the federal leases by allowing the RBU to attain 20-acre well spacing. **Figure 2.2-1** illustrates the locations of the proposed and existing well pads, and approximates the locations of the new well pads that would be utilized in the RBU Project Area under the Proposed Action.

Specifically, Alternative B includes the following primary components:

- Vertical drilling of up to 1 natural gas well from a new well pad;
- Directional drilling of up to 15 natural gas wells from existing well pads (well pads would be expanded by up to 0.5 acre per well); and
- Construction of up to 0.3 mile of new co-located road, gas lines, and produced water lines.

Drilling the wells would take less than 1 year. The anticipated life of an individual well is 20 to 30 years, and the anticipated time it would take for field abandonment and final reclamation is 5 years. Therefore, the anticipated life of the project under the No Action Alternative would be up to 36 years.

Development assumptions and surface disturbance anticipated under Alternative B are shown in **Table 2.2-1.** Initial surface disturbance for well pads, access roads, pipeline ROWs, and other surface facilities would equal approximately 12.7 acres. Those portions of the well pads, access road ROWs, pipeline ROWs, and other facilities not needed for production operations would be reclaimed within one to two growing seasons. Residual surface disturbance would be approximately 8.9 acres which would remain for the life of the well(s). No new compressors or expanded compression facilities would be needed.

All other aspects of this alternative would be identical to that of the Alternative A – Proposed Action as discussed in **Sections 2.1.1** through **2.1.14**.

INSERT Figure 2.2-1

Table 2.2-1. Surface Disturbance Under the No Action Alternative

Project Feature	Number or Miles	Size (disturbance width [feet] or acres/facility)	Initial Surface Disturbance (acres)	Residual Surface Disturbance (acres)[1]
Well Pads				
Proposed New Vertical Well Pads	1	2.5 acres	2.5	1.5
Proposed Directional Wells From Existing Well Pads	15	0.5 acres	7.5	5.5
Proposed Directional Wells From New Well Pads	0	0.5 acres	--	--
Subtotal	**16**	**--**	**10**	**7**
Access Roads				
New Roads Co-located with Pipelines	0.3 miles	40 feet[2]	1.4	1.4
Existing Roads with New Pipelines	0 miles	10 feet[3]	--	--
Subtotal	**0.3 miles**	**--**	**1.4**	**1.4**
Gas and Water Pipelines				
Pipelines Co-located with New Roads	0.3 miles	35 feet[2]	1.3	0.5[4]
Pipelines Co-located with Existing Roads	0 miles	35 feet[3]	--	--[4]
Subtotal	**--**	**--**	**1.3**	**0.5**
Central Facilities				
Compressor Stations (New and Upgrades)	0	4 acres average	--	--
Subtotal	**0**	**--**	**--**	**--**
Total New Disturbance	**--**	**--**	**12.7**	**8.9**

[1] Residual disturbance calculations are based on the assumption that interim reclamation will be successful.
[2] Initial disturbance assumes that a 75-foot wide disturbance corridor would be needed for construction, 40 feet of which would be utilized for new road construction, and 35 feet of which would be utilized for pipeline installation.
[3] Initial disturbance assumes that a 45-foot wide disturbance corridor would be needed for construction, 10 feet of which would be utilized for general road improvements, and 35 feet of which would be utilized for pipeline installation.
[4] Residual disturbance assumes that 20 foot wide portion of the original 35-foot wide disturbance corridor would be reclaimed leaving a 15-foot wide corridor for the long-term pipeline corridor.

2.3 ALTERNATIVE C – AGENCY PREFERRED ALTERNATIVE

In accordance with CEQ regulations, the BLM is required to identify a preferred alternative in the EA if one or more exists. Alternative C is the Agency Preferred Alternative. For the RBU Project Area, the primary objective of the Agency Preferred Alternative is to meet the purpose and need for the project while minimizing or mitigating environmental impacts.

This alternative would incorporate the same construction and operational components as the Proposed Action with additional environmental protection measures applied to those actions taking place on federal lands. None of the environmental protection measures described in this alternative would disallow lawful access to develop a lease, but they may require relocation of well pads, roads, or ancillary facilities within the lease, or require special construction or operational methods to reduce potential environmental impacts.

Conservation of resources under Alternative C would be enhanced by the following project requirements and limitations:

- No new surface disturbance would occur within USFWS designated Level 1 core conservation areas for Uinta Basin hookless cactus.
- No new surface disturbance would occur within mapped 100-year floodplains.
- No new surface disturbance would occur within the Lower Green River suitable WSR.
- No new surface disturbance will occur within Visual Resource Management (VRM) Class II areas.

Under Alternative C, the amount of proposed infrastructure and construction methods would include the development of up to 250 wells, including 70 new well pads. **Figure 2.3-1** illustrates the locations of the proposed and existing well pads, and approximates the locations of the new well pads that would be utilized in the RBU Project Area under Alternative C. Gas production in the existing RBU Project Area would be developed through the use of vertical and directional drilling. Specifically, Alternative C includes the following primary components:

- Vertical drilling of up to 70 natural gas wells from 70 new well pads;
- Directional drilling of up to 155 natural gas wells from existing well pads (well pads would be expanded by up to 0.5 acre per well);
- Directional drilling of up to 25 natural gas wells from the 70 new well pads;
- Construction of up to 9 miles of new co-located road, gas lines, and produced water lines;
- Depending upon well production, installation of up to 99 miles of replacement gas lines that would transport gas produced from both existing and proposed wells to the main gathering lines. These replacement spur gas lines would be buried adjacent to the existing gas lines; and
- Construction of one new compressor station and expansion of nine existing compressor stations that would increase field compression to 4,841 horsepower and dehydration of 57 million cubic feet per day (MMcfd).

Under this alternative, construction, drilling, and completion of all 250 wells would occur for approximately 4 years. The total number of wells drilled would depend largely on production success, engineering technology, reservoir characteristics, economic factors, commodity prices, rig availability, and lease stipulations. The anticipated life of an individual well is 20 to 30 years, and the anticipated time it would take for field abandonment and final reclamation is 5 years. Therefore, the anticipated life of the project under Alternative C would be up to 39 years.

INSERT Figure 2.3-1.

Development assumptions and surface disturbance anticipated under Alternative C are shown in **Table 2.3-1**. Initial surface disturbance for well pads, access roads, pipeline ROWs, and other surface facilities would equal approximately 924 acres. Those portions of the well pads, access road ROWs, pipeline ROWs, and other facilities not needed for production operations would be reclaimed within one to two growing seasons. Residual surface disturbance would be approximately 562 acres which would remain for the life of the well(s).

Table 2.3-1. Surface Disturbance Under Alternative C

Project Feature	Number or Miles	Size (disturbance width [feet] or acres/facility)	Initial Surface Disturbance (acres)	Residual Surface Disturbance (acres)[1]
Well Pads				
Proposed New Vertical Well Pads	70	2.5 acres	175	105
Proposed Directional Wells From Existing Well Pads	155	0.5 acres	78	52
Proposed Directional Wells From New Well Pads	25	0.5 acres	13	9
Subtotal	**250**	**--**	**266**	**166**
Access Roads				
New Roads Co-located with Pipelines	9 miles	40 feet[2]	44	44
Existing Roads with New Pipelines	99 miles	10 feet[3]	120	120
Subtotal	**108 miles**	**--**	**164**	**164**
Gas and Water Pipelines				
Pipelines Co-located with New Roads	9 miles	35 feet[2]	38	16[4]
Pipelines Co-located with Existing Roads	99 miles	35 feet[3]	420	180[4]
Subtotal	**--**	**--**	**458**	**196**
Central Facilities				
Compressor Stations (New and Upgrades)	9[5]	4 acres average	36	36
Subtotal	**9**	**--**	**36**	**36**
Total New Disturbance	**--**	**--**	**924**	**562**

[1] Residual disturbance calculations are based on the assumption that interim reclamation will be successful.
[2] Initial disturbance assumes that a 75-foot wide disturbance corridor would be needed for construction, 40 feet of which would be utilized for new road construction, and 35 feet of which would be utilized for pipeline installation.
[3] Initial disturbance assumes that a 45-foot wide disturbance corridor would be needed for construction, 10 feet of which would be utilized for general road improvements, and 35 feet of which would be utilized for pipeline installation.

[4] Residual disturbance assumes that 20 foot wide portion of the original 35-foot wide disturbance corridor would be reclaimed leaving a 15-foot wide corridor for the long-term pipeline corridor.
[5] Includes the construction of one new and the expansion of eight existing compressor stations.

All other aspects of this alternative would be identical to that of the Alternative A – Proposed Action as discussed in **Sections 2.1.1** through **2.1.14**.

2.4 ALTERNATIVE D – MINIMUM DEVELOPMENT ALTERNATIVE

This alternative was developed in response to issues raised regarding air quality during the agency scoping process. This alternative would incorporate the same construction and operational components as the Proposed Action with 334 fewer wells. Additional environmental protection measures would also be applied to those actions taking place on federal lands. None of the environmental protection measures described in this alternative would disallow lawful access to develop a lease, but they may require relocation of well pads, roads, or ancillary facilities within the lease, or require special construction or operational methods to reduce potential environmental impacts.

Similar to Alternative C, conservation of resources under Alternative D would also be enhanced by the following project requirements and limitations:

- No new surface disturbance would occur within USFWS designated Level 1 core conservation areas for Uinta Basin hookless cactus.
- No new surface disturbance would occur within mapped 100-year floodplains.
- No new surface disturbance would occur within the Lower Green River suitable WSR.
- No new surface disturbance will occur within Visual Resource Management (VRM) Class II areas.

Under Alternative D, the amount of proposed infrastructure and construction methods would include the development of up to 150 wells including 42 new well pads. **Figure 2.4-1** illustrates the locations of the proposed and existing well pads, and approximates the locations of the new well pads that would be utilized in the RBU Project Area under the Proposed Action. Gas production in the existing RBU Project Area would be developed through the use of vertical and directional drilling.

Specifically, Alternative D includes the following primary components:

- Vertical drilling of up to 42 natural gas wells from new well pads;
- Directional drilling of up to 96 natural gas wells from existing well pads (well pads would be expanded by up to 0.5 acre per well);
- Directional drilling of up to 12 natural gas wells from the 42 proposed new well pads;
- Construction of up to 7 miles of new co-located road, gas lines, and produced water lines;
- Depending upon well production, installation of up to 61 miles of replacement gas lines that would transport gas produced from both existing and proposed wells to the main gathering lines. These replacement spur gas lines would be buried adjacent to the existing gas lines; and
- Construction of one new compressor station and expansion of up to nine existing compressor stations that would increase field compression to 2,905 horsepower and dehydration of 34 million cubic feet per day (MMcfd).

INSERT Figure 2.4-1

Table 2.4-1. Surface Disturbance Under Alternative D

Project Feature	Number or Miles	Size (disturbance width [feet] or acres/facility)	Initial Surface Disturbance (acres)	Residual Surface Disturbance (acres)[1]
Well Pads				
Proposed New Vertical Well Pads	42	2.5 acres	105	63
Proposed Directional Wells From Existing Well Pads	96	0.5 acres	48	32
Proposed Directional Wells From New Well Pads	12	0.5 acres	6	4.1
Subtotal	**150**	**--**	**159**	**99**
Access Roads				
New Roads Co-located with Pipelines	7 miles	40 feet[2]	34	34
Existing Roads with New Pipelines	61 miles	10 feet[3]	74	74
Subtotal	**68 miles**	**--**	**108**	**108**
Gas and Water Pipelines				
Pipelines Co-located with New Roads	7 miles	35 feet[2]	30	13[4]
Pipelines Co-located with Existing Roads	61 miles	35 feet[3]	259	111[4]
Subtotal	**--**	**--**	**289**	**124**
Central Facilities				
Compressor Stations (New and Upgrades)	9[5]	4 acres average	36	36
Subtotal	**9**	**--**	**36**	**36**
Total New Disturbance	**--**	**--**	**592**	**367**

[1] Residual disturbance calculations are based on the assumption that interim reclamation will be successful.
[2] Initial disturbance assumes that a 75-foot wide disturbance corridor would be needed for construction, 40 feet of which would be utilized for new road construction, and 35 feet of which would be utilized for pipeline installation.
[3] Initial disturbance assumes that a 45-foot wide disturbance corridor would be needed for construction, 10 feet of which would be utilized for general road improvements, and 35 feet of which would be utilized for pipeline installation.
[4] Residual disturbance assumes that 20 foot wide portion of the original 35-foot wide disturbance corridor would be reclaimed leaving a 15-foot wide corridor for the long-term pipeline corridor.
[5] Includes the construction of one new and the expansion of eight existing compressor stations.

Under alternative, construction, drilling, and completion of all 150 wells would occur for approximately 3 years. The total number of wells drilled would depend largely on production success, engineering technology, reservoir characteristics, economic factors, commodity prices, rig availability, and lease stipulations. The anticipated life of an individual well is 20 to 30 years, and the anticipated time it would

take for field abandonment and final reclamation is 5 years. Therefore, the anticipated life of the project under Alternative C would be up to 38 years.

Development assumptions and surface disturbance anticipated under Alternative C are shown in **Table 2.4-1**. Initial surface disturbance for well pads, access roads, pipeline ROWs, and other surface facilities would equal approximately 592 acres. Those portions of the well pads, access road ROWs, pipeline ROWs, and other facilities not needed for production operations would be reclaimed within one to two growing seasons. Residual surface disturbance would be approximately 367 acres which would remain for the life of the well(s).

All other aspects of this alternative would be identical to Alternative A – Proposed Action and discussed in **Sections 2.1.1** through **2.1.14**.

2.5 COMPARISON SUMMARY OF IMPACTS AMONG ALTERNATIVES

Table 2.5-1 summarizes the impacts that would occur under each alternative. A full analysis of the impacts under each alternative is provided in **Chapter 4** of the EA.

2.6 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM FURTHER ANALYSIS

2.6.1 Vertical Drilling to Attain 20-acre Spacing

An alternative was considered that proposed a second well pad and road development for every 40-acre section in order to attain 20-acre well downhole spacing using vertical drilling. As directional drilling has been proven to be a viable technology for the RBU Project Area and as the objective of minimizing surface disturbance could not be accomplished by utilizing vertical drilling, this alternative was eliminated.

2.6.2 Surface Gas Lines

An additional alternative considered that all proposed replacement gas lines be placed on the surface within the existing pipeline ROWs. To prevent freezing, all water lines would have to be buried adjacent to the proposed gas line. All other components of this alternative including the proposed infrastructure, construction methods, statutory and regulatory requirements, and ACEPMs would be identical to those described above under Alternative B – Proposed Action. This alternative was eliminated from further consideration because the impacts from the development under this alternative were not substantially different from those of the Proposed Action alternative.

Table 2.5-1 Impact Summary Comparison Among Alternatives.

ALTERNATIVE		ALTERNATIVE A - PROPOSED ACTION			ALTERNATIVE B - NO ACTION ALTERNATIVE			ALTERNATIVE C - AGENCY PREFERRED ALTERNATIVE			ALTERNATIVE D - RESOURCE PROTECTION ALTERNATIVE		
PROJECT FEATURE	**Size (disturbance width [feet] or acres/facility)**	**Number or Miles**	**Initial Surface Disturbance (acres)**	**Residual Surface Disturbance (acres)[1]**	**Number or Miles**	**Initial Surface Disturbance (acres)**	**Residual Surface Disturbance (acres)[1]**	**Number or Miles**	**Initial Surface Disturbance (acres)**	**Residual Surface Disturbance (acres)[1]**	**Number or Miles**	**Initial Surface Disturbance (acres)**	**Residual Surface Disturbance (acres)[1]**
Well Pads													
Proposed New Vertical Well Pads	2.5 acres	74	185	111	1	2.5	1.5	70	175	105	42	105	63
Proposed Directional Wells	0.5 acres	410	205	136	15	7.5	5.5	180	91	61	108	54	36
Subtotal	**--**	**484**	**390**	**247**	**16**	**10**	**7**	**250**	**266**	**166**	**150**	**159**	**99**
Access Roads													
New Roads Co-located with Pipelines	40 feet[2]	12 miles	58	58	0.3 miles	1.4	1.4	9 miles	44	44	7 miles	34	34
Existing Roads with New Pipelines	10 feet[3]	99 miles	120	120	0 miles	--	--	99 miles	120	120	61 miles	74	74
Subtotal	**--**	**111 miles**	**178**	**178**	**0.3 miles**	**1.4**	**1.4**	**108 miles**	**164**	**164**	**68 miles**	**108**	**108**
Gas and Water Pipelines													
Pipelines Co-located with New Roads	60 feet[2]	12 miles	51	22[4]	0.3 miles	1.3	0.5[4]	9 miles	38	16[4]	7 miles	30	13[4]
Pipelines Co-located with Existing Roads	60 feet[3]	99 miles	420	180[4]	0 miles	--	--[4]	99 miles	420	180[4]	61 miles	259	111[4]
Subtotal	**--**	**--**	**471**	**202**	**0.3 miles**	**1.3**	**0.5**	**--**	**458**	**196**	**--**	**289**	**124**

ALTERNATIVE		ALTERNATIVE A - PROPOSED ACTION			ALTERNATIVE B - NO ACTION ALTERNATIVE			ALTERNATIVE C - AGENCY PREFERRED ALTERNATIVE			ALTERNATIVE D - RESOURCE PROTECTION ALTERNATIVE		
PROJECT FEATURE	**Size (disturbance width [feet] or acres/facility)**	**Number or Miles**	**Initial Surface Disturbance (acres)**	**Residual Surface Disturbance (acres)[1]**	**Number or Miles**	**Initial Surface Disturbance (acres)**	**Residual Surface Disturbance (acres)[1]**	**Number or Miles**	**Initial Surface Disturbance (acres)**	**Residual Surface Disturbance (acres)[1]**	**Number or Miles**	**Initial Surface Disturbance (acres)**	**Residual Surface Disturbance (acres)[1]**
Central Facilities													
Compressor Stations (New and Upgrades)	4 acres	9	36	36	0	--	--	9	36	36	9	36	36
Subtotal	**--**	**9**	**36**	**36**	**0**	**--**	**--**	**9**	**36**	**36**	**9**	**36**	**36**
Total New Disturbance	**--**	**--**	**1,075**	**663**	**--**	**12.7**	**8.9**	**--**	**924**	**562**	**--**	**592**	**367**
Life of Project (LOP)		Up to 43 Years			Up to 36 Years			Up to 39 Years			Up to 38 Years		

[1] Residual disturbance calculations are based on the assumption that interim reclamation would be successful.
[2] Initial disturbance assumes that a 75-foot wide disturbance corridor would be needed for construction, 40 feet of which would be utilized for new road construction, and 35 feet of which would be utilized for pipeline/utility line installation.
[3] Initial disturbance assumes that a 45-foot wide disturbance corridor would be needed for construction, 10 feet of which would be utilized for general road improvements, and 35 feet of which would be utilized for pipeline/utility line installation.
[4] Residual disturbance assumes that 20 foot wide portion of the original 35-foot wide disturbance corridor would be reclaimed leaving a 15-foot wide corridor for the long-term pipeline/utility corridor.

3.0 AFFECTED ENVIRONMENT

3.1 INTRODUCTION

This section discusses the existing physical, biological, and social factors, as they currently exist within the RBU Project Area and surrounding region. All resources considered during preparation of this EA are listed in **Appendix A**, the Interdisciplinary Team Analysis Record Checklist. Resources that were considered but dismissed from further analysis are also listed in **Appendix A**. This chapter provides the baseline for comparison of impacts/consequences described in **Chapter 4**.

3.2 RESOURCES BROUGHT FORWARD FOR ANALYSIS

3.2.1 Air Quality

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

3.2.1.1 Climate

The RBU Project Area is within a semiarid mid-continental climate regime typified by dry windy conditions and limited precipitation. The Uinta Basin is bordered by the Wasatch Range to the west, which extends north and south through the middle of the State, and the Uinta Mountains to the north, which extend east and west through the northeast portion of the State. Elevation of the RBU Project Area ranges from 4,800 feet above mean sea-level (amsl) to 5,400 feet amsl.

The closest climate measurements to the Project Area were recorded at Ouray 4 NE, Utah (1955-2006). The Ouray 4 NE station is located 8 miles north of compressor station TAP 5 at an elevation of 5,000 famsl (Western Regional Climate Center 2006). **Table 3.2-1** summarizes the mean temperature range, mean total precipitation, and mean total snowfall by month at that location.

Prevailing synoptic-scale westerly air masses originating from the Pacific Ocean are typically interrupted by the western mountain ranges before reaching the Uinta Basin. As a result, the lower elevations of the Uinta Basin receive a relatively low amount of precipitation. The higher elevations of the area generally receive a higher amount of precipitation.

3.2.1.2 Winds and Atmospheric Stability

The transportation and dilution of air pollutants are primarily a function of wind speed and direction. As wind speed increases, the dispersion of emitted pollutants also increases, thereby reducing pollutant concentrations.

Wind data within the RBU Project Area have not been directly measured. Local terrain effects will influence the wind profiles specific to the RBU Project Area. However, general wind speed and direction data are available from the Vernal Airport, (Vernal, Utah). **Figure 3.2-1** presents a wind rose depicting wind speed and direction for the period of 2005 – 2009. Note that the data represent the direction from which the wind is blowing (e.g., Wind Direction Origin). As shown, winds originate predominately from the west and west-northwest. Winds are calm 10.1 percent of the time.

Table 3.2-1. Temperature, Precipitation and Snowfall at Ouray 4 NE, Utah (1955-2006).

Season	Month	Average Temperature Range (° Fahrenheit)	Average Total Precipitation (inches)	Average Total Snowfall (inches)
Spring	March	23.7 – 54.1	0.5	1.4
	April	33.4 – 65.8	0.7	0.6
	May	42.8 – 77.2	0.7	0.0
	Total Spring Average	*33.3 – 65.7*	*1.9*	*2.0*
Summer	June	50.2 – 87.6	0.5	0.0
	July	56.1 – 94.7	0.6	0.0
	August	53.9 – 91.6	0.6	0.0
	Total Summer Average	*53.4 – 91.3*	*1.7*	*0.0*
Fall	September	43.9 – 81.1	0.8	0.0
	October	32.1 – 67.4	0.9	0.4
	November	20.6 – 47.6	0.5	1.8
	Total Fall Average	*32.2 – 65.4*	*2.2*	*2.2*
Winter	December	7.7 – 33.2	0.4	3.9
	January	2.8 – 29.2	0.4	4.3
	February	9.9 – 37.8	0.4	2.8
	Total Winter Average	*6.8 – 33.4*	*1.2*	*11.0*
Total Annual Average		***31.4 – 63.9***	***6.9***	***15.2***

Source: Western Regional Climate Center 2006. Data collected at Ouray 4 NE, Utah from 1955 to 2006.

3.2.1.3 Air Quality Evaluation Criteria

Criteria Pollutants

The EPA has promulgated National Ambient Air Quality Standards (NAAQS) to protect human health and welfare with an adequate margin of safety. Standards have been set for the following pollutants: ozone (O_3), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), lead (Pb), and particulate matter less than 10 microns in diameter (PM_{10}) or 2.5 microns in diameter ($PM_{2.5}$). The primary standards are set to protect public health, whereas secondary standards are set to protect public welfare (e.g., injury to crops or forests). When an area meets the NAAQS through monitoring, it is designated as attainment. Conversely if an area does not meet the NAAQS, it is designated as nonattainment. If an area does not have enough air monitoring data to make a NAAQS determination, it is designated as unclassified and is regulated as an attainment area. Uintah County is currently designated as unclassified/attainment for all criteria pollutants.

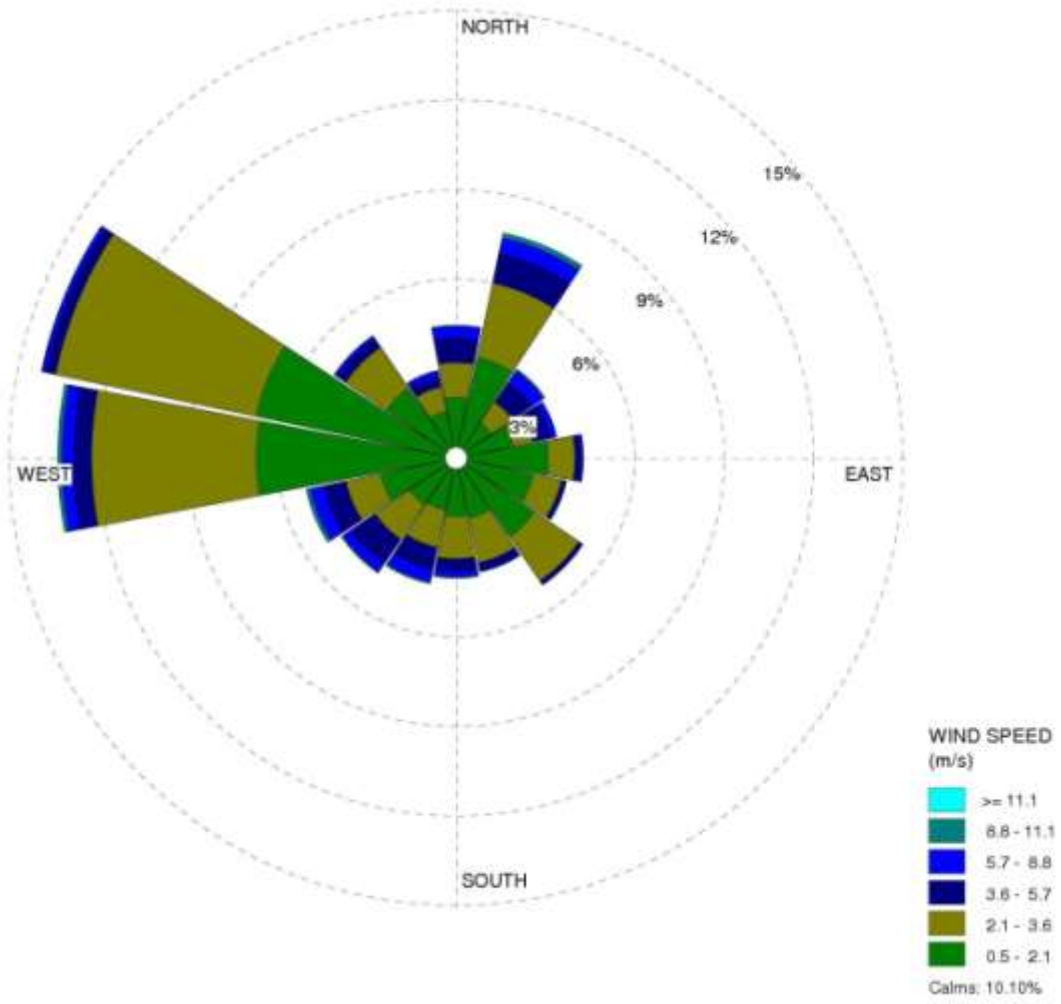


Figure 3.2-1. Wind Rose from Vernal Airport Data 2005-2009 (Vernal, UT)

Under the Prevention of Significant Deterioration (PSD) provisions of the Clean Air Act (CAA), incremental increases of specific pollutant concentrations are limited above a legally defined baseline level. Many national parks and wilderness areas are designated as PSD Class I. The PSD program protects air quality within Class I areas by allowing only slight incremental increases in pollutant concentrations. Areas of the State not designated as PSD Class I are classified as Class II. For Class II areas, greater incremental increases in ambient pollutant concentrations are allowed as a result of controlled growth. The closest Class I areas are Arches National Park (65 miles south) and Canyonlands National Park (85 miles south).

The NAAQS standards, and the PSD increments as reported by the Utah Department of Environmental Quality (UDEQ) Division of Air Quality (UDAQ) for Class I and II areas, are presented in **Table 3.2-2**.

Table 3.2-2. Ambient Criteria Pollutant National and State Ambient Air Quality Standards, and Prevention of Significant Deterioration (PSD) Increments

Pollutant	Averaging Period(s)	Uinta Basin Background Concentration [a] ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)	PSD Class II Increment ($\mu g/m^3$)
SO_2	3-hour 1-hour	16.7 21.7	1,300 197	512 --
NO_2 NO_2	Annual 1-hour	9.0 69.9	100 188	25 --
PM_{10}	24-hour	18.0	150	30
$PM_{2.5}$	Annual 24-hour	12.3 21.6[b]	15 35	4 9
CO CO	8-hour 1-hour	3,910 6,325	10,000 40,000	None None
O_3	8-hour	62-117 ppb[c]	75 ppb	None

[a] Data for this table were obtained from the USEPA Air Quality System (AQS) website (Greater Natural Buttes FEIS, AQTSD, March 2012). Background data from: Ouray Monitoring Station Data (USEPA AQS Database). 2009/2010 data period = 7/30/09 to 6/30/2010. 20010/2011 period = 7/1/2010 to 6/30/2011. Redwash Monitoring Station Data (USEPA AQS Database). 2009/2010 data period = 7/30/09 to 6/30/2010. 20010/2011 period = 7/1/2010 to 6/30/2011.

[b] Value for PM 2.5 24-hour is 2-year average from the Ouray monitor.

[c] Ozone data is the Highest 4th High from Ouray Monitoring Station data for the period 7/30/2009 through 6/30/2010 and is the highest value from two years and two monitoring stations in the area, Redwash and Ouray (AQIA, Greater Natural Buttes Supplement to the DEIS, Feb 2011 based on USEPA AQS Database). Ozone data shown is unofficial and non-regulatory, and presented for informational purposes only. There is considerable variability in background ozone concentrations and the high, 4th-high values shown here are isolated events that do not represent the background ozone concentration in the region. The background ozone concentrations are normally much less than 75 ppb, as discussed further in the text.

Active year-round air quality monitoring in the Uinta Basin began in the summer of 2009 south of Vernal at two monitoring sites: Red Wash and Ouray. As of the Fall of 2011, the monitors at Ouray and Redwash were certified as Federal Reference Method (FRM). The data collected after they were certified can be used to make a NAAQS determination. The complete EPA Ouray and Redwash monitoring data can be found at: http://www.epa.gov/airexplorer/index.htm.

Before being certified as FRM monitors, both the Ouray and Red Wash monitoring sites recorded numerous exceedances of the 8 hour ozone standard during the winter months (January through March 2010 and 2011). Winter ozone is being formed under a "cold pool" process whereby stagnate air conditions with very low mixing heights form under clear skies with snow-covered ground and abundant sunlight that, combined with area precursor emissions (NO_x and VOCs), create intense episodes of ozone. Similar high numbers were not seen during the 2012 monitoring season due to the lack of snow cover, and no exceedance of the NAAQS was observed in the 2012 monitoring season with the highest 8-hour observation being 62 ppb. Outside of the isolated winter time observations, ozone concentrations in the region are much less than 75 ppb. Relatively high winter time ozone exceedances have also been observed in similar types of locations in Wyoming and have contributed to a nonattainment designation for ozone for Sublette County, Wyoming. Winter ozone formation is a newly recognized issue, and the

methods of analyzing and managing this problem are still in development. Existing photochemical models are currently unable to replicate winter ozone formation satisfactorily, in part due to the very low mixing heights associated with the unique meteorology of these ambient conditions.

The Utah Division of Air Quality (UDAQ) conducted limited monitoring of $PM_{2.5}$ in Vernal, Utah in December 2006. During the 2006-2007 winter seasons, $PM_{2.5}$ levels were measured at the Vernal monitoring station that were higher than the $PM_{2.5}$ health standard that became effective in December 2006. The $PM_{2.5}$ levels recorded in Vernal were similar to other areas in northern Utah that experience wintertime inversions. The sources of elevated $PM_{2.5}$ concentrations during winter inversions in Vernal, Utah haven't been identified as of yet. The most likely causes of elevated $PM_{2.5}$ at the Vernal monitoring station are probably those common to other areas of the western U.S. (combustion and dust) plus nitrates and organics from oil and gas activities in the Basin. $PM_{2.5}$ monitoring that has been conducted in the vicinity of oil and gas operations in the Uinta Basin by the Red Wash and Ouray monitors beginning in summer 2009 have not recorded any exceedances of either the 24 hour or annual NAAQS.

In 2008, the BLM participated in the Uinta Basin Air Quality Study (UBAQS) technical analysis of the potential air quality and air quality related value impacts that may result from oil and gas industry activity and other emission sources within the Uinta Basin. This analysis, known as the UBAQS, was finalized in 2009. The analysis calculated that air quality in the Basin is expected to remain in compliance with the NAAQS for criteria pollutants out to 2012 (IPAMS, UBAQS 2009). Additional analysis carried out for the GASCO EIS and Anadarko Greater Natural Buttes EIS have also shown that air quality in the Basin is expected to remain in compliance with the NAAQS for criteria pollutants.

Hazardous Air Pollutants

Under section 112(d) of the CAA, the EPA is required to develop regulations establishing national emission standards for hazardous air pollutants for all industries that emit one or more of the pollutants in major source quantities. These standards are established to reflect the maximum degree of reduction in HAP emissions through application of maximum achievable control technology (MACT). Source categories for which MACT standards have been implemented include Oil and Natural Gas Production and Natural Gas Transmission and Storage.

There are no applicable Federal or State of Utah ambient air quality standards for assessing potential HAP impacts to human health. However, the State of Utah has adopted Toxic Screening Levels (TSLs) which are applied during the air permitting process to assist in the evaluation of HAPs released into the atmosphere (UDEQ-UDAQ 2000). The TSLs are derived from Threshold Limit Values (TLVs) published in the American Conference of Governmental Industrial Hygienists (ACGIH) – "Threshold Limit Values for Chemical Substances and Physical Agents" (ACGIH 2007). These levels are not standards that must be met, but screening thresholds which if exceeded, would suggest that additional information is needed to evaluate potential health and environmental impacts. The UDEQ-UDAQ, TSLs are presented in **Table 3.2-3**.

Greenhouse Gases

According to the EPA (EPA 2008a and 2008b), the burning of fossil fuels over the past 200 years and deforestation have caused the concentrations of heat-trapping "greenhouse gases" to increase in our atmosphere. These gases prevent heat from escaping to space, somewhat like the glass panels of a greenhouse.

Greenhouse gases are necessary to life as we know it, because they keep the planet's surface warmer than it otherwise would be. But, as the concentrations of these gases continue to increase in the atmosphere,

the Earth's temperature is climbing above past levels. According to National Oceanic and Atmospheric Administration (NOAA) and National Aeronautics and Space Administration (NASA) data, the Earth's average surface temperature has increased by about 1.2º F to 1.4º F in the last 100 years. The eight warmest years on record (since 1850) have all occurred since 1998, with the warmest year being 1998. However, according to the British Meteorological Office's (BMO) Hadley Centre (BMO 2009), the United Kingdom's foremost climate change research center, the mean global temperature has been relatively constant for the past nine years after the warming trend from 1950 through 2000. So while scientists believe that Earth will continue to warm in the future, this warming has not occurred for the past ten years. Therefore, quantified or globally accepted predictions on the ultimate outcome of global warming, is still unknown. The warmest year on record was 1998, a year associated with the most intense El Nino global phenomena ever experienced. Most of the warming from 1950 through 2000 is speculated to be the result of human activities. Other aspects of the climate, such as rainfall patterns, snow and ice cover, and sea level, are also changing.

Table 3.2-3. Utah Toxic Screening Levels (TSLs)

Pollutant and Averaging Time	TSLs (µg/m^3)
Formaldehyde (1-hour)	36.8
Acrolein (1-hour)	22.9
Benzene[a] (24-hour)	53.2
Toluene (24-hour)	2,512
Ethylbenzene (24-hour)	14,473
Xylenes (24-hour)	14,473
n-Hexane (24-hour)	5,875
1,3 Butadiene	147

Although there exists an acute TLV for benzene, the State of Utah does not apply a comparison to an acute TSL since the chronic TSL is more stringent.
Source: UDEQ-UDAQ, 2008b

If greenhouse gases continue to increase, climate models predict that the average temperature at the Earth's surface could increase from 3.2º F to 7.2º F above 1990 levels by the end of 21st Century. Scientists speculate that human activities are changing the composition of the atmosphere, and that increasing the concentration of greenhouse gases will change the planet's climate. But scientists are not sure by how much it will change, at what rate it will change, or what the exact effects will be.

3.2.1.4 Existing Sources of Air Pollution

The Uinta Basin has seen recent oil and gas development on Federal, Tribal, State, and private lands.

Existing point and area sources of air pollution within the RBU Project Area and surrounding region include the following:

- Exhaust emissions, primarily CO, NO_2, and formaldehyde, from existing natural gas-fired compressor engines used in production of natural gas;
- Natural gas dehydrator still-vent emissions of VOCs, BTEX and *n*-hexane;
- VOC emissions from fugitive sources;
- Gasoline and diesel-fueled vehicle tailpipe emissions of VOC, NO_2, CO, SO_2, PM_{10}, and $PM_{2.5}$;

- SO_2, NO_2, and fugitive dust emissions from coal-fired power plants and coal mining and processing;
- Fugitive dust (in the form of PM_{10} and $PM_{2.5}$) from vehicle traffic on unpaved roads, wind erosion in areas of soil disturbance, and road sanding during winter months; and
- Long-range transport of pollutants from distant sources contributing to regional haze.

3.2.2 Soils

The development of soils is governed by many factors, including climatic conditions (e.g., the amount and timing of precipitation, temperature, and wind), the parent material that the soil is derived from, topographic position (e.g., slope, elevation, and aspect), geomorphic processes, and time.

3.2.2.1 RBU Project Area Soil Types

The Soil Survey of Uintah Area, Utah – Parts of Daggett, Grand, and Uintah Counties, published by the U.S. Department of Agriculture (USDA) Soil Conservation Service, is the primary source of information concerning soils in the RBU Project Area (USDA-NRCS 2003). This survey has been supplemented by additional information available on the National Resource Conservation Service (NRCS) soils web site (USDA-NRCS 2007a). Soil information is not available for that portion of the RBU Project Area located on Tribal lands.

Soils in the RBU Project Area are developed on the side slopes of canyons, benches, ridges, hills, alluvial fans, and floodplains. In addition, about 59 acres of the RBU Project Area are covered by bare rock outcrop. **Figure 3.2-2** illustrates the eight soil map units within the RBU Project Area and shows the relationship of these soil units with the proposed development locations. **Appendix C** summarizes the soil textures, parent materials, landforms, slopes, depth class, runoff speed, and other factors of the soil map units in the RBU Project Area that are relevant to erosion and reclamation potential. Sixty-nine percent of the RBU Project Area is covered by just three soil types. Over 42 percent (7,111 acres) is covered by the Motto-Casmos complex that consists largely of clay loams. Another 19 percent (3,105 acres) is covered by the Motto-Rock Outcrop complex, which consists largely of similar soil types; and 8 percent (1,257 acres) is covered by the Cadrina extremely stony loam-rock outcrop complex. The five remaining soil types cover between 15 and 539 acres each. The soils on the Tribal surface are assumed to be similar in nature to the soils that occur in the rest of the RBU Project Area.

3.2.2.2 Biological Soils

Many soils in the Uinta Basin possess characteristics typical of soils with a high potential to include biological soil crusts. Biological soil crusts (also known as cryptogrammic, cryptobiotic, microbiotic, and microphytic soils) are composed of a symbiotic association of cyanobacteria, lichens, mosses, green algae, microfungi, and bacteria that form a rough carpet on the surface and a soil-binding matrix below. Biological soil crusts typically occur as brownish or black soil crusts that appear on the surface of sandy desert soils. Since biological soils crusts are highly

INSERT Figure 3.2-2.

adaptable, they occur in the full range of arid soil types from shallow to deep, heavy to light textures, and moist to drier conditions. No site-specific inventories have been completed to document the presence of biological soil crusts in the RBU Project Area. As such, it is assumed for the purpose of this EA that biological soils crusts may occur intermittently in the Project Area.

3.2.2.3 Erosion and Reclamation Potential of RBU Project Area Soils

The key attributes used to evaluate potential environmental impacts to soils are erosion potential and ease of reclamation after soil disturbance. Soil mapping conducted by the NRCS typically provides information about each soil type within the mapped area that can be used to evaluate the erosion potential and reclamation potential of each soil unit (USDA-NRCS 2007a; USDA-NRCS 2007b).

Erosion Potential

Erosion potential can vary widely across soil units within a given area, and depends on the particle size distribution of the soil, the slopes on which it is found, and the amount and type of vegetative cover. The USDA-NRCS typically rates each of the soil units according to its water erosion potential (K_w). The erosion potential indicates the general susceptibility of a soil to sheet and rill erosion. The value of K_w ranges from 0.02 to 0.69. The higher the K_w value of a soil type, the more susceptible the soil type is to sheet and rill erosion. Erosion hazards become critical issues when protective vegetation is removed during and following activities such as well pad expansion. Typically, soils found on steeper slopes have a higher erosion hazard than those found on gentler slopes. Soils with more fines are at greater risk of wind erosion, and soils with more gravel and/or stones have a lower risk of wind erosion.

Most of the soil types within the RBU Project Area have erosion potentials of 0.15 or less, indicating moderate water erosion potential. Higher erosion potentials of 0.17 to 0.37 are given for the Crustown loamy sand (62) and Turzo loam (242). Soils on slopes greater than 40 percent and badland areas could be expected to have severe erosion potentials.

Reclamation Potential

Reclamation potential depends on soil structure, pH conditions, and soil salinity. Excessive salinity (salt content) or sodicity (sodium content) can inhibit the growth of desirable vegetation and therefore, successful reclamation.

The USDA has provided reclamation material source ratings for the soils in the RBU Project Area on the Web Soil Survey (USDA-NRCS 2007a). With the exception of the Turzo soils, all of the soils in the RBU Project Area are rated poor for reclamation potential based on the attributes of the primary soil type. The poor ratings are generally due to the shallow depth to bedrock, low organic matter content, high stone content, and excessive salinity or sodicity.

3.2.3 Water Resources

Water resources within the RBU Project Area include perennial surface water flows in Willow Creek; intermittent flows in ephemeral tributaries to Willow Creek, Hill Creek, and the Green River; and alluvial and bedrock groundwater.

3.2.3.1 Surface Water

Figure 3.2-3 shows the surface water features in the vicinity of the RBU Project Area. The RBU Project Area is primarily drained by Willow Creek and its ephemeral tributaries. Small portions of the RBU

Project Area also drain to Hill Creek and directly to the Green River. With the exception of Willow Creek, other streams in the RBU Project Area are ephemeral and only flow
in direct response to rainfall events. These streams have developed a dendritic drainage pattern and are incised with rills and gullies typical of badland topography.

Stream Classification

All streams and water bodies in Utah are assigned to one or more of five classes by the Utah Water Quality Board (UWQB). All streams within the RBU Project Area are classified as Class 2B, 3A, and 4. Class 2B streams are protected for secondary contact recreation such as boating, wading, or similar uses. Class 3A streams are protected for cold water species of game fish and other cold water aquatic life. Class 4 streams are protected for agricultural uses including irrigation of crops and stock watering.

Stream Flow

The USGS formerly maintained two surface water gauging stations in the vicinity of the RBU Project Area on Willow Creek and Hill Creek. The locations of these stations are shown on **Figure 3.2-3**. The station on Willow Creek monitored the combined flow from both creeks. The Hill Creek station was only monitored for discharge until September 1981, and the Willow Creek station was only monitored until 1983, but these data are still useful for determining flow conditions for these streams. **Table 3.2-4** presents summary flow data for the two stations.

Monthly mean discharge measured at the Willow Creek station over the period of record ranged from 10.4 cubic feet per second (cfs) in September to 66.5 cfs in May. Fifty percent of all flows were greater than 16 cfs at this location, and zero flow was recorded 3.4 percent of the time. The mean monthly discharge measured on Hill Creek was much less and ranged from 0.67 cfs in September to 16.7 cfs in May. Hill Creek is frequently dry during the late summer and winter months. No flow was recorded 46 percent of the time at this station during the period of record.

Table 3.2-4. Historic Stream Flow Data for USGS Gauging Stations

USGS Gauging Station Name and Number	Range of Monthly Mean Discharge (cfs)	Peak Daily Discharge (cfs)	Mean Annual Discharge (cfs)	Period of Record
Willow Creek near Ouray, Utah 09308000	10.4 (September) to 66.5 (May)	500 (August 27, 1952)	25.6	July 1947 – September 1983
Hill Creek Mouth near Ouray, Utah 09307900	0.67 (September) to 16.7 (May)	88 (May 26, 1979)	5.40	October 1974 – September 1981

Surface Water Quality

Table 3.2-5 provides a summary of the historic water quality data available for Hill Creek and Willow Creek. Water quality data were collected at the two USGS gauging stations described above, but not since 1983.

INSERT Figure 3.2-3.

Table 3.2-5. Historic Water Quality Data for Hill Creek and Willow Creek

Monitoring Station Name and Number	Parameters	Period of Record
Hill Creek Mouth near Ouray, Utah (USGS 09307900)	General Water Quality (alkalinity, hardness, pH, SC, TDS, TSS, temp, SAR), major ions (Ca, Mg, K, Na, HNO_3, Cl, F, SiO_2, ammonia, NO_2, NO_3, SO_4), trace metals (Al, As, Ba, B, Cu, Fe, Mn, Se, Sr, Zn)	February 1975 – November 1981
Willow Creek near Ouray, Utah (USGS 09308000)	General Water Quality (alkalinity, hardness, pH, SC, TDS, TSS, temp, SAR), major ions (Ca, Mg, K, Na, HNO_3, Cl, F, SiO_2, ammonia, NO_2, NO_3, SO_4), trace metals (Al, As, Ba, B, Cu, Fe, Mn, Se, Sr, Zn)	December 1950 – January 1955; October 1974 – September 1983
Willow Creek Near Ouray Above Conf w/ Green River (UDEQ 4933500)	General Water Quality (alkalinity, hardness, pH, DO, SC, TDS, TSS, temp, Turbidity), major ions (Ca, Mg, K, Na, HNO_3, Cl, ammonia, NO_2, NO_3, SO_4), trace metals (Al, As, Ba, B, Cd, Cr, Cu, Fe, Pb, Mn, Hg, Ni, Se, Ag, Zn)	August 1982 – May 1983; March 1995 – June 1996; August 2000 – April 2001; July 2005 – May 2009
Willow Creek 1.5 Miles Above Jim Little Canyon (UDEQ 4933524)	General Water Quality (alkalinity, hardness, pH, DO, SC, TDS, TSS, temp, Turbidity), major ions (Ca, Mg, K, Na, HNO_3, Cl, ammonia, NO_2, NO_3, SO_4), trace metals (Al, As, Ba, B, Cd, Cr, Cu, Fe, Pb, Mn, Hg, Ni, Se, Ag, Zn)	July 2006 – February 2009

Sources: USGS 2012, EPA 2012

The Utah Division of Environmental Quality (UDEQ) monitors and assesses Willow Creek on a regular basis to determine if the stream is supporting beneficial uses. Water quality data have been, and are currently being, collected from Willow Creek at UDEQ station 4933500 located downstream of the RBU Project Area near Ouray, Utah above the confluence with the Green River **(see Figure 3.2-3)**. These data are stored in the EPA STORET database.

Table 3.2-6 provides a summary of the sample results for UDEQ station 4933500 for the period August 1982 to May 2009. Based on these data, the waters in Willow Creek are described as calcium-magnesium bicarbonate-sulfate type waters with high to very high hardness (260 to 531 mg/L as $CaCO_3$). Specific conductance values are similar to those recorded at USGS station 09308000. Total Dissolved Solids (TDS) range from 410 to 1,950 milligrams per liter (mg/L) and average 907 mg/L, in excess of the secondary standard of 500 mg/L. Total suspended solids (TSS) are highly variable and ranges from 14.4 mg/L to over 6,000 mg/L during the period of record. Ammonia, sulfate, aluminum, arsenic, cadmium, copper and iron also exceed the applicable standards for one or more samples each.

Willow Creek was listed on the Utah 2004 list of 303(d) impaired water bodies for TDS (UDEQ 2004). The majority of the elevated TDS in Willow Creek is due to erosion of the naturally saline geologic formations in the area, including the slightly to moderately saline Uinta Formation. Other potential sources of TDS in the watershed include irrigation return flows, erosion of unpaved road surfaces, and oil and gas activities. The TMDL for TDS was completed and approved in August 2004 (UDEQ 2008). Willow Creek is currently listed for benthic macroinvertebrate bioassessments (UDEQ 2010). The source of the impairment is not known. The completion of the assessment for Willow Creek was given a low priority.

Storm water permits or other associated permits may be required to conduct activities associated with the construction and operation of the proposed wells, however these would be determined on a site specific basis.

3.2.3.2 Groundwater

The principal aquifers in the RBU Project Area include unconsolidated alluvial deposits along Willow Creek, sandstone layers within the Uinta Formation, and two deeper sandstone zones within the Green River Formation (Hood and Fields 1978; Schlotthauer et al. 1981). The alluvial aquifers are usually unconfined whereas the consolidated aquifers are generally unconfined near outcrops and confined down dip.

Unconsolidated materials present in the valley fill along Willow Creek form the principal aquifer in the RBU Project Area. These deposits range in thickness from about 50 to 70 feet within the stream channels to about 200 feet near the mouths of major canyons. These alluvial aquifers can produce significant quantities of water (up to 1,000 gpm) from the floodplain deposits of the Green and White Rivers but generally produce lower quantities from deposits located along the ephemeral or intermittent streams (Hood and Fields, 1978; Schlotthauer et al. 1981). Other small areas of saturated alluvium may exist along the larger unnamed ephemeral streams in the area.

Table 3.2-6. Summary of Water Quality Analysis for Willow Creek, UDEQ Station 4933500

Parameters	Standards		Summary Statistics			
	Drinking Water	Aquatic Biota[3]	No. of Samples	No. of Detects	Range of Detects	Mean
General Water Quality Indicators						
Alkalinity as $CaCO_3$ (mg/L)			44	44	190 – 535	344
Dissolved Oxygen (mg/L)		>6.5	44	44	**5.1** – 19.52	9.53
pH	6.5 to 8.5[2]	6.5 to 9.0	84	84	8.10 – **9.15**	8.48
Hardness (mg/L)			24	24	260 – 531	415
Spec. Cond. (umhos/cm)			88	84	368 – 2,753	1,304
Temperature (^oC)			44	44	-0.26 – 24.7	11.3
Total Dissolved Solids (mg/L)	500[2]	1,200	44	54	410 – **1,950**	**907**
Total Suspended Solids (mg/L)		90	44	44	14.4 – **6,560**	**1,033**
Ionic Constituents (Total)						
Bicarbonate (mg/L)			44	44	232 – 720	410
Calcium (mg/L)			29	29	35 – 84	67.3
Chloride (mg/L)	250[2]		44	34	7.0 – 100	24.2
Magnesium (mg/L)			44	44	34.0 – 96.1	58.2
Ammonia (mg/L)		0.11 to 0.49[4]	31	10	0.05 – **0.121**	NC
Nitrite + Nitrate, total (mg/L)	10(1[5])	4	39	33	0.034 – 2.37	NC
Phosphate (mg/L)			37	36	0.01 – 1.42	0.63
Potassium (mg/L)			44	44	1.95 – 7.75	3.17
Sodium (mg/L)			44	44	46.4 – 458	160
Sulfate (mg/L)	250[2]		44	44	138 – 1,120	**380**
Trace Metals (Dissolved)						
Aluminum (ug/L)	50 to 200[2]	750	8	7	30.6 – **235**	93.3
Arsenic (ug/L)	10[1]	190	8	7	7.1 - 30.8	**11.1**
Barium (ug/L)	2,000[1]	1,000	8	7	38.6 – 142	71.8

Parameters	Standards		Summary Statistics			
	Drinking Water	Aquatic Biota[3]	No. of Samples	No. of Detects	Range of Detects	Mean
Boron (ug/L)			4	4	**266- 471**	360
Cadmium (ug/L)	5	250	9	1	**62**	NC
Chromium (ug/L)	100[1]	74	8	3	4.03 – 7.53	NC
Copper (ug/L)	1300[1], 1000[2]	9	8	2	**3.25**	NC
Iron (ug/L)	300[2]	1,000	11	9	29.6 – 3,420	480
Lead (ug/L)	15[1]	2.5	11	1	**4.49**	NC
Manganese (ug/L)	50[2]		11	5	5.3-153	NC
Selenium (ug/L)	50[1]	5	11	3	1.22 – 2.9	NC
Silver (ug/L)	100[2]	1.6	11	0	--	NC
Zinc (ug/L)	5,000[2]	120	11	2	12 – 42.3	NC

Bold values exceed standards
NC = Mean not calculated due to undefined non-detect values in database
(1) Federal Drinking Water Primary Maximum Contaminant Level (MCL)
(2) Federal Drinking Water Secondary Standard (SMCL)
(3) Aquatic life (Utah Water Quality Standards, R317-2 Utah Administrative Code).
(4) Value is dependent on temperature and pH
(5) Federal Drinking Water Quality Standard is 1 mg/L for Nitrite and 10 mg/L for Nitrate
Source: EPA 2012.

Unconsolidated deposits of alluvium and gravel on mesa tops and ridges may also locally contain some groundwater.

The Uinta Formation covers the majority of the RBU Project Area and contains water-bearing zones within confined sandstone layers surrounded by fine-grained siltstones and mudstones. Two zones within the Green River Formation are considered to be regional aquifers. The Birds Nest Aquifer, which may be present beneath the RBU Project Area, lies between the upper part of the Parachute Creek Member and the Mahogany Oil Shale Zone. The Douglas Creek Member of the Green River Formation also produces water to some wells from fine- to medium-grained sandstone beds (Howells et al. 1987).

The Instruction Memorandum (IM) No. UT 2010-055, published by the U.S. Department of Interior – Bureau of Land Management, provides information and guidance for locating and evaluating potential usable groundwater zones. The IM supports Onshore Oil and Gas Order No. 1 drilling plan requirements outlined in Section III, D., 3. and surface use plan of operation requirements in Sec. III, D., 4.

The IM was utilized to determine if the RBU Project Area has the potential to impact private wells and usable groundwater zones identified as Sole Source Aquifers (SSAs) or Drinking Water Source Protection Zones (DWSPZs). Attachments K and L of the IM were reviewed to determine if the RBU Project Area overlies a SSA. To determine if the RBU Project Area is located in a designated DWSPZ, a UDEQ interactive map was referenced and the results of the review indicated that the RBU Project Area does not overlie a SSA. The nearest SSA (Castle Valley) is located approximately ninety (90) miles to the south. In addition, the RBU Project Area does not overlie or intersect a DWSPZ. The closest DWSPZ (T4) is located approximately thirty-five (35) miles to the north.

Groundwater Quality

There is limited information concerning the quality of groundwater in the RBU Project Area. Groundwater in unconsolidated alluvial aquifers in the southern Uinta Basin generally reflects the overall

water quality of nearby streams, rivers, or recharge sources. Away from outcrop areas, water quality generally is poorer and becomes much higher in dissolved solids with depth. TDS concentrations in the Uinta Formation are reported to range from 3,260 mg/L to 64,300 mg/L (Schlotthauer et al. 1981). The Bird's-Nest Aquifer generally produces water with TDS between 3,000 and 10,000 mg/L, but some water from the zone is unusable (TDS more than 10,000 mg/L). The TDS of water in the Douglas Creek aquifer is also generally between 3,000 and 10,000 mg/L.

Use of groundwater from the Uinta and Green River Formations is limited to livestock watering and industrial uses because of its poor quality in terms of TDSs and hardness.

3.2.3.3 Floodplains

The most recent data available regarding 100-year floodplains in the RBU Project Area are from a 1977 U.S. Department of Housing and Urban Development and Federal Emergency Management Agency survey, which inventoried public and State lands in Uintah County.

Mapped 100-year floodplains are located along Willow Creek to the north of the RBU Project Area, along the Green River, and the lower reaches of a series of unnamed ephemeral washes in the center of the RBU Project Area, as shown on **Figure 3.2-3**. These floodplains are generally located on benches above the current stream channels that were formed by deposition of sediment carried by runoff from the adjacent ridges and canyon walls during storm and snowmelt events. These floodplains support riparian vegetation in some areas, and are underlain by alluvial groundwater aquifers.

3.2.4 Paleontological Resources

The entire RBU Project Area is underlain by exposed bedrock of the Uinta and Green River formations. Exploration of these deposits for vertebrate fossils began over 130 years ago and is still active today. The Uinta Formation has documented occurrences of invertebrate fossils, plants, and trace fossils in the form of invertebrate burrows, bird and mammal tracks, and coprolites. The Green River Formation has documented occurrences of vertebrate and invertebrate fossils throughout the formation. Soils are generally less than 20 inches deep, and bedrock outcroppings are found throughout the RBU Project Area. However, the occurrence of fossils in both formations is sporadic and unpredictable. Therefore, both of these units are classified as Class 4a (high occurrence of scientifically important fossils with little or no soil or vegetative cover)

3.2.5 Cultural Resources

The Area of Potential Effect (APE) for the proposed undertaking is the RBU Project Area. A Class I cultural resource inventory was conducted within the proposed RBU Project Area, on public lands administered by the BLM VFO, the BIA, and SITLA. The objective of the inventory was to identify the extent of previous cultural resource investigations within the RBU Project Area and the number, locations, types, and significance of those previously documented cultural resources. The Class I data review is used to predict the type and potential site density of cultural resources and provides a basis for assessing the potential impact to archaeological sites in the event that lands are developed for oil and gas exploration or other surface-disturbing land uses.

3.2.5.1 Cultural Background

The cultural-chronological sequence in the RBU Project Area includes the Archaic stage (7000 B.C. to A.D. 400), which can be further subdivided into Early, Middle, Late, and Terminal periods; the Formative

stage (A.D. 700 to A.D. 1250) (Matson, 1991), which is largely associated with the San Rafael Fremont in the RBU Project Area; the Protohistoric stage (A.D. 1200 to A.D. 1750), largely associated with Numic-speaking (Ute) peoples; and the historic period, which began with the arrival of Europeans in the eighteenth century.

3.2.5.2 Summary of Inventory Results

The Class I data-review resulted in the identification of 284 previous cultural resource inventories that have been conducted in the RBU Project Area. Most of the inventories were conducted during the permit process for oil and gas exploration and development, including seismic lines and well pad and pipeline construction. Of the 284 previous inventories, 251 (88 percent) resulted in a finding of no cultural resources. Thirty-three (12 percent) of these previous cultural resource inventories identified a total of 51 archaeological sites within the RBU Project Area (**Appendix D**). Of the 51 known archaeological sites that have been located within the RBU Project Area, 31 (61 percent) were evaluated to be eligible for listing on the NRHP, 18 (35 percent) were evaluated to be ineligible for listing on the NRHP, and two (0.04 percent) were not evaluated. These known archeological resources in the RBU Project Area are dominated by prehistoric sites (67 percent of the sites identified). Prehistoric site types within the RBU Project Area consist of lithic scatters, rock art, open camps, and rock shelters. Historic site types within the RBU Project Area consist of temporary camps, rock art, cairns, and Gilsonite mining sites.

Based on the results of the Class I data review, predictions about site density, location, type, and sensitivity within the RBU Project Area can be made tentatively. Because inventories in the RBU Project Area have been done mostly in response to clearances required for individual projects, their findings may not be representative of the entire RBU Project Area. However, given the available information, we can anticipate that sites would most likely be associated with temporary use of the area during the prehistoric time period. The available documentation indicates that sensitive sites (eligible to the NRHP) having additional research potential may be common in the immediate study area.

3.2.6 Livestock Grazing

The RBU Project Area contains portions of three grazing allotments: Green River AMP, Sand Wash, and Wild Horse Bench Allotments. These three allotments in the RBU Project Area are grazed by sheep or cattle during various grazing periods. **Figure 3.2-4** provides a map of the grazing allotments that occur in the RBU Project Area. Livestock grazing also occurs throughout portions of the RBU Project Area on Tribal lands. Formal allotments and grazing seasons have not been identified on Tribal or private lands.

An animal unit month (AUM) is defined as "the amount of dry forage required by one animal unit for one month based on a forage allowance of 26 pounds per day" (BLM, 2008c). Between the three allotments, there are approximately 2,325 livestock AUMs on 12,635 acres of usable land allotted for grazing within the RBU Project Area.

All allotments have been placed in one of three management categories: Category M (Maintain Existing Resource Conditions), Category I (Improve Existing Resource Conditions) and Category C (Custodial Management). Designation of categories is dynamic and primarily based on resource potential, resource use conflicts, opportunity for positive economic return on public investments, and the present management situation (BLM, 2008c). Details on each allotment, including management categories, within the RBU Project Area are summarized in **Table 3.2-7.**

INSERT Figure 3.2-4.

Table 3.2-7. Grazing Allotment Information in the RBU Project Area

Allotment Name	Type	Management Status	Use Period	Permitted AUMs Active	Permitted AUMs Suspended	Total Permitted AUMs	Total Allotment Acres	Usable[1] Allotment Acres within the RBU Project Area	Permitted AUMs[2] within the RBU Project Area
Green River AMP Allotment	Cattle	Improve	6/01 - 10/15	437	117	554	10,090	157	6
Sand Wash Allotment	Cattle	Maintain	11/30 - 04/30	4,526	1,350	5,876	74,424	2,592	160
Wild Horse Bench Allotment	Sheep	Improve	11/16 - 4/15	4,619	-	4,619	9,115	9,886	3,997
Total						**11,049**	**93,629**	**12,635**	**4,163**

Source: BLM, 2010
[1] Usable land is defined as land that has a slope lower than 40 percent.
[2] Allotment AUMs within the RBU Project Area were calculated using total permitted AUMs and total acreage for each grazing allotment.

3.2.7 Vegetation Including Special Status Plant Species and Invasive or Noxious Weeds

3.2.7.1 General Vegetation

The plant communities encountered in the RBU Project Area consist of typical Intermountain Basin shrubland associations. These communities are often mixed, transitional, or widely distributed.

The vegetation communities are mapped and described using data and descriptions from the Southwest Regional Gap Analysis Project (SWReGAP) vegetation maps (Lowry et al. 2007) according to methodologies and nomenclature adopted by the U.S. National Vegetation Classification System (US-NVCS) (FGDC 1997). In this effort, a total of 14 vegetation communities are recognized and mapped within the RBU Project Area **(Figure 3.2-5) (Table 3.2-8).** These 14 vegetation types can be grouped into five general land cover types. In order of abundance, they are Scrub/Shrub, Grasslands/Herbaceous, Woody Wetland, Barren Lands, and Disturbed Land.

<u>Scrub/Shrub</u>

The Scrub/Shrub land cover type covers approximately 12,831 acres within the Project Area and includes five vegetation cover types: Colorado Plateau Mixed Low Sagebrush Shrubland; Colorado Plateau Pinyon-Juniper Shrubland; Inter-mountain Basins Big Sagebrush Shrubland; Intermountain Basins Mat Saltbrush Shrubland; and Inter-mountain Basins Mixed Salt Desert Scrub. The five scrub/shrub vegetation types that occur in the Project Area are described briefly below.

Colorado Plateau Mixed Low Sagebrush Shrubland - This vegetation cover type occurs in the Colorado Plateau, Tavaputs Plateau, and Uinta Basin in canyons, gravelly draws, hilltops, and dry flats at elevations generally below 6,000 feet amsl. Soils are often rocky, shallow, and alkaline. It includes open shrublands and steppe dominated by black sagebrush (*Artemisia nova*) or Bigelow sagebrush (*Artemisia bigelovii*) sometimes with Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*). The Colorado Plateau Mixed Low Sagebrush Shrubland type covers 332 acres within the Project Area.

Intermountain Basins Big Sagebrush Shrubland - This vegetation cover type occurs throughout much of the western U.S., typically at elevations between 5,000 and 7,500 feet amsl in broad basins between mountain ranges, plains, and foothills. Soils are typically deep, well drained, and non-saline. These shrublands are dominated by Basin big sagebrush (*Artemisia tridentata* ssp. *Tridentata*) and/or Wyoming big sagebrush. Scattered Juniper spp., greasewood (*Sarcobatus vermiculatus*) and saltbush (*Atriplex* spp.) may be present in some stands. Rubber rabbitbrush (*Ericameria nauseosa*), yellow rabbitbrush (*Chrysothamnus viscidiflorus*), antelope bitterbrush (*Purshia tridentata*), or mountain snowberry (*Symphoricarpos oreophilus*) may codominate disturbed stands. The Inter-mountain Basins Big Sagebrush Shrubland type covers 534 acres within the Project Area.

Intermountain Basins Mat Saltbush Shrubland - This vegetation cover type occurs on gentle slopes and rolling plains on Mancos Shale in the northern Colorado Plateau and Uinta Basin and on arid, wind-swept basins and plains across parts of Wyoming. Substrates are shallow, typically saline, alkaline, fine-textured soils. These landscapes that typically support dwarf shrublands composed of relatively pure stands of saltbush such as mat saltbush (*Atriplex corrugate*) or Gardner's saltbush (*Atriplex gardneri*)

INSERT Figure 3.2-5.

Table 3.2-8. Vegetation Communities within the RBU Project Area

Land Cover Type	Vegetation Community	Acres within the Project Area	Percent within the Project Area
Scrub/Shrub	Colorado Plateau Mixed Low Sagebrush Shrubland	332	2.0
	Intermountain Basins Big Sagebrush Shrubland	534	3.2
	Inter-Mountain Basins Mat Saltbush Shrubland	191	1.1
	Inter-Mountain Basins Mixed Salt Desert Scrub	11,328	67.8
	Colorado Plateau Pinyon-Juniper Shrubland	446	2.7
Total		**12,831**	**76.8**
Grasslands/ Herbaceous	Inter-Mountain Basins Semi-Desert Grassland	18	0.1
	Inter-Mountain Basins Semi-Desert Shrub Steppe	1,928	11.5
Total		**1,946**	**11.6**
Woody Wetland	Inter-Mountain Basins Greasewood Flat	694	4.2
	Rocky Mountain Lower Montane Riparian Woodland and Shrubland	62	0.4
Total		**756**	**4.6**
Barren Lands	Inter-Mountain Basins Shale Badland	59	0.4
	Colorado Plateau Mixed Bedrock Canyon and Tableland	241	1.4
Total		**300**	**1.8**
Disturbed	Invasive Annual Grassland	24	0.1
	Invasive Southwest Riparian Woodland and Shrubland	< 1	--
	Existing Development (i.e., roads, well pads, other surface facilities)	861	5.1
Total		**885**	**5.2**
Grand Total		**16,719**	**100.0**

Other dominant or codominant dwarf-shrubs may include longleaf wormwood (*Artemisia longifolia*), birdfoot sagebrush (*Artemisia pedatifida*), or bud sagebrush (*Picrothamnus desertorum*), sometimes with a mix of other low shrubs such as winterfat (*Krascheninnikovia lanata*) or shortspine horsebrush (*Tetradymia spinosa*). The Inter-mountain Basins Mat Saltbush Shrubland type covers 191 acres within the Project Area.

Intermountain Basins Mixed Salt Desert Scrub - This widespread shrub-steppe system is dominated by perennial grasses and forbs and occurs throughout much of the northern Great Basin and Wyoming. Soils are typically deep and nonsaline, often with a microphytic crust. Shrubs may increase following heavy grazing and/or with fire suppression. The vegetation is characterized by a typically open to moderately dense shrubland composed of one or more saltbush species such as shadscale saltbush (*Atriplex confertifolia*), fourwing saltbush (*Atriplex canescens*), cattle saltbush (*Atriplex polycarpa*), or *Atriplex spinifera*. Other shrubs present to codominate may include Wyoming big sagebrush, yellow rabbitbrush, rubber rabbitbrush, Mormon tea (*Ephedra nevadensis*), spiny hopsage (*Grayia spinosa*), winterfat, bud sagebrush, or shortspine horsebrush. These shrublands and steppe habitats are the most prevalent

vegetation community in the Project Area, covering approximately 11,328 acres, or 68 percent, of the Project Area.

Colorado Plateau Pinyon-Juniper Shrubland - This vegetation cover type occurs in dry mountains and foothills of the Colorado Plateau region including from the Western Slope of Colorado to the Wasatch Range. It is typically found at lower elevations ranging from 5,000 to 8,000 feet amsl. The vegetation is dominated by dwarfed (usually < 3 m tall) two-needle pinyon (*Pinus edulis*) and/or Utah juniper (*Juniperus osteosperma*) trees forming extensive tall shrublands in the region along low-elevation margins of pinyon-juniper woodlands. Other shrubs, if present, may include black sagebrush, Wyoming big sagebrush, yellow rabbitbrush, or blackbrush (*Coleogyne ramosissima*). This vegetation cover type covers 446 acres within the Project Area, and it occurs at higher elevations than Great Basin Pinyon-Juniper Woodland.

Grasslands/Herbaceous

The Grasslands/Herbaceous land cover type covers approximately 1,946 acres within the Project Area and includes two vegetation cover types: Intermountain Basins Semi-desert Shrub Steppe and Intermountain Basins Semi-desert Grassland. The two grasslands/herbaceous vegetation types that occur in the Project Area are described below.

Intermountain Basins Semi-desert Shrub Steppe - This vegetation cover type includes open-canopied shrublands of typically saline basins, alluvial slopes, and plains across the intermountain western U.S. Substrates are often saline and calcareous, medium- to fine-textured, alkaline soils, but they can include some coarser-textured soils. The vegetation is characterized by a typically open to moderately dense shrubland composed of one or more saltbush species, with a sparse to moderately dense herbaceous layer dominated by perennial grasses. Characteristic grasses include Indian ricegrass (*Achnatherum hymenoides*), blue grama (*Bouteloua gracilis*), saltgrass (*Distichlis spicata*), needle-and-thread grass (*Hesperostipa comate*), James' galleta (*Pleuraphis jamesii*), Sandberg bluegrass (*Poa secunda*), and alkali sacaton (*Sporobolus airoides*). Characteristic shrub species include fourwing saltbush, sand sagebrush (*Artemisia filifolia*), Greene's rabbitbrush (*Chrysothamnus greenei*), yellow rabbitbrush, rubber rabbitbrush, broom snakeweed (*Gutierrezia sarothrae*), and winterfat. Scattered Basin big sagebrush may be present but does not dominate. The Inter-mountain Basins Semi-Desert Shrub Steppe type covers 1,928 acres of the Project Area.

Intermountain Basins Semi-desert Grassland - This vegetation cover type occurs throughout the intermountain western U.S. on dry plains and mesas at approximately 4,750–7,600 feet in elevation. These grasslands occur in lowland and upland areas and may occupy swales, playas, mesa tops, plateau parks, alluvial flats, and plains, but sites are typically xeric. The dominant perennial bunch grasses and shrubs within this system are all very drought-resistant. These grasslands are typically dominated or codominated by Indian ricegrass, three-awn (*Aristida* spp.), blue grama, needle-and-thread grass, Torrey's muhly (*Muhlenbergia torreyana*), or James' galleta, and may include scattered shrubs and dwarf-shrubs of species of sagebrush, saltbush, blackbrush, snakeweed, or mulefat (*Baccharis salicifolia*). The Inter-mountain Basins Semi-Desert Grassland type covers 18 acres within the Project Area.

Woody Wetland

The Woody Wetland land cover type covers approximately 756 acres within the Project Area and includes two vegetation cover types: Inter-mountain Basins Greasewood Flat and Rocky Mountain Lower Montane Riparian Woodland and Shrubland. The two woody wetland vegetation types that occur in the Project Area are described below.

Inter-mountain Basins Greasewood Flat - This vegetation cover type occurs throughout much of the western U.S. in intermountain basins and extends onto the western Great Plains. It typically occurs near drainages on stream terraces and flats or may form rings around more sparsely vegetated playas. Sites typically have saline soils and a shallow water table. They may flood intermittently but remain dry for most growing seasons. This vegetation cover type usually occurs as a mosaic of multiple communities, with open to moderately dense shrublands dominated or codominated by greasewood, fourwing saltbush, shadscale saltbush, or mulefat may be present to codominant. Occurrences are often surrounded by mixed salt desert scrub. The Inter-mountain Basins Greasewood Flat type occurs on 694 acres of the Project Area.

Rocky Mountain Lower Montane Riparian Woodland and Shrubland - This vegetation cover type is found in the foothills, canyon slopes, and lower mountains of the Rocky Mountains and on outcrops and canyon slopes in the western Great Plains. These shrublands occur between 5,000 and 9,500 feet amsl in elevation and are usually associated with exposed sites, rocky substrates, and dry conditions, all of which limit tree growth. Dominant trees may include boxelder (*Acer negundo*), narrowleaf cottonwood (*Populus angustifolia*), balsam poplar (*Populus balsamifera*), eastern cottonwood (*Populus deltoids*), Fremont cottonwood (*Populus fremontii*), Douglas-fir (*Pseudotsuga menziesii*), peachleaf willow (*Salix amygdaloides*), or Rocky Mountain juniper (*Juniperus scopulorum*). Dominant shrubs include Rocky Mountain maple (*Acer glabrum*), speckled alder (*Alnus incana*), water birch (*Betula occidentalis*), red osier dogwood (*Cornus sericea*), river hawthorn (*Crataegus rivularis*), stretchberry (*Forestiera pubescens*), chokecherry (*Prunus virginiana*), skunkbush sumac (*Rhus trilobata*), park willow (*Salix monticola*), Drummond's willow (*Salix drummondiana*), narrowleaf willow (*Salix exigua*), sandbar willow (*Salix irrorata*), shining willow (*Salix lucida*), or silver buffaloberry (*Shepherdia argentea*). The Rocky Mountain Lower Montane Riparian Woodland and Shrubland type occurs on 62 acres of the Project Area.

Barren Lands

The Barren Lands land cover type covers approximately 300 acres within the Project Area and includes two vegetation cover types: Intermountain Basins Shale Badland and Colorado Plateau Mixed Bedrock Canyon and Tableland. The two barren lands vegetation types that occur in the project area are described below.

Intermountain Basins Shale Badland - This widespread vegetation cover type of the intermountain western U.S. is composed of barren and sparsely vegetated substrates typically derived from marine shales, but it also includes substrates derived from siltstones and mudstones (clay) with a high rate of erosion and deposition. Landforms are typically rounded hills and plains that form a rolling topography. The harsh soil properties and high rate of erosion and deposition are driving environmental variables supporting sparse dwarf-shrubs, e.g., mat saltbush, Gardner's saltbush, birdfoot sagebrush, and herbaceous vegetation. The Intermountain Basins Shale Badland type covers 59 acres within the Project Area.

Colorado Plateau Mixed Bedrock Canyon and Tableland - The distribution of this vegetation cover type is centered on the Colorado Plateau where it is composed of barren and sparsely vegetated landscapes on steep cliff faces, narrow canyons, and open tablelands of predominantly sedimentary rocks, such as sandstone, shale, and limestone. The vegetation is characterized by very open tree canopy or scattered trees and shrubs with a sparse herbaceous layer. Common species includes two-needle pinyon, Ponderosa pine (*Pinus ponderosa*), Juniper species, littleleaf mountain mahogany (*Cercocarpus intricatus*), and other short-shrub and herbaceous species, utilizing moisture from cracks and pockets where soil accumulates. The Colorado Plateau Mixed Bedrock Canyon and Tableland type covers 241 acres of the Project Area.

Disturbed Land

The Disturbed Land cover type covers approximately 885 acres within the Project Area and includes three vegetation cover types: Invasive Annual Grassland, Invasive Southwest Riparian Woodland and Shrubland, and Existing Development. The Invasive Annual Grassland type covers approximately 24 acres within the Project Area. These areas are dominated by introduced annual grass species such as cheatgrass (*Bromus tectorum*) and California brome (*Bromus carinatus*). The Invasive Southwest Ripararian Woodland and Shrubland type covers < 1 acre and is dominated by tamarisk (*Tamarix* spp.) and Russian olive (*Elaeagnus angustifolia*). Existing development includes areas that are cleared of vegetation such as roads, well pads, and other surface features which cover an estimated 861 acres of the Project Area.

3.2.7.2 Invasive and Noxious Weeds

A "noxious weed" is defined as any plant the Utah Department of Agriculture commissioner determines to be especially injurious to public health, crops, livestock, land, or other property per the Utah Noxious Weed Act (Utah State Legislature 2007). Invasive weeds include plants that are not listed as noxious, but are not native to a particular area.

State and County listed noxious weeds are organized into three levels: A, B, and C. Class A weeds have a relatively low population size within the State and are highest priority, being an early detection and rapid response weed. Class B weeds have a moderate population throughout the State and are generally thought to be controllable in most areas. Class C weeds are found extensively in the State and are thought to be beyond control, and efforts would be towards containment of smaller infestations. **Table 3.2-9** summarizes those weeds designated and published as noxious for the State of Utah, under the Commissioner of Agriculture, Section 4-17-3, Utah Noxious Weed Act.

The most common locations for weeds include existing disturbance areas such as roadsides, well pads, pipelines, adjacent washes, and areas where grazing has removed native species. The most problematic noxious weeds in this area of Uintah County are saltcedar (*Tamarix ramosissima)* and hoary cress (*Cardaria draba)*. The most common invasive species (not listed on the noxious weed list for the area) in the RBU Project Area are Russian thistle (*Salsola iberica*), halogeton (*Halogeton glomeratus*), and cheatgrass (*Bromus tectorum*).

Table 3.2-9 Uintah County and State of Utah Noxious Weeds.

Common Name	Scientific Name	State or County Noxious Weed List
Black Henbane	*Hyoscyamus niger*	State List Class A
Diffuse Knapweed	*Centaurea diffusa*	State List Class A
Johnsongrass	*Sorghum halepense*	State List Class A
Leafy Spurge	*Euphorbia esula*	State List Class A
Medusahead	*Taeniatherum caput-medusae*	State List Class A
Oxeye Daisy	*Chrysanthemum leucanthemem*	State List Class A
Purple Loosestrife	*Lythrum salicaria*	State List Class A
St. Johnswort	*Hypericum perforatum*	State List Class A
Spotted Knapweed	*Centaurea maculosa*	State List Class A

Common Name	Scientific Name	State or County Noxious Weed List
Sulfur Cinquefoil	*Potentilla recta*	State List Class A
Yellow Starthistle	*Centaurea solstitialis*	State List Class A
Yellow Toadflax	*Linaria vulgaris*	State List Class A
Bermudagrass	*Cynodon dactylon*	State List Class B
Dalmation Toadflax	*Linaria genistifolia*	State List Class B
Dyer's Wood	*Istatis tinctoria*	State List Class B
Hoary Cress	*Cardaria draba*	State List Class B
Perennial Pepperweed	*Lepidium latifolium*	State List Class B
Poison Hemlock	*Conium maculatum*	State List Class B
Russian Knapweed	*Centaurea repens*	State List Class B
Squarrose Knapweed	*Centaurea virgata*	State List Class B
Scotch Thistle	*Onopordum acanthium*	State List Class B
Canada Thistle	*Cirsium arvense*	State List Class C
Field Bindweed	*Convolvulus arvensis*	State List Class C
Houndstongue	*Cynoglossum officiniale*	State List Class C
Quackgrass	*Elytrigia repens*	State List Class C
Saltcedar	*Tamarix ramosissima*	State List Class C
Common Teasel	*Dipsacus fullonum*	Uintah County List A
Puncturevine	*Tribulus terrestris*	Uintah County List B
Russian Olive	*Elaeagnus angustifolia*	Uintah County List C

3.2.7.3 Special Status Plant Species

Special status plant species include those listed as threatened or endangered under the ESA of 1973, as amended, species proposed for listing, species of special concern and other species identified either by the USFWS, BLM, Utah Natural Heritage Program (UNHP), or Utah Native Plant Society (UNPS) as unique or rare, and which have the potential to occur within the RBU Project Area and surrounding region.

Based on examination of USFWS, UNHP, and BLM data, two Federally-listed plant species are known to occur or have potential to occur within the RBU Project Area: the Uinta Basin hookless cactus (*Sclerocactus wetlandicus*) and clay reed-mustard (*Schoenocrambe argillacea*). Refer to the "Summary of Potential Occurrences of Special Status Plant Species" (**Appendix E**) for an analysis of all special status plant species potentially occurring in the VFO area and their potential to occur in the RBU Project Area.

<u>Uinta Basin Hookless Cactus</u>

The Uinta Basin hookless cactus (*Sclerocactus glaucus*) was listed as threatened under the ESA in 1979. Recently, the Uinta Basin hookless cactus has been reclassified and three species, which were collectively recognized as Uinta Basin hookless cactus during the time of its listing, are now recognized separately; Colorado hookless cactus (*S. glaucus*), Pariette cactus (*S. brevispinus*) and Uinta Basin hookless cactus (*S. wetlandicus*). Of these three species, *S. wetlandicus* has the potential to occur in the RBU Project Area and is analyzed in this EA.

Information on the habitat requirements and distribution of this species has been rapidly changing as more studies and surveys are conducted in the Uinta Basin. Currently, it is known to occur on Quaternary and Tertiary alluvium soils overlain with cobbles and pebbles of the Duchesne River, Green River, and Uinta Formations between 4,500 to 6,600 feet in elevation (BLM 2008; UNPS 2006). It is found on the gravelly hills and terraces on river benches, valley slopes, and rolling hills along the Green, White, and Duchesne rivers. Preferred habitat is generally associated with Pleistocene outwash terraces with coarse-textured, alkaline soils overlain by a surficial pavement of large, smooth, rounded cobble. It can be found in a range of vegetative communities including clay badlands, salt desert shrub, and pinyon-juniper. Associated species include black sagebrush, shadscale saltbush, James' galleta, and Indian ricegrass.

Approximately 15,896 acres of USFWS designated potential habitat for the Uinta Basin hookless cactus has been identified within RBU Project Area **(Figure 3.2-6)**. This habitat was derived using observed populations and other variables (e.g., aspect, soil, and formations), and will be refined over time as additional surveys are conducted. Within designated potential habitat for the Uinta Basin hookless cactus, the USFWS has proposed *Sclerocactus wetlandicus* and *S. brevispinus* core conservation areas and management recommendations in response to the ongoing energy development in the Uinta Basin. The purpose of the proposed core conservation areas and management recommendations is to protect the most important populations or sub-populations, and ensure survival and recovery of both *Sclerocactus* species. Areas where cactus numbers are known to be highly concentrated (most dense per unit area) are classified as Level 1 core conservation areas. As proposed, the most restrictive conditions for oil and gas development would occur in Level 1 areas, where no new surface disturbance would be allowed. In Level 2 areas, existing surface disturbance would not be allowed to exceed 5 percent of the total designated area and surface well density cannot exceed 4 wells per section. Approximately 251 and 1,156 acres of Level 1 and 2 core conservation areas occur in the RBU Project Area, respectively. It is important to note that at the time this document was developed, these proposed measures are interim management recommendations that have not been finalized or formally adopted as standard mitigation practices by the BLM.

Clay Reed-Mustard

Clay reed-mustard (*Schoenocrambe argillacea*) is a Federally-threatened perennial herbaceous plant that is endemic to the Uinta Basin in Uintah County, Utah. Clay reed-mustard typically grows on steep, north-facing slopes with fine textured soil overlain with sandstone talus derived from the zone of contact between the Green River and Uinta Formations. More specifically, the species has been documented below the rocky contact zone of the Uinta Formation and the Evacuation Creek Member at elevations ranging from 4,700 to 5,800 feet amsl (UNHP-UDWR 2007). Clay reed-mustard is associated with the mixed desert shrub community. Dominating shrub species associated with clay reed-mustard populations include Utah serviceberry (*Amelanchier utahensis*), black sagebrush, Castle Valley clover (*Atriplex gardneri cuneata*), shadscale, and green rabbitbrush (UNHP-UDWR 2007).

Known populations of clay reed-mustard occur in the central portion of Uintah County, with portions of several populations extending onto the Uintah and Ouray Indian Reservation. The species has the potential to occur within the western portion of RBU Project Area where the geological formations and soils associated with this species are found. BLM data include occupied habitat in the southwest corner of the Project Area, which was identified in 1991. Population count information is not available for this area.

INSERT Figure 3.2-6.

Spanish Bayonet

Spanish bayonet *(Yucca sterilis)* is a perennial shrub/subshrub in the Agavaceae family. The species is a BLM sensitive plant species, and is also known as a rhizomatous subspecies of the *Yucca harrimaniae*. The species has been collected while in flower, but is not known to produce fruit. *Y. sterilis* grows in the lower elevations of Duchesne and Uintah Counties in salt and mixed desert shrub vegetation communities. There is potential for the species to occur in the RBU Project Area.

3.2.8 Fish and Wildlife Including Special Status Species

3.2.8.1 Wildlife Habitats

The Project Area and surrounding region support a variety of natural vegetation communities and landscape features that offer a diversity of wildlife habitat types. While these habitat types correspond with the vegetation community types discussed in **Section 3.2.7** above, they are also defined by a number of distinct landscape features such as washes and gullies, rock outcrops and hillsides, cliffs and taluses, and cave and mine entrances. All contribute to the diversity and abundance of wildlife in the area as they generally provide a microhabitat for wildlife uniquely adapted to or dependent on, these features. Although the RBU Project Area comprises approximately 16,719 acres, past oil and gas development has highly fragmented wildlife habitats in the area.

3.2.8.2 General Wildlife

Small mammals potentially found within the RBU Project Area and surrounding region include the cottontail rabbit (*Sylvilagus* spp.), black-tailed jackrabbit (*Lepus californicus*), coyote (*Canis latrans*), badger (*Taxidea taxus*), striped skunk (*Mephitis mephitis*), western spotted skunk (*Spilogale gracilis*), and various species of rodents and bats. Bird species that may be present include the black-throated sparrow (*Amphispiza bilineata*), Say's phoebe (*Sayornis saya*), ferruginous hawk (*Buteo regalis*), Brewer's sparrow (*Spizella breweri*), sage sparrow (*Amphispiza belli*), grasshopper sparrow (*Ammodramus savannarum*), and horned lark (*Eremophila alpestris*). Herptiles potentially found in the region include the wandering garter snake (*Thamnophis elegans vagrans*), Great Basin gopher snake (*Pituophis catenifer deserticola*), milksnake (*Lampropeltis triangulum*), Great Basin spadefoot toad (*Scaphiopus intermontana*), western whiptail (*Cnemidophorus tigris*), sagebrush lizard (*Sceloporus graciosus*), and shorthorned lizard (*Phymosoma douglassii*).

Although all of these species are important members of wildland ecosystems and communities, most are common and have wide distributions within the region. Consequently, the relationship of most of these species to the proposed project is not discussed in the same depth as species that are threatened, endangered, sensitive, of special economic interest, or are otherwise of high interest or unique value.

3.2.8.3 Big Game

Three resident big game species are known to occur in the RBU Project Area: pronghorn antelope (*Antilocapra americana*), mule deer (*Odocoileus hemionus*), and Rocky Mountain bighorn sheep (*Ovis canadensis*).

Pronghorn Antelope

Pronghorn antelope occupy the majority of the RBU Project Area on a year-round basis. The UDWR has identified approximately 16,478 acres of the RBU Project Area as crucial value, year-long fawning pronghorn habitat (**Figure 3.2-7**). Pronghorn that occupy the RBU Project Area are considered to be a

INSERT Figure 3.2-7

part of the Book Cliffs pronghorn herd unit (Herd Unit #10). The Book Cliffs pronghorn herd unit had a 2010 pre-season population of approximately 244 animals, which is 46 percent below the objective for this population. Pre-hunt production ratios in 2010 ranged from 23 to 44 fawns per 100 does for the Book Cliffs-Bitter Creek subunit and Book Cliffs-South subunit, respectively (Bernales et al. 2010).

Although most leases in the RBU Project Area do not contain stipulations other than the standard lease terms at the time of issuance, one Federal lease, U-76500, contains a notice that seasonal restrictions may be implemented during the antelope kidding season (May 15 through June 20).

Mule Deer

Mule deer occupy the Green River corridor, located west of the RBU Project Area, on a year-round basis. The UDWR has identified only a small area (approximately 149 acres) in the western portion of the RBU Project Area as year-long, crucial value fawning habitat (**Figure 3.2-8**). Mule deer numbers in the RBU Project Area are low and mainly occur along the Green River. Mule deer that occupy the RBU Project Area are part of the Book Cliffs mule deer herd unit (Herd Unit #10). The Book Cliffs mule deer herd unit had a 2010 winter population estimate of 7,000 animals, which is approximately 53 percent below the objective for this population. Pre-hunt production ratios in 2010 were 47 fawns per 100 does, which was slightly above the three year average of 41 from 2008 to 2010 (Bernales et al. 2010).

Rocky Mountain Bighorn Sheep

In the RBU Project Area, Rocky Mountain bighorn sheep intermittently occupy (both spatially and temporally) the Willow Creek and Green River corridors on a year-round basis. Bighorn sheep in this area are not native but instead were introduced onto the Ouray Indian Reservation. No management objectives exist for this Rocky Mountain bighorn sheep Tribal population (UNHP-UDWR 2008). The UDWR has identified approximately 6,806 acres of year-long, crucial value bighorn sheep habitat in the western and eastern portions of the RBU Project Area (**Figure 3.2-9**).

3.2.8.4 Migratory Birds

The western portion of the RBU Project Area along the Green River has been designated by the Utah Steering Committee (USC) as a Bird Habitat Conservation Area (BHCA) (USC 2005). Bird Habitat Conservation Areas are intended to identify areas where bird habitat conservation projects may take place, predicated on concurrence, collaboration, and cooperation with all landowners involved; however, BHCAs have no official status (USC 2005). The BHCA that occurs in the RBU Project Area is the Green River BHCA (BHCA #37), which includes the lowland riparian priority habitat type and extends from the town of Ouray, north of the RBU Project Area, south to the fork of the Colorado River.

Migratory bird species that may utilize the RBU Project Area are listed below based on preferred habitats (i.e., nesting and foraging habitats) and vegetative communities present in the area. Those migratory bird species (including special status raptor species) that are Federally-listed are candidates for Federal listing under the ESA, or are State sensitive are addressed in **Section 3.2.8.6**, Utah Partners in Flight [2]Priority Species are denoted by an asterisk (*). Non-special status raptor species are addressed in **Section 3.2.8.5**.

Intermountain Basins Mat Saltbush Shrubland, Intermountain Basins Mixed Salt Desert Scrub, and Colorado Plateau Pinyon-Juniper Shrubland - The following migratory bird species may be associated

[2] Utah Partners-in-Flight is a cooperative partnership among Federal, State, and local government agencies as well as public organizations and individuals organized to emphasize the conservation of birds not covered by existing conservation initiatives.

INSERT Figure 3.2-8

INSERT Figure 3.2-9

with these scrub/shrub communities, which comprise the largest proportion of vegetation within the RBU Project Area: black-throated sparrow (*Amphispiza bilineata*), black-chinned hummingbird* (*Archilochus alexandri*), common yellowthroat (*Geothlypis trichas*), Lewis's woodpecker (*Melanerpus lewis*), gray flycatcher* (*Empidonax wrightii*), western kingbird (*Tyrannus verticalis*), green-tailed towhee (*Pipilo chlorurus*), northern mockingbird (*Mimus polyglottos*), Say's phoebe (*Sayornis saya*), ferruginous hawk* (*Buteo regalis*), and prairie falcon (*Falco mexicanus*).

Intermountain Basins Big Sagebrush Shrubland and Colorado Plateau Mixed Low Sagebrush Shrubland - Although the following birds are often associated with these vegetation communities, they may also use other scrub/shrub vegetation communities as well: Brewer's sparrow* (*Spizella breweri*), mountain bluebird (*Sialia currucoides*), sage sparrow* (*Amphispiza belli*), grasshopper sparrow* (*Ammodramus savannarum*), horned lark (*Eremophila alpestris*), greater sage-grouse* (*Centrocercus urophasianus*), sage thrasher (*Oreoscoptes montanus*), and vesper sparrow (*Pooecetes gramineus*).

Inter-Mountain Basins Shale Badland and Colorado Plateau Mixed Bedrock Canyon and Tableland - Although these birds may forage in other vegetation communities, the following migratory birds may utilize the badland and rock outcrop areas in the RBU Project Area: canyon wren (*Catherpes mexicanus*), barn swallow (*Hirundo rustica*), cliff swallow (*Hirundo pyrrhonota),* common raven (*Corvus corax*), and rock wren (*Salpinctes obsoletus*).

3.2.8.5 Raptors

The RBU Project Area supports habitat for territories, nests, and/or roosting sites for numerous species of raptors. Nest sites could occur on rock outcrops, on taller shrubs, or in trees. **Table 3.2-10** provides the raptor species with the potential to occur in or near the RBU Project Area, and a description of their typical nesting habitats.

Table 3.2-10. Raptor Species with the Potential to Occur In or Near the RBU Project Area

Common Name	Scientific Name	Nesting Habitats
American Kestrel	*Falco sparverius*	Holes in tree cavities, cliff crevices
Bald Eagle	*Haliaeetus leucocephalus*	Large trees near rivers, lakes, marshes, or other wetland areas
Burrowing Owl	*Athene cunicularia*	Mammal burrows, typically prairie dog colonies
Cooper's Hawk	*Accipiter cooperii*	Woodland and riparian zones
Ferruginous Hawk	*Buteo regalis*	Trees and shrubs, cliffs, utility structures, and rock outcrops
Golden Eagle	*Aquila chrysaetos*	Cliff ledges and rock outcrops
Great-horned Owl	*Bubo virginianus*	Cliff ledges or nests of other species
Northern Harrier	*Circus cyaneus*	Ground within thick vegetation
Peregrine Falcon	*Falco peregrinus*	Cliff ledges
Prairie Falcon	*Falco mexicanus*	Cliff ledges
Red-tailed Hawk	*Buteo jamaicensis*	Cliff ledges, rock outcrops, aspen, pinyon-juniper woodlands
Short-eared Owl	*Asio flammeus*	Typically a ground nester.
Swainson's Hawk	*Buteo swainsoni*	Nest in trees in or near open areas.
Turkey Vulture	*Cathartes aura*	Rock outcrops, caves, and tree cavities

All raptor species and their nests are protected from take or disturbance under the MBTA of 1918 (16 U.S.C. 703 et seq.); however, because golden eagles, bald eagles, and burrowing owls are considered to be special status raptor species, they are discussed in further detail in **Section 3.2.8.6**.

3.2.8.6 Special Status Wildlife Species

This section discusses wildlife species that have a special-status designation, which includes:

- Species Federally-listed as threatened or endangered, proposed for Federal listing as threatened or endangered, or considered to be a candidate for Federal listing as threatened or endangered under the ESA, or listed as sensitive by the BLM;
- Species listed as sensitive by the UDWR, including both wildlife species of concern and species receiving special management under a Conservation Agreement in order to preclude the need for Federal listing; and
- Species protected under certain specified regulations.

Special status wildlife species that have the potential to occur within the RBU Project Area or be affected by development activities within the RBU Project Area are discussed below. Refer to the "Summary of Potential Occurrence of Special Status Wildlife Species" (**Appendix E**) for an analysis of all special status wildlife species found in the VFO area and their potential to occur in the RBU Project Area.

<u>White-tailed Prairie Dog</u>

The white-tailed prairie dog (*Cynomys leucurus*) is listed by the BLM as a sensitive species and is also listed as a UDWR Wildlife Species of Concern (Tier II species in the Utah CWCS). The USFWS was petitioned in May 2010 to federally list the white-tailed prairie dog as threatened or endangered under the ESA, but subsequently decided that the petition was not warranted.

Colonies of this species occur primarily in mountain valleys, semi-desert grasslands, and open shrublands (Fitzgerald et al. 1994). They are distributed in relatively large, sparsely populated complexes and live in loosely knit clans (UDWR 2006). In Utah, the white-tailed prairie dog occurs predominantly in the Uinta Basin and the northern part of the Colorado Plateau. This species is the main food source of the endangered black-footed ferret (Fitzgerald et al. 1994).

While white-tailed prairie dogs are likely to be present within portions of the Project Area, UDWR and the BLM have not conducted prairie dog colony surveys or burrow density estimates for white-tailed prairie dog colonies within the entire RBU Project Area boundary.

<u>Greater Sage Grouse</u>

As of March 5, 2010, the greater sage grouse (*Centrocercus urophasianus*) is a candidate for listing under the ESA (75 FR 13910-13958). This means the species does not receive statutory protection under the ESA and individual states currently retain responsibility for managing the bird (USFWS 2010). However, the USFWS will review the status of the species annually to determine whether it warrants more immediate action (USFWS 2010).

The BLM Washington Office Instruction Memorandum (IM) No. 2012-043 and 2012-044 (BLM 2012) supplements the BLM's 2004 National Strategy for sage-grouse and identifies those management actions necessary to sustain sage-grouse populations while also achieving the Department of the Interior's energy-related priorities. Priority habitat, which is the habitat of highest conservation value relative to maintaining suitable sage-grouse populations range-wide, has not yet been identified by the UDWR using

a consistent methodology. The Governor's task force is in the process of identifying the preliminary priority habitat and the preliminary general habitat in accordance with IM 2012-044. In the meantime, the BLM is using UDWR identified occupied sage grouse habitat as preliminary priority habitat. The nearest preliminary priority habitat is located approximately 0.4 mile southeast of the southeast corner of the Project Area.

No sage grouse leks are known to occur in the Project Area, nor is any part of the Project Area known to be within a 2-mile buffer zone of a lek. The nearest document lek is located approximately 6.8 miles southeast of the Project Area (**Figure 3.2-10**). In addition, no habitats designated as occupied, brood rearing, or winter habitats for sage grouse occur within the RBU Project Area. Although most of the habitat within the Project Area is marginal for sage grouse breeding and nesting, it is possible that a few individual sage grouse occasionally use portions of the Project Area.

Yellow-billed Cuckoo

The yellow-billed cuckoo (*Coccyzus americanus*) is a candidate for listing under the ESA. This species is a neotropical migratory species that breeds in the U.S. and Canada and winters in South America (USFWS 2001). The cuckoo is a riparian obligate bird that feeds in cottonwood groves and nests in willow thickets. Nest sites have been correlated with large patches (greater than 10 hectares) of cottonwood-willow stands, dense understories, high local humidity, low local temperatures, and in proximity to slow or standing water. In Utah, this species nests in riparian areas and has been documented in cottonwood habitat along the Green River west of the RBU Project Area. Breeding has been confirmed in the Ouray National Wildlife Refuge located along the Green River approximately 13 miles upstream from the RBU Project Area (Howe and Hanberg 2000). Although the RBU Project Area does not support the necessary habitat elements to support the yellow-billed cuckoo, potential habitat for the species does occur immediately west of the RBU Project Area along the Green River.

Bald Eagle

Effective August 8, 2007, the USFWS delisted the bald eagle (*Haliaeetus leucocephalus*) in the lower 48 states from the Federal list of endangered and threatened wildlife (72 FR 37346). However, the bald eagle is still protected under the Bald and Golden Eagle Protection Act and the MBTA. Although no bald eagle nesting sites exist within or near the RBU Project Area, known winter roost sites are located along the Green River, west of and outside the RBU Project Area. Wintering bald eagles concentrate at established roosting sites for the purpose of feeding and sheltering in close proximity to sufficient food sources. Specifically, 15 bald eagle roosting sites are located within 0.5 mile of the RBU Project Area boundary, however all three roosts are located immediately adjacent to the Green River which is physically screened from project development by canyons walls. Winter roosting usually occurs from early November through late March, and bald eagles may use the RBU Project Area as foraging habitat during this period.

Golden Eagle

The golden eagle (*Aquila chrysaetos*) is protected under the MBTA and Bald and Golden Eagle Protection Act, based on the similarity of the juvenile bald eagle's physical appearance to that of the adult golden eagle. Populations of golden eagles in Utah are considered to be year-round residents.

Two active golden eagle nests have been located along the western boundary of the RBU Project Area. These nests were located on cliffs facing the Green River along the northwestern boundary of the RBU Project Area. Potential nesting and foraging habitat is found throughout the RBU Project Area, and therefore additional breeding golden eagles could establish territories/nests in the future.

INSERT Figure 3.2-10.

Burrowing Owl

The burrowing owl (*Athene cunicularia*) is listed as a UDWR Wildlife Species of Concern and BLM Sensitive Species. Burrowing owls are summer residents on the plains over much of Utah and usually arrive on breeding grounds from late March to mid-April (Johnsgard 2002). In Utah, prairie dog burrows are the most important source of burrowing owl nest sites. Burrowing owls' use of abandoned prairie dog towns is minimal: active prairie dog towns are the primary habitat for the owls.

Burrowing owl surveys have not been conducted in the RBU Project Area. However, as there are scattered prairie dog colonies in portions of the RBU Project Area, the burrowing owl has the potential to occur within the RBU Project Area.

Bonytail Chub

The bonytail chub (*Gila elegans*) is a Federally-endangered fish species. Historically, the bonytail was a common species in the main river channels of the Colorado River systems. However, today the bonytail chub exists in very low numbers in its natural habitat (USFWS 1994). There are currently no self-sustaining populations of bonytail chub in the wild, and very few individuals have been caught throughout the Upper Colorado River Basin in Utah. A few individuals have been caught in the Green River in Hideout Canyon and Gray Canyon, and at the confluence of the Colorado River and the Green River. Releases of hatchery-reared bonytail chub into the Upper Basin have resulted in low survival, with no evidence of reproduction or recruitment. The bonytail chub is adapted to major rivers where it has been observed in pools and eddies. Flooded bottomland habitats are important growth and conditioning areas for bonytail chub, particularly as nursery habitats for young (USFWS 2002a).

In Utah, a total of 139 river miles and their associated 100-year floodplains have been designated by the USFWS as critical habitat for the bonytail chub in portions of the Green River and Colorado River. The closest designated critical habitat is located in the Green River approximately 20 miles downstream from the RBU Project Area (USFWS 2007).

Colorado Pikeminnow

The Colorado pikeminnow (*Ptychocheilus lucius*) is a Federally-endangered fish species. The Colorado pikeminnow (formerly known as the Colorado squawfish) is endemic to the Colorado River Basin where it has adapted to rivers with seasonally variable flow, high silt loads, and turbulence. In Utah, the Colorado pikeminnow was historically found in the Colorado, Green, Duchesne, San Juan, White, and Dolores Rivers and probably numerous smaller streams. Today, the species is most abundant in the Green River below the confluence with the Yampa River; the White River from Taylor Draw Dam near Rangely, Colorado, downstream to the confluence with the Green River; and the mainstem of the Colorado River from Palisade, Colorado to Lake Powell. The Yampa River and Gray Canyon of the lower Green River hold the two principal spawning sites of this species (USFWS 2002b).

A total of 726 river miles in Utah have been designated by the USFWS as critical habitat for the Colorado pikeminnow. This critical habitat occurs in portions of the Green, Colorado, White, and San Juan Rivers and their respective 100-year floodplains, including portions of the Green River that flow west of the RBU Project Area (USFWS 2007).

Humpback Chub

The humpback chub (*Gila cypha*) is a Federally-endangered fish species. In Utah, specimens of humpback chub have been reported from the upper Green River, Desolation Canyon on the Green River,

the lower Yampa River, the White River, and the Colorado River above and below Glen Canyon Dam. Populations of adult humpback chub are found in boulder-strewn river canyons where they utilize a variety of habitats including pools, riffles, eddies, rocky runs, and travertine dams. The highest known concentrations of humpback chub are found in the Westwater Canyon and Grand Canyon reaches of the Colorado River. Humpback chub in the Desolation and Gray canyons of the Green River hold the third most abundant population of this species (USFWS 2002c).

In Utah, a total of 139 river miles and their associated 100-year floodplains have been designated by the USFWS as critical habitat for the humpback chub in portions of the Green River and Colorado River. The closest designated critical habitat is located in the Green River approximately 20 miles downstream from the RBU Project Area (USFWS 2007).

Razorback Sucker

The razorback sucker (*Xyrauchen texanus*) is a Federally-endangered fish species. In the Upper Colorado River Basin in Utah, the razorback sucker is currently found in the Green River, upper Colorado River, and San Juan River sub-basins. The fish are mostly aged adults with little or no recruitment, except in the middle Green River, where small numbers of juveniles and young adults indicate low recruitment levels. The largest population of razorback sucker in the Upper Colorado River Basin exists in low-gradient, flat-water reaches of the middle Green River between the Duchesne River and Yampa River (USFWS, 2002d). Adult razorback suckers occupy a variety of habitat types including impounded and riverine areas, eddies, backwaters, gravel pits, flooded bottoms, flooded mouths of tributary streams, slow runs, sandy riffles, and others. They typically move into flooded areas in early spring and begin spawning migrations to specific locations as they become reproductively active. Spawning occurs over rocky runs and gravel bars (USFWS 2002d).

A total of 688 river miles in Utah have been designated by the USFWS as critical habitat for the razorback sucker. This critical habitat occurs in portions of the Green, Colorado, Duchesne, White, and San Juan Rivers and their respective 100-year floodplains, including portions of the Green River that flow west of the RBU Project Area (USFWS 2007).

Roundtail Chub

The roundtail chub (*Gila robusta*) is listed as a Utah State sensitive species and is found in the Upper Colorado River Basin. This species is a large member of the minnow family found most often in major rivers and smaller tributary streams. The roundtail chub has been described as varying from sedentary to mobile, depending on life stage and habitat conditions (Sigler and Sigler 1996).

Roundtail chub populations occur in the Green River from the Colorado River confluence upstream to Echo Park and in the White River from the Green River confluence upstream to near Meeker, Colorado. In the Upper Colorado River Basin (New Mexico, Utah, Colorado and Wyoming), the species has been extirpated from about 45 percent of its historical range, including the Price River and portions of the San Juan, Gunnison and Green Rivers. Data on smaller tributary systems are largely unavailable, and population abundance estimates are available only for short, isolated river reaches. Known distribution of this species includes portions of the Green River west of the RBU Project Area (UNHP-UDWR 2007).

Bluehead Sucker

The bluehead sucker (*Catostomus discobolus*) is a Utah State sensitive species found in the Upper Colorado River Basin. Bluehead suckers occur in small to large streams, rivers, and tributaries in the Upper and Lower Colorado River Basin, including the Green River. Large adult bluehead may inhabit

stream environments as deep as 6 to 9 feet, although they most commonly feed in riffles and swift runs. Spawning occurs in spring and early summer at lower elevations and mid- to late summer in higher, colder waters. Spawning occurs on gravel beds in shallow water (Sigler and Sigler 1996).

Populations of this species currently occur in the mainstream Green River from the Colorado River confluence upstream to Lodore, Colorado, and in the White River from the Green River confluence upstream to Meeker, Colorado. In the upper Colorado River Basin (Utah, Wyoming, Colorado, and New Mexico), bluehead suckers currently occupy about 45 percent of their historical habitat. Recent declines of the species have occurred in the White River below Taylor Draw Dam, and in the upper Green River. Known distribution of this species includes portions of the Green River west of the RBU Project Area (UNHP-UDWR 2007).

Flannelmouth Sucker

The flannelmouth sucker (*Catostomus latipinnis*) is listed as a Utah State sensitive species found in the Upper Colorado River Basin. Flannelmouth suckers typically inhabit deep water habitats of large rivers, but are also found in small streams and occasionally in lakes. Flannelmouth suckers spawn during March and April in the southern portions of Utah and from May to June in northern Utah at higher elevations (Sigler and Sigler 1996).

Flannelmouth sucker populations can be found from the Green River from the Colorado River confluence upstream to the Flaming Gorge Reservoir, and the White River from Kenny Reservoir in Colorado to the Green River. Recent investigations of historical accounts and museum specimens indicate that flannelmouth suckers occupy approximately 50 percent of their historic range in the Upper Colorado River Basin (Utah, Wyoming, Colorado, and New Mexico). Populations have declined since the 1960s due to impoundment of the Green River in Wyoming and Utah (Flaming Gorge Reservoir) and the Colorado River in Glen Canyon, Utah (Lake Powell). Known distribution of this species includes portions of the Green River west of the RBU Project Area (UNHP-UDWR 2007).

3.2.9 Visual Resources

The RBU Project Area lies within the Uinta Basin of the Colorado Plateau physiographic province. The general visual characteristics of the Uinta Basin topography west of the Green River can be described as relatively flat with wide, shallow valleys that are not more than a few hundred feet below the surrounding country (Stokes 1986). The landscape is composed of scenery that is typical of the central Uinta Basin: a predominance of shallow, gently rolling hills and drainages; shale-colored bluffs and steeply incised drainages near the Green River and Nine Mile Canyon; distant views of the Uinta Mountains to the north, the Roan Cliffs and Book Cliffs to the south, and the Wasatch foothills to the west.

There is no human habitation within the Project Area and oil and gas activities, structures, and surface disturbances are present in much of the region. Modifications of the landform and vegetation, and placement of structures on the land, are prevalent throughout most of the project area. Lands along the Green River adjacent to the western portion of the Project Area are parts of an area inventoried and found to have natural landscape character and an appearance of naturalness (BLM 2008c). These lands are being managed to protect natural landscapes, as they are large, roadless, and relatively undeveloped.

3.2.9.1 Visual Resources Management

The project area lies within BLM-administered public land that has been inventoried and is managed for its visual resources. The BLM uses a Visual Resource Management (VRM) system to inventory and manage visual resources on public lands. The primary objective of VRM is to manage visual resources so that the quality of scenic (visual) values is protected (BLM 1992). The VRM system uses four classes (and their associated visual resource objectives) to describe the different degrees of surface disturbance or modification allowed on the landscape (see **Table 3.2-11**). The classes are visual ratings that describe an area in terms of visual quality, viewer sensitivity to the landscape (i.e., the public's perception of the importance of scenery and scenic quality within an area), and the distance from which a viewer would be likely to observe an area (BLM 1986). The area's BLM-designated VRM class and visual resource objectives can be used to analyze and determine the visual impacts of proposed activities on the land, and to gauge the amount of disturbance an area can tolerate before it exceeds the visual objectives of its VRM class (BLM 1986).

Table 3.2-11. BLM Visual Resource Management (VRM) Class Objectives

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

The Vernal RMP manages the BLM-administered lands in the Project Area under VRM Class I, II, III, and IV objectives. The designation of these management classes was based on resource use of the area, the area's visual quality and viewer sensitivity, the level of use by the public, and the type of visitor use that the area receives (BLM 1992). Public visitation within the proposed project area is not high; however, areas adjacent to the project area (Green River corridor), are high-quality recreational and scenic destinations.

VRM classes within the RBU Project Area are shown in **Figure 3.2-11**. The total number of acres of each VRM class within the RBU Project Area is tabulated below in **Table 3.2-12.**

INSERT Figure 3.2-11.

Table 3.2-12. VRM Classes within the RBU Project Area

VRM Class	Acres of Project Area	Percent on BLM Land in Project Area
Class I	0	0
Class II	357	3
Class III	2,540	21
Class IV	9,098	76

3.2.10 Socioeconomics and Environmental Justice

Entities of interest for the socioeconomic analysis include Uintah and Duchesne Counties, the Ute Tribe, and the State of Utah. It should be noted that although all project-related development would occur in Uintah County, Uintah and Duchesne Counties share a common boundary and are linked by a transportation network that integrates the labor force and support services that serve the oil and gas industry in the Uinta Basin. As such, the study area for this project was established to encompass the effects of the project on the economy, population, and housing throughout both counties.

3.2.10.1 Uintah and Duchesne Counties

Population and Housing

Table 3.2-13 below summarizes key demographic statistics as provided by the Demographic and Economic Analysis section of the Governor's Office of Planning and Budget in Utah. The (2010) combined population for Uintah and Duchesne Counties is approximately 51,195 persons. There are an estimated 21,420 housing units in the study area and the employed labor force is 27,100 persons. Based on this information, the ratio of employees to the overall population is one employee for every 1.9 persons.

The balance between jobs and housing is the relationship between the numbers of people employed in an area versus the potential housing opportunities in that area. In theory, a balanced community would have 1.0 to 1.5 employees for every housing unit. A ratio over this range indicates that there are more jobs than available housing. Conversely, a ratio less than this range indicate that there is more housing than available jobs. There are an estimated 21,420 housing units in Duchesne and Uintah Counties and the employed labor force is 27,100 persons (GOPB 2011). Based on this information, the ratio of employees to the potential housing opportunities is 1.27 employees for every housing unit.

Table 3.2-13. Demographic Characteristics of the Socioeconomic Study Area

County	Population[1]	Housing Units[1]	Employment Labor Force[2]	Individuals per Household[1]
Duchesne County	18,607	9,493	9,784	2.62
Uintah County	32,588	11,927	17,316	2.95
State of Utah	2,763,885	979,709	1,181,544	3.04*

* Weighted average of persons per household in both counties.
(1) Source: U.S. Census Bureau, 2010b.
(2) Source: GOPB, 2011

Table 3.2-14 shows the numeric change in demographic characteristics from 2000 to 2010 and the corresponding Average Annual Rate of Change (AARC). As shown, employment labor force and housing units over the last 10 years have been increasing much faster than the overall growth in population.

Table 3.2-14. Demographic Trends, 2000-2010, Uintah and Duchesne Counties

Demographic Trend	2000	2010	AARC (Percent)
Employment Labor Force[2]	16,670	27,100	6.3
Population[1]	39,595	51,195	2.9
Housing Units[1]	12,746	21,420	6.8

(1) Source: U.S. Census Bureau, 2010a
(2) Source: GOPB, 2011

In terms of racial composition, in 2010 approximately 89 percent of Duchesne County's population was White and five percent was Native American. In terms of ethnicity, six percent were of Hispanic origin (GOPB, 2011). The racial composition of Uintah County was as follows: 87 percent White and eight percent Native American. In terms of ethnicity, seven percent were of Hispanic origin.

Local Economy and Employment

In Uintah and Duchesne Counties, the top three employment sectors in 2010 were government; natural resource and mining; and transportation, trade, and utilities. **Table 3.2-15** provides a breakdown of nonagricultural sources of employment by economic sector.

Table 3.2-15. Sources of Employment by Sector, 2011

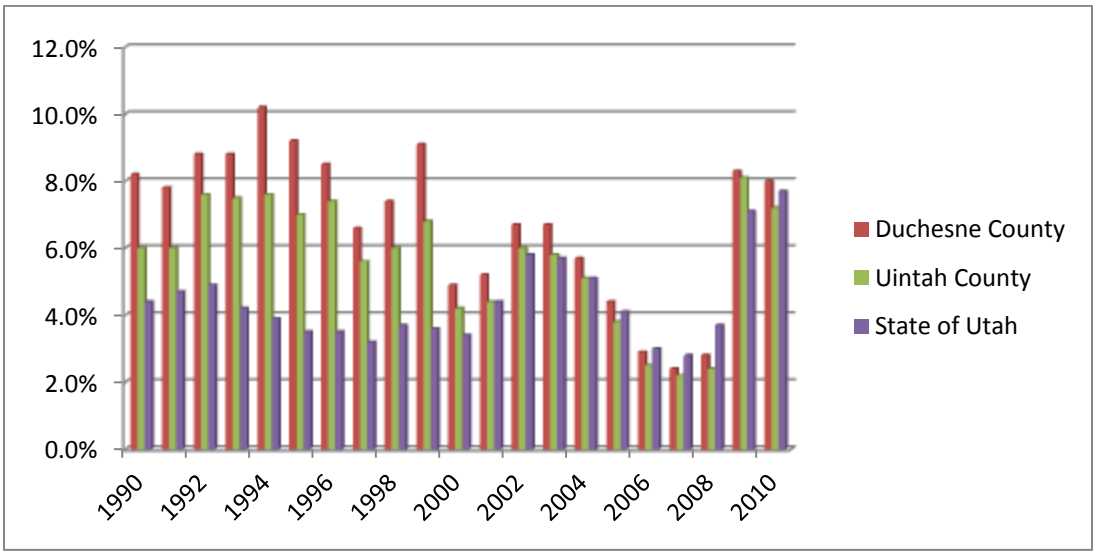
Employment Sector	Duchesne County		Uintah County	
	Jobs	% Total	Jobs	% Total
Natural Resources and Mining	1,510	20.6%	2,627	19.8%
Construction	523	7.1%	957	7.2%
Manufacturing	170	2.3%	166	1.3%
Trade, Transportation, and Utilities	1,707	23.3%	3,031	22.8%
Information Services	193	2.6%	136	1.0%
Financial Activity	177	2.4%	537	4.0%
Professional and Business	206	2.8%	684	5.2%
Education and Health	349	4.8%	966	7.3%
Leisure and Hospitality	374	5.1%	976	7.3%
Other Services	184	2.5%	365	2.7%
Government	1,938	26.4%	2,835	21.3%
Total	**7,331**	**100.0**	**13,280**	**100**

Source: GOPB, 2011

Annual data from the Utah's Department of Workforce Services (UDWS) show that for 2010 the unemployment rate in Duchesne County (8.0 percent) was slightly higher than the statewide average of 7.7 percent. However, the unemployment rate in Uintah County (7.2 percent) was slightly lower than the statewide average. The unemployment rate for the State of Utah has almost doubled, from 3.7 percent in

2008 to 7.7 percent in 2010. Utah, while lower than the national unemployment rate, has followed the national trend where the unemployment rate increased from 4.6 percent in 2007 to 5.8 percent in 2008, 9.3 in 2009, and 9.6 in 2010 (Bureau of Labor Statistics, 2011). Utah's economy has gradually strengthened in 2010. Though economic activity has been on the uptick, slack hiring has driven a slight increase in the unemployment rate from 7.1 percent in 2009 to 7.7 percent in 2010.

In 2009, the per capita income in Uintah County ($29,034) was lower than the State of Utah average ($31,886), and the national average ($38,846). However, the per capita income for Duchesne County ($34,107) in 2009 was higher than both the State and national average. It should be noted that Utah is unique when comparing personal income and median household income. Although Utah has a very low per capita personal income, the State's median household income is ranked tenth highest in the nation. This is due to the fact that Utah has the largest household size in the nation, and per capita figures are diluted by a larger number of children. As such, median household figures provide a more accurate measure of family income. In 2010, Utah's three-year average $59,857 median household income was 118.9 percent of the national average of (GOPB, 2011). Although there are no median household income statistics available for Uintah and Duchesne Counties, based on the information presented above, it can be assumed that the median household income is competitive with the national average.



Source: UDWS, 2010

Figure 3.2-12. Average Annual Unemployment Rates: 1990-2010

The U.S. Bureau of Economic trends for 2009 are discussed in this EA. The recession beginning in late 2007 had a diverse impact across counties in Utah, where 45 percent of counties had decreases while 55 percent experienced increases. The largest percentage declines were in the natural resource dependent Uintah County (-10.3 percent) and Duchesne County (-8 percent) (GOPB, 2011).

As shown by comparing **Table 3.2-15** and **Table 3.2-16**, payroll from natural resources and mining comprises a high percent of the total wages in Uintah and Duchesne Counties relative to the total employment within the sector.

Local Government Fiscal Conditions and Revenues from Oil and Gas Activities

Oil and gas operations contribute considerable revenue to various local, State, and Federal governmental entities through payment of various royalties and taxes. The following types of revenue are typically generated by oil and gas development.

Federal Mineral Lease Royalties – Federal mineral lease royalties are collected from oil and gas extraction operations located on Federally-held minerals. At present, the Federal royalty rate is 12.5 percent of the total production rate. Federal mineral leasing regulations require that 50 percent of royalties collected from mineral lease royalties are returned to the State of origin.

State Mineral Lease Royalties – Similar to Federal mineral royalties, the State of Utah receives mineral lease royalties at a rate of approximately 12.5 percent for all oil and gas development on State lands. Within the RBU Project Area all State lands are managed by the SITLA. The SITLA is an independent agency that manages lands granted to the State of Utah by the United States predominantly for the purpose of supporting public schools and academic institutions. Within the State of Utah, the largest source of trust land revenue is oil and gas.

Table 3.2-16. Non-Agricultural Payroll Wages by Employment Sector, 2011

Employment Sector	Duchesne County		Uintah County	
	Wages (Millions)	% of Total	Wages (millions)	% of Total
Natural Resources and Mining	104.9	34.5	172.2	30.8
Construction	23.3	7.7	44.9	8.0
Manufacturing	7.0	2.3	5.3	0.9
Trade, Transportation, and Utilities	64.8	21.3	126.2	22.6
Information Services	7.4	2.4	4.5	0.8
Financial Activity	5.7	1.9	26.7	4.8
Professional and Business	8.9	2.9	27.0	4.8
Education and Health	11.3	3.7	27.6	4.9
Leisure and Hospitality	4.2	1.4	12.5	2.2
Other Services	6.9	2.3	11.7	2.1
Government	59.4	19.6	100.9	18.0
Total	**303.8**	**100.0**	**559.5**	**100.0**

Source: GOPB, 2011

Sales and Use Tax Revenue – Sales taxes are paid by oil and gas operations when purchases of equipment, materials, or supplies are made in the local area. Examples of purchases that generate sales tax revenue include gravel, pipe, fuel, and other supplies purchased locally. Like property tax revenue, sales and use tax revenues are used by local cities and counties to fund a wide variety of important local services and community facilities.

As of January 01, 2011, the Utah sales and use tax rate has been 4.75 percent with a maximum possible sales tax (including local and municipal sales taxes) of 13.1 percent. Local governments in Utah are allowed to add a local sales tax of up to 3.6 percent on top of the Utah State sales tax for all qualifying sales in their jurisdiction. Thus, the actual sales tax paid on any purchase in Utah can be up to 8.35

percent depending on the location. The average sales tax in Utah, including local sales taxes charged by counties and cities, ranges from 5.95 percent to 8.35 percent.

Severance Tax – Severance tax is a tax levied by the State on oil and gas produced, saved, sold or transported from the field where it was produced. These taxes are paid on crude oil, condensate, unprocessed gas, residue gas, and natural gas liquids. Within the State of Utah, severance taxes are collected at a split rate. For example, the severance tax rate for oil is 3 percent of the value of the oil up to and including the first $13 per barrel of oil, and 5 percent of the value of the oil from $13.01 and above per barrel of oil. The severance tax rate for natural gas is 3 percent for the value of the gas up to and including the first $1.50 per one thousand cubic feet (MCF), and 5 percent of the value of the gas from $1.51 and above per MCF. The severance tax rate for natural gas liquids is 4 percent of the taxable value of the natural gas liquids. It should be noted that no tax is imposed upon stripper wells, with oil wells at less than 20 barrels barrels of oil per day (BOPD) and gas wells at less than 60 one thousand cubic feet per day (MCFD); the first 12 months of production for wildcat wells; and the first six months of production for development wells.

Oil and mining severance tax is one of Utah's eight major miscellaneous tax revenue sources (sales, income, corporate franchise, insurance, beer, cigarette, tobacco, oil and mining severance taxes). In 2010, the State of Utah collected $56,200,970 (Utah State Tax Commission 2010). Severance taxes are paid to the Utah State Tax Commission and deposited into the State's general tax fund. Because taxes are paid directly to the State of Utah, collection information is not available on a per county basis. However, due to the prevalence of oil and gas activity within the Uinta Basin, it can be assumed that the majority of severance tax collected originates in Duchesne and Uintah Counties.

Conservation Tax – A conservation tax is collected by the Utah State Tax Commission at a rate of two-tenths of one percent (0.002) of the value of oil and gas produced, sold, or transported from any oil and gas field in Utah. Revenue generated from the conservation tax is paid to the Utah State Tax Commission and deposited into the State's general tax fund. During 2010, the State of Utah collected approximately $4,191,039 from conservation fees (Utah State Tax Commission 2010).

3.2.10.2 Ute Indian Tribe

Demographics of the Ute Indian Tribe

The Uintah and Ouray Indian Reservation (also referred to as the Reservation), established in 1861, is Utah's largest Reservation and is the home of the Northern Ute (e.g., White River, Uintah, and Uncompahgre bands). The population of the Reservation is 24,369 residents; however, only 2,951 residents are American Indian (U.S. Census Bureau, 2010a). Approximately 50 percent of those with Ute Indian Tribal membership (3,157 individuals) currently live on the Reservation or on off-Reservation trust land (Ute Tribe, 2011).

Today the Reservation is approximately one-third its original size of four-million acres. In a series of land taking by the U.S. Government, the Reservation was gradually reduced in a piecemeal fashion in the early 1900's. Legal disputes over land ownership and water, which have continued over the last century, have resulted in the expansion of the Reservation to its current size. Currently, the Reservation, which is slightly more than one-million acres, comprises one-fourth of the Uinta Basin and includes portions of four Utah counties. Mineral resources are the Ute Tribe's greatest economic asset (Utah Department of Community and Culture-DIA, 2009).

Local Economy and Employment

While revenues from mineral extraction provide substantial revenue for the Ute Tribe, the local economy is sustained by a variety of industries. Major sources of employment include education, health, and social services; agriculture, forestry, mining, and fishing and hunting; retail trade; public administration; arts, entertainment, recreation, accommodation, and food services; and construction. **Table 3.2-17** provides a breakdown of sources of employment by industry. Approximately one-fourth of the Reservation's working class is employed by the government (U.S. Census Bureau, 2009). Under Ordinance No. 92-07, the Ute Tribe established a Contracting Preference Ordinance for all Reservation employers. This Ordinance, passed in 1992, requires enterprises doing business within the Reservation to employ, to the greatest extent possible, Tribal members and Tribally-owned subcontractors (Ute Indian Tribe, 1992).

According to the U.S. Census 2008-2010 American Community Survey 3-Year Estimates, the unemployment rate on the Uintah and Ouray Reservation was 3.0 percent, which was slightly lower than the average unemployment rate in the State of Utah (4.8 percent), and in the United States (5.8percent) (U.S. Census Bureau, 2010d).

Table 3.2-17. Ute Tribe Sources of Employment by Industry

Employment Sector	Number of Jobs	Percent of Total
Agriculture, Forestry, Mining, and Fishing and Hunting	1,554	17.2%
Construction	741	8.2%
Manufacturing	150	1.7%
Wholesale Trade	172	1.9%
Retail Trade	1029	11.4%
Transportation, Warehousing, and Utilities	569	6.3%
Information	236	2.6%
Finance, Insurance, Real-estate and Rental and Leasing	219	2.4%
Professional, Scientific, Management, and Administrative Services	539	6.0%
Education, Health, and Social Services	1,820	20.1%
Arts, Entertainment, Recreation, Accommodation, and Food Services	801	8.9%
Other Services	356	3.9%
Public Administration	847	9.4%
Total	**9,033**	**100.0%**

Source: U.S. Census Bureau, 2010d

According to the U.S. Census 2008-2010 American Community Survey 3-Year Estimates, the per capita income of Tribal members was approximately $23,507, which was higher than the State of Utah ($22,828) and lower than the national average ($26,942) (U.S. Census Bureau, 2010d). As of the U.S. Census 2008-2010 American Community Survey 3-Year Estimates, approximately 11.5 percent of Reservation residents lived below the poverty level. Poverty thresholds in the United States are determined by a combination of factors such as age, income, and family size. The U.S. Census Bureau's 2010 weighted average poverty threshold for an individual was $10,956 (U.S. Census Bureau, 2010a).

In terms of employment, under Ordinance No. 92-07, the Ute Tribe established a Contracting Preference Ordinance. This Ordinance, passed in 1992, requires enterprises doing business within the Reservation to employ, to the greatest extent possible, qualified Tribal members and Tribally-owned subcontractors.

Ute Tribal Fiscal Conditions and Revenues from Oil and Gas Activities

Revenue generated through mineral extraction is an important source of income for Tribal members. Within the Uintah and Ouray Reservation, there exists a complex mix of surface ownership of mineral rights; however, within the RBU Project Area, mineral ownership generally mirrors surface ownership. In areas where the Ute Tribe has mineral ownership, lease royalties are collected. The mineral lease royalty rate on Tribal minerals is minimally 12.5 of the gross value of the resources being sold. Due to confidentiality reasons, the exact mineral lease rate on Tribal lands is not disclosed.

In addition to collecting mineral lease royalties, the Ute Tribe charges a severance tax on all oil and gas that is produced, transported, or sold. Severance taxes are collected at a rate between four and eight percent of the gross value of the resources being sold.

In areas where surface and mineral ownership are held in split estate, the Ute Tribe collects revenue by entering into Surface Use Agreements (SUAs). SUAs provide compensation for the disturbance and/or the loss of income (e.g., agricultural land and crop production lost as a result of oil and gas development). Revenue from SUAs in the RBU Project Area is negotiated with the Ute Tribe on a case-by-case basis.

3.2.10.3 Split-Estate

Many of the lands within the RBU Project Area contain split-estate ownership. Split-estate ownership means that the individual or entity owning the surface rights does not own the sub-surface mineral rights. Split-estates allow holders of mineral rights to pursue resource extraction operations on land where the surface may be owned or managed by other individuals or agencies. In split-estate situations, mineral rights take precedence over surface rights associated with the property.

Of the 4,075 acres of Tribal land within the RBU Project Area, only 520 acres of sub-surface minerals are owned by the Ute Tribe. Of the remainder, 240 acres are owned by State of Utah, and 3,315 acres are Federally-owned. Mineral ownership is considered proprietary data by the Ute Tribe; therefore, only surface ownership is included on figures in this EA.

Of the approximately 12,002 acres of Federal Lands within the RBU Project Area, approximately 11,362 acres of minerals are owned by the Federal government. The remaining 640 acres are owned by the State of Utah.

All minerals under State lands within the RBU Project Area are owned by the State of Utah.

3.2.10.4 Environmental Justice

Environmental Justice is the principle defined by Executive Order 12898 and implemented by agency directives that low-income, minority and Tribal groups should not have to experience a disproportionate share of any negative effects resulting from a plan or project.

The BLM standard for identifying a low-income population is the poverty level used by the U.S. Census Bureau. The standard for identifying minorities is either: (1) the minority of the population of the affected area exceeds 50 percent or (2) the minority population percentage of the affected areas is “meaningfully greater” than the minority population percentage in the general population or other

appropriate unit of geographic analysis. For environmental justice compliance, the relevant minority population is the total minority population comprising all persons of a minority race plus persons of Hispanic origin. **Table 3.2-18** shows the minority and poverty levels in communities within the study area.

As shown in **Table 3.2-18**, the communities with a poverty rate of over 50 percent in the study area include the Fort Duchesne Census Designated Place (CDP), Randlett CDP and White Rocks CDP, which are located on the Uintah and Ouray Indian Reservation. The table also shows that these same communities are also minority communities. Communities elsewhere in Duchesne and Uintah Counties would not be considered environmental justice communities.

Table 3.2-18. Poverty and Minority Population Characteristics of Selected Communities in the Study Area

Area of Concern	Percent of Total Population in Poverty	Minority Race or Hispanic as a Percent of Total Population	Percent American Indian
Duchesne City	10.8	6.9	1.7
Roosevelt	18.7	22.3	10.9
Duchesne County[1]	10.8	13.7	4.5
Vernal	15.6	13	3
Uintah County[1]	11.5	13.4	7.7
Fort Duchesne CDP	36.9	98.7	94.9
Randlett CDP	59.7	96.4	93.3
White Rocks CDP	18.6	96.2	96.2
Uintah and Ouray Reservation[1]	**11.5**	**21.3**	**13.9**

CDP = Census Designated Place.
(1) Source: U.S. Census Bureau, 2010a

4.0 ENVIRONMENTAL CONSEQUENCES

4.1 INTRODUCTION

This Chapter provides an analysis of the impacts or environmental consequences that would result from implementation of Alternative A – Proposed Action, Alternative B – No Action Alternative, Alternative C – Agency Preferred Alternative, or Alternative D – Minimum Development Alternative. The impact analysis describes the effects of implementing the alternatives on the physical, biological, and human environment as described in **Chapter 3**. The resource-specific effects of the alternatives are evaluated both quantitatively and qualitatively, depending on available data and the nature of the resource analyzed. Mitigation measures and residual impacts are discussed, where appropriate, to further minimize impacts.

An environmental consequence or impact is defined as a modification in the existing environment brought about by the Proposed Action or an alternative. Impacts can be a primary result of the action (direct) or a secondary result (indirect), and can be permanent or long-lasting (long-term) or temporary and of short duration (short-term). Impacts can vary in degree from only a slight discernible change to a total change in the environment.

Direct effects are caused by the action and generally occur at the time the action is implemented and within the Project Area (e.g., removal/loss of vegetation). Indirect effects are caused by the action and occur later in time or farther removed from the Project Area (e.g., sediment yield impacts downstream from the Project Area). Short-term impacts are effects on the environment that occur during and immediately after well pad construction, drilling, completion, testing, and/or production facility installation, and can last up to four years, or until completion of interim reclamation. Although short in duration, such impacts can be obvious and disruptive. For this project, short-term impacts are defined as lasting four years or less. Long-term impacts are changes made in the environment during construction and operation of the project that remain longer than four years and perhaps for the life of the project (approximately 20 years) and beyond.

Analysis of the development of wells on State and Tribal leases are included for each alternative; however, the BLM only approves the development of Tribal leases following authorization of the BIA during the APD process and does not have the authority to approve development on State leases. Despite this, analysis of these wells was included to further inform the BLM AO on the overall extent of project impacts.

4.2 AIR QUALITY

This Section on air quality environmental impacts is based on emission inventories for the Proposed Action and alternatives (Appendix F-1 through F-4); the *Near Field Air Quality Technical Support Document for the XTO Energy RBU Infill Development Project* (RBU Near-Field TSD), Kleinfelder/Buys and Associates 2010/updated 2012 (Appendix G); the *Ozone Impact Assessment for XTO Energy's River Bend Unit Natural Gas Development Project Environmental Assessment*, (RBU Ozone Assessment) Alpine/Buys and Associates, May 2010 (Appendix H-1), and the *Memorandum to Update the Ozone Impact Assessment for XTO Energy's River Bend Unit Natural Gas Development Project* (RBU Ozone Update Memo), Alpine 2011 (Appendix H-2). A visibility degradation analysis was also conducted and is discussed in the RBU Near-Field TSD.

Both development and production activities for the Proposed Action and alternatives may cause emissions of pollutants with the potential to affect ambient air quality. These emissions may be caused by the following sources:
Development Activities:

- Well pad, new central facility and road construction: equipment producing fugitive dust while moving and leveling earth and vehicles generating fugitive dust on access roads;
- Drilling: vehicles generating fugitive dust on access roads and drill rig engine exhaust;
- Completion: vehicles generating fugitive dust on access roads, frac pump engine and generator emissions and completion venting emissions;
- Vehicle tailpipe emissions associated with all development phases.
- Production Activities:
- Well production operations: three-phase separator emissions, well site glycol dehydration unit emissions, flashing and breathing emissions from condensate tanks, fugitive emissions from pneumatic devices, fugitive dust and tailpipe emissions from pumpers and trucks transporting produced condensate and water from storage tanks;
- Central production facility: compressor engines emissions, central glycol dehydration unit emissions, fugitive emissions from pneumatic devices, flare emissions from central dehydrators and central flashing and breathing emissions from condensate tanks; and
- Vehicle tailpipe emissions associated with all production phases.

The potential for adverse air quality effects of the Proposed Project is assessed by comparing the potential ambient air quality impact of the Proposed Project to the NAAQS. The potential impact of the Proposed Project is a combination of the existing (background) ambient air quality and the modeled impact of future activities caused by the Proposed Project.

Table 3-2 in **Chapter 3** presents the background ambient air quality and the associated NAAQS. For near-field impacts resulting from development activities, the pollutant of concern is PM_{10} and $PM_{2.5}$. For near-field impacts resulting from production activities, the pollutants of concern are NO_2 and CO. Ozone is the pollutant of concern for far-field impacts related to production. These potential impacts are discussed in the following sections.

Prior to early 2010, the NAAQS for NO_2 was promulgated only for an annual average. In early 2010 (after the RBU Near-Field TSD analyses had been completed), the USEPA promulgated a new 1-hour NO_2 standard. This standard is complex and is stated as the 3-year average of the 98th percentile of the annual distribution of daily maximum 1-hour concentrations within an area.

Although the potential impact of development activities was not quantitatively analyzed in the RBU Near-Field TSD, such activities are not expected to cause an exceedance of the 1-hour standard. This is because development activities at any one location would be temporary and would not otherwise contribute to NO_2 concentrations after these activities are completed.

For example, drill rig emissions analyzed for a similar development project (Greater Natural Buttes FEIS, March 2012) determined that if Tier 2 drill rig engines are used and there are no more than four drill rigs running on adjacent well pads simultaneously, maximum single hour modeled impacts are less than the NAAQS.

The Proposed Action drilling operations are consistent with GNB, and thus the 1-hour NO_2 standard will not be exceeded with the Proposed Action. Potential emissions from operational traffic are also not

expected to adversely impact one-hour NO_2 concentrations due to the low traffic volume associated with the proposed alternatives.

In addition to the above BLM proposed 1-hour NO_2 mitigation measures, prior to beginning drilling operations they will be reviewed by the Utah Department of Air Quality and the USEPA under the Clean Air Act permitting program on state or tribal lands, including the new Tribal New Source Review regulations. Under this permitting program, operations may not commence until it is demonstrated that they will not cause an exceedance of the 1-hour NO_2 NAAQS.

Not only has the USEPA published a new 1-hour NO_2 NAAQS in a probabilistic form, on June 22, 2010 the USEPA published a new 1-hour SO_2 NAAQS and deleted the annual standard. The new 1-hour SO2 standard is expressed as the 3-year average of the 99th percentile of the annual distribution of daily maximum 1-hour concentrations within an area. Based on analysis for a similar project (Greater Natural Buttes, FEIS, March 2012), and the relatively low amounts of production related SO_2 emissions, project related impacts are anticipated to remain well below the 1-hour SO_2 NAAQS.

4.2.1 Alternative A – Proposed Action

Pollutant emissions have the potential to affect air quality on both a local and a regional scale. Emission inventories for the criteria pollutants [nitrogen oxides (NO_x), CO, SO_2, particulates (PM_{10} and $PM_{2.5}$)] and HAPs were developed for the Proposed Action development and production-related activities. Near-field pollutant dispersion modeling was performed to assess the potential air quality impacts from the Proposed Action for comparison to existing ambient air quality standards. Far-field (ozone) modeling was also conducted and is discussed further in the following paragraphs.

In addition to the modeling conducted specifically for the Proposed Action, the air quality analyses performed for the Anadarko Greater Natural Buttes FEIS (March 2012), and the Gasco Uinta Basin Natural Gas Development Project (March 2012) both incorporated the Proposed Action emissions. These analyses showed that air quality in the project area is not expected to be adversely impacted from the Proposed Action.

4.2.1.1 Emissions

During the development phase, vehicle and fugitive dust emissions would increase within the RBU Project Area. Vehicle emissions would result from work crews commuting to and from the work site and from the transportation and operation of equipment to construct well pads, roads, and pipelines. Vehicle tailpipes would emit small quantities of NO_2, SO_2, and CO. Fugitive dust concentrations (PM_{10} and $PM_{2.5}$) would increase with additional vehicle traffic on roads and from wind erosion in areas of soil disturbance. Drill rig operations would result mainly in an increase of NO_2 and CO emissions. These emissions would produce elevated pollutant levels but would be short-term and localized for the duration of the activities. **Table 4.2-1** summarizes emissions expected from the development phase.

Table 4.2-1. Annual Emissions for Various Phases of the Proposed Action*

Pollutant	Development Emissions (tons/year) [a]					Total (tons/yr)
	Construction	Drilling	Completion	Interim Reclamation	Wind Erosion	
NO_X	0.23	192	26.0	0.03	0.00	218
CO	1.20	154	22.4	0.27	0.00	178
VOC	0.14	45.6	17	0.02	0.00	63
SO_2	0.01	0.70	0.30	0.002	0.00	1.0
PM_{10}	8.88	496	210	1.59	0.03	716
$PM_{2.5}$	0.95	54.6	21.2	0.16	3.84E-03	77
Benzene	0.00	0.10	0.07	0.00	0.00	0.2
Toluene	0.00	0.04	0.06	0.00	0.00	0.1
Ethylbenzene	0.00	0.00	0.00	0.00	0.00	0.002
Xylene	0.00	0.02	0.02	0.00	0.00	0.0
n-Hexane	0.00	0.00	0.31	0.00	0.00	0.3
Formaldehyde	0.00	9.97E-03	5.73E-04	0.00	0.00	0.011
Acrolein	0.00	9.96E-04	5.49E-05	0.00	0.00	1.1E-03
CO_2	0	19,541	932	0	0.00	20,472
CH_4	8.65E-03	12.4	89	1.55E-03	0.00	101
N_2O	0	0	0	0	0.00	0
GWP [b]	0	19,801	2,801	0	0.00	22,593

[a] Assumes maximum development scenario (93 wells developed in one year)

* Emissions Inventory as presented for the Proposed Action based on revisions to data and assumptions from the Emission Inventory as analyzed in the Near-Field AQTSD. Revisions made to account for refinements in production data and related equipment requirements

[b] Global Warming Potential = CO_2 + 21 x CH_4 + 310 x N_2O. GHG and GWP emissions shown as 0 in the table indicate that there may be a small amount of that specific GHG for that specific operation, but the emission is de minimis in the total GWP. If an emission is shown as 0.00, then that GHG is not emitted for that specific operation (e.g., wind erosion).

During the production phase, NO_2, CO, VOC, PM, and HAP emissions would result from the long-term operation of several compressor engines, separator heaters, dehydrators, and pump unit engines. Vehicle tailpipes would emit small quantities of NO_2, SO_2, and CO. Fugitive dust concentrations (PM_{10} and $PM_{2.5}$) would increase with additional vehicle traffic on roads.

Emissions for the Proposed Action from the operation of compressor engines were calculated based on the additional 8,520 of horsepower distributed over eight existing compressor stations and one new compressor station. Emissions were estimated based on typical emissions and control rates for a 4-stroke lean-burn engine with an oxidation catalyst. These controls were applied to the CO and formaldehyde emissions because of requirements of the MACT Federal rules found under Title 40, Section 63, Subpart ZZZZ of the Code of Federal Regulations. **Table 4.2-2** summarizes the annual emissions associated the production phase.

Table 4.2-2. Total Annual Production Emissions from the Proposed Action*

Pollutant	Total Project Production Related Emissions (tons/year) [a]							
	Pumping Unit Engines	Production Heaters	Stock Tanks	TEG Dehydrators	Operations Vehicle	Pneumatics	Compressor Engines	Total (tons/year)
NO_X	30	218	0.00	0.00	15.8	0.0	82	346
CO	60	183	0.00	0.00	44.0	0.0	16	302
VOC	15	2.68	1,326	1,535	9.01	2196.5	38	5,122
SO_2	0.00	0.00	0.00	0.00	0.65	0.0	0.00	0.65
PM_{10}	1.5	16.6	0.00	0.00	1.36	0.0	3.0	22
$PM_{2.5}$	1.5	16.6	0.00	0.00	0.14	0.0	3.0	21
Benzene	0.12	0.00	8.5	161	0.00	0.0	0.03	170
Toluene	0.04	0.01	7.1	363	0.00	0.0	0.03	370
Ethylbenzene	0.00	0.00	0.1	21.7	0.00	0.0	0.00	21.8
Xylene	0.01	0.00	1.3	321	0.00	0.0	0.01	323
n-Hexane	0.00	3.92	26.5	13.1	0.00	0.0	0.08	44
Formaldehyde	1.5	0.16	0.00	0.00	0.00	0.0	4.9	6.6
Acetaldehyde	0.21	0.00	0.00	0.00	0.00	0.0	0.6	0.8
Acrolein	0.20	0.00	0.00	0.00	0.00	0.0	0.37	0.57
CO_2	38,217	261,486	11.0	0	0	0	32,839	332,553
CH_4	17	5.01	446	163	0.48	8634.1	373	9,639
N_2O	0	4.79	0	0	0	0	0	4.79
GWP [b]	38,574	263,076	9,377	3,423	10	181,136	40,672	536,457

[a] Assumes maximum development scenario(484 producing wells). Emission estimates for additional HAPs are included in the inventory. Emission for HAPs less than 0.5 tons per year are not shown.

* Emissions Inventory as presented for the Proposed Action based on revisions to data and assumptions from the Emission Inventory as analyzed in the Near-Field AQTSD. Revisions made to account for refinements in production data and related equipment requirements

[b] Global Warming Potential = CO_2 + 21 x CH_4 + 310 x N_2O. GHG and GWP emissions shown as 0 in the table indicate that there may be a small amount of that specific GHG for that specific operation, but the emission is de minimis in the total GWP.

The emission estimates presented in **Tables 4.2-1 and 4.2-2** are significantly less (on the order of one-half) than the emissions presented in the May 2010 Draft EA for the Proposed Action. The May 2010 emission estimates were based on an initial estimate prepared by Dominion Energy. After the May 2010 Draft EA was prepared, the Project Proponent (i.e., XTO), conducted an extensive internal review of the methodology and assumptions used in the Dominion Energy estimates. The review determined that the Dominion emission estimates contained a number of assumptions and methods that over-estimated

emissions. **Table 4.2-3** shows the main refinements made to yield the emission assumptions shown in **Tables 4.2-1 and 4.2-2**. The refinements in **Table 4.2-3** reduced total NOx emissions (development plus production) from 905 tons per year to 564 tons per year and VOC emissions from 11,848 tons per year to 5,185 tons per year. Nevertheless, the RBU Near-Field impact analysis is based on the original May 2010 Dominion Energy emission over-estimates.

Table 4.2-3. Basis for Refined Emission Estimates from the Proposed Action*

Item	Dominion Energy Estimate	Refined Estimate
Well Production	Constant for 15+ years	Production decline that is actually experienced
Well Gas Production Rate	1.2 MMscf gas per day per well	0.2 MMscf per day per well
Well Condensate Production Rate	3 bbl per day per well	1 bbl per day per well
Gas analysis for VOC content	Single value from a compressor station	Values from well sites
Number of wells requiring pumping units	454 wells and 35 hp engines	73 wells and 22 hp engines
Glycol dehydrator reboilers	500 MMBtu/hour	250 MMBTU/hour

4.2.1.2 Criteria Pollutant Impacts

Criteria pollutants modeled for potential impacts and compared to ambient air quality standards include PM_{10}, $PM_{2.5}$, NO_2 (annual) and CO. The highest possibility of emissions for PM_{10} and $PM_{2.5}$ takes place during the construction and development phase of the proposed action. The highest possibility of emissions for NO_x and CO takes place during the drilling, completion, and production phases of the proposed action. Each pollutant was modeled under the maximum development scenarios of the proposed action. **Tables 4.2-4 and 4.2-5** presents the maximum predicted impacts from the dispersion modeling added to the existing background concentration and compared to the applicable ambient air quality standard for each modeled criteria pollutant. Modeling assumptions can be found in the RBU Near-Field TSD. Maximum impacts are a combination of worst-case meteorology (i.e., poorest dispersion conditions), worst-case (i.e., maximum) emissions, and maximum background.

Table 4.2-4. Proposed Action Potential Construction and Development Impacts

Pollutant	Averaging Period	Ambient Air Concentration (µg/m^3)				
		Year of Maximum Impact	Predicted	Background [a]	Total	NAAQS
PM_{10}	24-Hour	1999	41.9	18.0	59.9	150
$PM_{2.5}$	24-Hour	1995	18.4	21.6	40.0[b]	35
	Annual	1995	0.73	12.3	13.0	15

[a] Based on data collected at the Ouray or Redwash Monitoring Stations (see AQIA, Greater Natural Buttes FEIS, AQTSD, March 2012).

[b] Although the modeled total impact appears to exceed the NAAQS, this is not case. The NAAQS is the 3-year average of the 98th percentile. The modeled impact presented herein is the maximum modeled concentration, not the 98th percentile. Accordingly, due to the conservative nature of the model assumptions, use of a background data value based on less than 3-years of data, and use of the maximum impact instead of the 98th percentile, actual impacts are expected to be less than the NAAQS.

Table 4.2-5. RBU Proposed Action Development and Operations Impacts

Pollutant	Averaging Period	Ambient Air Concentration (µg/m^3)					
		Year of Maximum Impact	Predicted	Background [a]	Total	PSD Class II Increment	NAAQS
NO_2	Annual	1999	19.2[b]	9.0	28.2	25	100
CO	8-hour	1999	338	3,910	4,248	-	10,000
	1-hour	1996	658	6,325	6,983	-	40,000

[a] Based on data collected at the Ouray or Redwash Monitoring Stations (see AQIA, Greater Natural Buttes FEIS, AQTSD, March 2012).
[b] NO_2 impacts are converted from modeled NOx to NO_2 using a 75% conversion rate.

4.2.1.3 Hazardous Air Pollutant Impacts

Modeled results were compared to the Utah screening levels, and the acute, chronic, and carcinogenic thresholds for potential adverse health impacts. Impacts from HAPs with the highest four predicted emissions, plus acrolein due to the dangers in small levels of exposure, were compared to all criteria. Short-term impacts from HAP exposure were assessed by comparing one-hour average impacts to the HAP-specific acute REL (reference exposure level) and annual average impacts to the HAP-specific RfC (reference concentration for continuous inhalation exposure). The REL is the acute concentration at or below which no adverse health effects are expected. The RfC is the average concentration, i.e., an annual average, at or below which no long-term adverse health effects are expected. Both of these guideline values are for non-cancer effects. **Table 4.2-6** presents the predicted results of emission impacts under the proposed action in comparison to the State of Utah TSLs for averaging periods of 1-hour (short-term) and 24-hour (chronic). None of the HAPs exceed Utah TSLs.

Table 4.2-6. RBU Proposed Action Predicted HAP Comparison to State of Utah TSLs

Pollutant and Averaging Time	Predicted Maximum Impact (µg/m^3)	Maximum Impact Year	Toxic Screening Levels [b] (µg/m^3)	Percent of TSL
Formaldehyde (1-hour)	12.8	1996	36.8	34.8%
Acrolein (1-hour)	1.63	1996	22.9	7.12%
Benzene [a] (Annual)	26.9	1999	53.2	50.6%
Toluene (24-hour)	10.5	1996	2,512	0.40%
Xylenes (24-hour)	103	1999	14,473	0.70%

[a] Although there exists an acute TLV for benzene, the State of Utah does not apply a comparison to an acute TSL since the chronic TSL is more stringent. Thus, the annual Benzene impact is compared to the Benzene chronic TSL.
[b] Source: Utah Department of Environmental Quality – Division of Air Quality (2008).

Table 4.2-7 presents the acute RELs and RfCs for non-cancer effects for the Proposed Action. The predicted maximum concentrations of all HAPs are compared against the REL and RfC for each pollutant. Predicted concentrations of acrolein for the Proposed Action exceed both the acute REL and the RfC.

Table 4.2-7. Proposed Action Non-Carcinogenic Acute REL and RfC Impacts

HAP	REL [a] (µg/m^3)	Predicted Maximum 1-Hour Impact (µg/m^3)	Percent of REL	RfC [c] (µg/m^3)	Predicted Maximum Annual Impact (µg/m^3)	Percent of RfC
Acrolein	0.19	1.63	858%	0.02	0.13	650%
Acrolein [d]	2.5	1.63	65%	0.35	0.13	37%
Formaldehyde	94	12.8	13.6%	9.8	1.04	10.6%
Benzene [b]	1,300	187	13.0%	30	26.9	89.6%
Toluene	37,000	521	1.41%	5,000	43.3	0.87%
Xylenes	22,000	321	1.46%	100	26.2	26.2%

[a] USEPA Reference Exposure Level (REL) for no adverse effects EPA Air Toxics Database, Table 2 (EPA 2007), unless otherwise noted.
[b] REL for benzene is based on a 6-hr exposure (OEHHA 1999), predicted concentration is a 6-hr average.
[c] EPA Air Toxics Database, Table 1 (EPA 2007)
[d] California OEHHA acute and chronic REL, June 2008.

The modeling based on the May 2010 Draft EA for the Proposed Action shows an apparent exceedance of the acrolein USEPA REL and RfC. However, the modeling does not show an exceedance of the California RELs and RfC. However, the May 2010 Draft EA modeling was for emissions of acrolein much greater than for the current Proposed Action (shown in **Tables 4.2-1 and 4.2-2**). Furthermore, the maximum modeled acrolein concentrations are at locations where there are no persons exposed (i.e., the modeling was done for the maximum impact point, just as the NAAQS modeling). Therefore, no adverse health effects from acrolein emissions are expected.

Table 4.2-8 presents the unit risk factor, exposure adjustment factor, and the estimated cancer risk for the MLE and MEI exposure scenarios for the Proposed Action known, probable, and possible carcinogenic HAPs. The unit risk factor is a slope factor that when multiplied by the ambient air concentration provides an estimate of the probability of one additional person contracting cancer based on continuous exposure over a 70-year lifetime. A range of unit risk factors is available for benzene. All estimated risks are within the acceptable range.

There is uncertainty associated with adding cancer risk values together although it is commonly done for carcinogens having similar modes of action or target organs. However formaldehyde, a suspected human carcinogen is suspected to cause leukemia which is also the type of cancer possibly caused by benzene. Therefore it is reasonable to add benzene and formaldehyde risk numbers together.

As is the case for acrolein and the other acute and chronic HAPs, the modeled cancer risk shown in **Table 4.2-8** is from the May 2010 Draft EA, with emissions much larger than the current Proposed Action. Furthermore, the exposures are for hypothetical locations (maximum impact), even when there are no persons actually exposed. Therefore, the actual cancer risk is expected to be less than one in one million.

Table 4.2-8. Proposed Action Carcinogenic HAP Risk

Exposure Scenario	HAP	Unit Risk Factor ($1/\mu g/m^3$)	Exposure Adjustment Factor	Modeled Annual Impact ($\mu g/m^3$)	Cancer Risk
MLE	Benzene	2.2×10^{-06} to 7.8×10^{-06}	0.095	26.9	5.6×10^{-06} to 2.0×10^{-05}
	Formaldehyde	1.3×10^{-05}	0.095	1.04	1.3×10^{-06}
	TOTAL MLE RISK				**1.3×10^{-05}**
MEI	Benzene	2.2×10^{-06} to 7.8×10^{-06}	0.40	26.9	2.4×10^{-05} to 8.4×10^{-05}
	Formaldehyde	1.3×10^{-05}	0.643	1.04	8.7×10^{-06}
	TOTAL MEI RISK				**9.3×10^{-05}**

Example Benzene MLE Calculation: 0.0000022 unit risk factor * 0.095 adjustment factor * 26.9 impact = 0.0000056 cancer risk
MEI = maximally exposed individual
MLE = most likely exposure

4.2.1.4 Visibility Impacts

A screening analysis to determine the impacts on visibility caused by the RBU Project Area at 50 km distances was performed. The VISCREEN model approved by the USEPA was used to determine the visual effect parameters (color difference parameter and plume contrast against a background) from the RBU project area emissions plumes from a given vantage point (i.e., a scenic vista). VISCREEN is recommended for use up to a maximum distance of 50 km from the source. Due to the distance from RBU to the nearest Class I area (greater than 150 km), analyzing the visibility impact (degradation) that RBU could have on a given location at 50 km is considered to be a conservative (over-estimate.

Potential visibility degradation can be evaluated in terms of the change in deciview (Δdv), change in contrast, and/or change in visual range. All three criteria are related to the extinction coefficient (B_{ext}) but are numerically different.

Changes in deciviews are calculated by sophisticated long range transport models. A 1.0 dv "Just Noticeable Change" is equivalent to a 10% change in B_{ext}. There are no applicable federal, state, tribal, or local visibility standards. However, predicted visibility impacts are often compared to Levels of Acceptable Change (LAC) developed by Federal Land Managers (FLAG 2000). This threshold is based on the original development of the deciview scale (Pitchford and Malm 1994), and is supported by EPA's Final Regional Haze Regulation (EPA 1999) decision to use 1.0 Δdv as the significance level when preparing periodic reasonable progress reports. Therefore, a "Just Noticeable Change" threshold of a 10% change in extinction or 1.0 Δdv can be used as a significance criterion.

The VISCREEN model used for the visibility impact screening analysis calculates the contrast of a potential plume of pollutants emitted by the proposed project. The model uses 5 percent contrast as the significance criterion. Contrast is directly related to visual range, and most visual range calculations use a 2 percent contrast difference as being "barely noticeable". That is, if there is a 2 percent difference in contrast between the object being viewed and the background, the object would be barely noticeable and the distance at which the contrast decreases to 2 percent is the visual range. Accordingly, to be

comparable to the deciview "Just Noticeable Change" criterion, a 2 plume percent contrast value was used as the significance criterion instead of the default VISCREEN criterion of 5 percent.

Results from execution of the VISCREEN model with the inputs specified above are reported in the RBU Near-Field TSD. The modeled potential plume contrast for the Proposed Action was 1 percent or less 50 km from the RBU. This contrast value is less than the "Just Noticeable Change" criterion and is not considered objectionable or adverse.

The 50 km distance was used as the VISCREEN model is designed to yield conservative (i.e., over predict) estimates of potential visibility impacts near a source. The model uses hypothetical worst case meteorology (e.g., 1 meter per second wind speed) and assumes straight line transport indefinitely. At a 1 meter per second wind speed, it will take nearly 14 hours to transport emissions 50 km. Therefore, using VISCREEN quantitatively for distances beyond 50 km is not reasonable. However, at distances beyond 50 km, the plume contrast will be much less than at 50 km due to plume dispersion and entrainment of background ambient air.

The results of the VISCREEN analysis for the Proposed Action is consistent with the GNB EIS analysis. The GNB EIS analyzed the incremental impacts of GNB on regional haze in 12 Class I areas and 8 Class II areas of interest. The analysis showed that the GNB project would not cause an incremental increase over the baseline greater than the 1.0 deciview threshold for the GNB Proposed Action (3,675 wells). For Class II areas the GNB analysis showed that the GNB Proposed Action could cause an incremental impact of 102 days per year greater than 1.0 deciview at Flaming Gorge, and 32 days per year greater than 1.0 deciview at Dinosaur National Monument. However, the RBU Proposed Action is only 484 wells (less than 15 percent of the GNB total). Accordingly, although it is possible that RBU could cause an incremental increase of 1.0 deciview at the Flaming Gorge Class II area, the frequency of such an increase would be small to non-existent. At the Dinosaur National Monument, it is highly unlikely that RBU could cause an incremental increase of 1.0 deciview. Although the 1.0 deciview threshold is discussed for Class II areas, the Federal Land Managers have not published guidance regarding thresholds of concern for visibility in such areas.

4.2.1.5 Greenhouse Gases

The Proposed Project greenhouse gas (GHG) emissions were shown in **Tables 4.2-1 and 4.2-2**. The USEPA has recently promulgated two regulatory programs that could potentially affect the Proposed Project: 40 CFR 98 Subpart W Mandatory Reporting and the GHG Tailoring Rule.

Subpart W of the Greenhouse Gas Mandatory Reporting Rule is applicable to Petroleum and Natural Gas Systems (i.e. the project as described in the Alternatives). Subpart W does not require any controls or establish any emissions limits related to GHG emissions or impacts. Therefore, there is no requirement under the mandatory reporting rule at this time that would affect any of the Alternatives of the proposed project, other than the possibility of monitoring, recordkeeping, and reporting of GHG emissions.

The Tailoring Rule applies to large single sources of GHG emissions under the PSD program. If emissions for a single source exceed 100,000 tons per year global warming potential, then Best Available Control Technology, among other requirements, apply. However, the Proposed Action is not subject to the Tailoring Rule because the emissions are not at a single source.

4.2.1.6 Eolian Dust

According to Climate Science (2008), eolian dust is generated from a wide range of sources including industrial emissions and the wind erosion of soils. Dust may affect ocean productivity, control terrestrial

nutrient cycling and alter regional and global climate. Dust deposition onto snow cover in the western United States has recently been shown to accelerate melt and reduce snow-cover duration by approximately one month, a finding that has broad implications for water resources in mountainous regions of the United States. Regional sources of dust produce significant quantities of mineral aerosols with effects on soil fertility, air quality and human health. Like many arid environments, the drylands of the western United States have experienced widespread land-use change over the past two centuries, with rapid acceleration of agricultural and grazing activities following the westward expansion of the United States in the 1800s. Despite growing evidence of the impacts of land use on wind erosion of soils around the world, the history of human influences on atmospheric dust remains poorly documented. Records showing increased dust accumulation in Antarctic ice cores between the nineteenth and twentieth centuries, and evidence for changing chemistry of glacial dust during the twentieth century, suggest higher contemporary atmospheric mineral aerosol loads than during the pre-industrial period. However, without more documentation of contemporary and paleo-deposition rates, we are largely limited to speculation about how humans have altered regional and global dust emissions, and in particular to this project, how it could contribute to eolian dust deposition.

4.2.1.7 Project-Specific Ozone Assessment

In May 2010, a preliminary analysis of potential ozone impacts from the Proposed Action project emissions and cumulative emissions was performed using the Models-3 Community Multiscale Air Quality (CMAQ) modeling system, version 4.6 publicly released October 2006. The results of this project-specific analysis were presented in the RBU Ozone Assessment (**Appendix H-1**). For this analysis, the modeled emissions were based on emissions for 2018, the year of maximum project emissions and with the original over-estimated Dominion Energy methodology. In order to simulate atmospheric ozone levels, it is necessary to develop emissions estimates for all other emission sources (i.e., industrial, electric generation, motor vehicle, biogenic) in addition to the emissions from the RBU project. The foundation datasets for the emissions development were based on the emissions data developed by the Western Regional Air Partnership (WRAP).

With the original over-estimated emissions, the results of the model indicated that no areas in the vicinity of the XTO RBU project area would experience an exceedance of the 75 parts per billion (ppb) ozone NAAQS with either the 2005 or 2006 meteorological data with or without the project emissions. The maximum predicted impact from the Proposed Action case in 2018 was shown to be less than 0.7 ppb when the USEPA-recommended "relative non-monitored area" methodology was used. The project-specific ozone impact analysis was updated in 2011 with the refined emission estimates for the Proposed Action shown in **Tables 4.2-1 and 4.2-2**. This update was reported in the RBU Ozone Update Memo **(Appendix H-2)**. Again, no area was shown to exceed the 75 ppb NAAQS, and the maximum "relative non-monitored area" impact of the Proposed Action was zero for one of the two meteorological years modeled (2005) and less than 0.4 ppb for the second meteorological year (2006).

During the winters of 2009-2010 and 2010-2011, monitored ozone concentrations in the Uinta Basin exceeded the 8-hour NAAQS of 75 ppb. However, none of the summer days exceeded the NAAQS. Furthermore, during the winter of 2011-2012, there were no monitored exceedances of the 75 ppb value (reported by the 2012 Uintah Basin Winter Ozone and Air Quality Study Summary of Interim Findings, Ongoing Analyses, and Additional Recommended Research, August 7, 2012, available at www.deq.utah.gov/locations/uintahbasin/docs/2012/Aug). Winter-time exceedance of the ozone standard is a new phenomenon and is not well understood nor modeled. Nevertheless, the BLM has established an Ozone Action Plan, and is conducting a updated ozone modeling effort and other efforts as part of an Adaptive Management Strategy/Air Resource Management Strategy (ARMS). Based on the data review and criteria set forth in the ozone action plan, the BLM, in consultation with the appropriate Federal, Tribal and State stakeholders, will determine when to trigger implementation of the Ozone Action Plan.

The specifics of the Ozone Action Plan, Adaptive Management Strategy, and ARMS are discussed in **Section 4.2.5**, Potential Mitigation Measures.

4.2.2 Alternative B – No Action Alternative

Under this alternative, XTO would continue to develop the necessary infrastructure in order to drill and operate 16 wells previously approved under EA No. 1997-49. The number of new well pads and roads under this alternative would be substantially less than the number of new well pads and roads under the Proposed Action. **Table 4.2-9** and **4.2-10** summarize the annual emissions associated with various phases of the RBU Infill No Action Alternative.

Table 4.2-9. Annual Emissions for Various Phases of the RBU Infill No Action Alternative B

Pollutant	Development Emissions (tons/year) [a]					Total (tons/yr)
	Construction	Drilling	Completion	Interim Reclamation	Wind Erosion	
NO_X	0.04	36	4.5	0.00	0.00	40
CO	0.23	28	3.8	0.02	0.00	32
VOC	0.03	8.4	3	0.00	0.00	11
SO_2	0.00	0.12	0.05	0.000	0.00	0.2
PM_{10}	1.80	85	36	0.11	0.03	123
$PM_{2.5}$	0.20	9.5	3.7	0.01	3.84E-03	13
Benzene	0.00	0.02	0.01	0.00	0.00	0.0
Toluene	0.00	0.01	0.01	0.00	0.00	0.0
Ethylbenzene	0.00	0.00	0.00	0.00	0.00	0.000
Xylene	0.00	0.00	0.00	0.00	0.00	0.0
n-Hexane	0.00	0.00	0.05	0.00	0.00	0.1
Formaldehyde	0.00	1.87E-03	9.85E-05	0.00	0.00	0.002
Acrolein	0.00	1.87E-04	9.45E-06	0.00	0.00	2.0E-04
CO_2	0	3,664	160	0	0.00	3,824
CH_4	1.67E-03	2.3	15	1.09E-04	0.00	18
N_2O	0	0	0	0	0.00	0
GWP [b]	0	3,712	475	0	0.00	4,202

[a] Assumes maximum development scenario (16 wells in a single year)
[b] Global Warming Potential = CO_2 + 21 x CH_4 + 310 x N_2O. GHG and GWP emissions shown as 0 in the table indicate that there may be a small amount of that specific GHG for that specific operation, but the emission is de minimis in the total GWP. If an emission is shown as 0.00, then that GHG is not emitted for that specific operation (e.g., wind erosion).

Table 4.2-10. Total Annual Production Emissions from the No Action Alternative

Pollutant	Tons/Year [a]							Total (tons/year)
	Pump Unit Engines	Production Heaters	Condensate Tanks	TEG Dehydrators	Operations Vehicle	Pneumatics	Compressor Engines	
NO_X	7	7	0.00	0.00	0.4	0.0	3	17
CO	13	6	0.00	0.00	1.5	0.0	1	21
VOC	3	0.09	32	51	0.25	25.0	1	113
SO_2	0.00	0.00	0.00	0.00	0.02	0.0	0.00	0.02
PM_{10}	0.3	0.5	0.00	0.00	0.04	0.0	0.1	1
$PM_{2.5}$	0.3	0.5	0.00	0.00	0.00	0.0	0.1	1
Benzene	0.03	0.00	0.2	5	0.00	0.0	0.00	6
Toluene	0.01	0.00	0.2	12	0.00	0.0	0.00	12
Ethylbenzene	0.00	0.00	0.0	0.7	0.00	0.0	0.00	0.7
Xylene	0.00	0.00	0.0	11	0.00	0.0	0.00	11
n-Hexane	0.00	0.13	0.7	0.4	0.00	0.0	0.00	1
Formaldehyde	0.3	0.01	0.00	0.00	0.00	0.0	0.2	0.5
Acrolein	0.05	0.00	0.00	0.00	0.00	0.0	0.0	0.1
CO_2	8,376	8,410	0.3	0	0	0	1,195	17,981
CH_4	4	0.16	12	5	0.01	119.2	14	155
N_2O	0	0.15	0	0	0	0	0	0.15
GWP [b]	8,460	8,460	252	105	0	2,503	1,489	21,283

[a] Assumes maximum development scenario 16 producing wells
[b] Global Warming Potential = CO_2 + 21 x CH_4 + 310 x N_2O. GHG and GWP emissions shown as 0 in the table indicate that there may be a small amount of that specific GHG for that specific operation, but the emission is de minimis in the total GWP.

The near-field and ozone impact analyses discussed in **Section 4.2.1.7** was conducted and analyzed using the specifications of the Proposed Action, which includes the maximum development scenario throughout the life of the project (i.e. 484 wells). Due to the fact that the No Action Alternative would consist of significantly less development than the Proposed Action, this alternative would yield equal or lesser impacts than the Proposed Action.

4.2.3 Alternative C – Agency Preferred Alternative

Under this alternative, XTO would develop the necessary infrastructure in order to drill and operate 250 wells. The number of new well pads and roads under this alternative would be less than the number of

new well pads and roads under the Proposed Action. **Table 4.2-11** and **4.2-12** summarize the annual emissions associated with the various phases of Alternative C.

Table 4.2-11. Annual Emissions for Various Phases of the RBU Infill Alternative C

Pollutant	Development Emissions (tons/year) [a]					Total (tons/yr)
	Construction	Drilling	Completion	Interim Reclamation	Wind Erosion	
NO_X	0.28	125	16.8	0.04	0.00	142
CO	1.48	100	14.4	0.32	0.00	116
VOC	0.18	29.7	11	0.03	0.00	41
SO_2	0.01	0.45	0.20	0.002	0.00	0.7
PM_{10}	10.90	320	135	1.88	0.03	468
$PM_{2.5}$	1.16	35.3	13.7	0.19	3.84E-03	50
Benzene	0.00	0.06	0.04	0.00	0.00	0.1
Toluene	0.00	0.02	0.04	0.00	0.00	0.1
Ethylbenzene	0.00	0.00	0.00	0.00	0.00	0.001
Xylene	0.00	0.02	0.01	0.00	0.00	0.0
n-Hexane	0.00	0.00	0.20	0.00	0.00	0.2
Formaldehyde	0.00	6.49E-03	3.69E-04	0.00	0.00	0.007
Acrolein	0.00	6.48E-04	3.54E-05	0.00	0.00	6.8E-04
CO_2	0	12,722	601	0	0.00	13,323
CH_4	1.06E-02	8.0	57	1.83E-03	0.00	65
N_2O	0	0	0	0	0.00	0
GWP [b]	0	12,890	1,798	0	0.00	14,688

[a] Assumes maximum development scenario (60 wells developed in one year)
[b] Global Warming Potential = CO_2 + 21 x CH_4 + 310 x N_2O. GHG and GWP emissions shown as 0 in the table indicate that there may be a small amount of that specific GHG for that specific operation, but the emission is de minimis in the total GWP. If an emission is shown as 0.00, then that GHG is not emitted for that specific operation (e.g., wind erosion).

Table 4.2-12. Total Annual Production Emissions from Alternative C

Pollutant	Tons/Year [a]							Total (tons/year)
	Pump Unit Engines	Production Heaters	Condensate Tanks	TEG Dehydrators	Operations Vehicle	Pneumatics	Compressor Engines	
NO_X	16	113	0.00	0.00	8.1	0.0	47	183
CO	31	95	0.00	0.00	22.8	0.0	9	157

Pollutant	Tons/Year [a]							Total (tons/year)
	Pump Unit Engines	Production Heaters	Condensate Tanks	TEG Dehydrators	Operations Vehicle	Pneumatics	Compressor Engines	
VOC	8	1.39	502	795	4.63	390.7	22	1,724
SO_2	0.00	0.00	0.00	0.00	1.34	0.0	0.00	0.34
PM_{10}	0.8	8.6	0.00	0.00	1.70	0.0	1.7	12
$PM_{2.5}$	0.8	8.6	0.00	0.00	0.07	0.0	1.7	11
Benzene	0.06	0.00	3.8	83	0.00	0.0	0.02	87
Toluene	0.02	0.00	3.0	188	0.00	0.0	0.02	191
Ethylbenzene	0.00	0.00	0.0	11.3	0.00	0.0	0.00	11.3
Xylene	0.01	0.00	0.5	167	0.00	0.0	0.01	167
n-Hexane	0.00	2.03	11.4	6.8	0.00	0.0	0.05	20
Formaldehyde	0.8	0.08	0.00	0.00	0.00	0.0	2.8	3.7
Acrolein	0.11	0.00	0.00	0.00	0.00	0.0	0.3	0.4
CO_2	19,894	135,342	5.8	0	0	0	18,659	173,901
CH_4	9	2.59	195	85	0.25	1,862.9	212	2,367
N_2O	0	2.48	0	0	0	0	0	2.48
GWP [b]	20,083	136,165	4,101	1,785	5	39,121	23,111	224,377

[a] Assumes maximum development of 250 producing wells
[b] Global Warming Potential = CO_2 + 21 x CH_4 + 310 x N_2O. GHG and GWP emissions shown as 0 in the table indicate that there may be a small amount of that specific GHG for that specific operation, but the emission is de minimis in the total GWP.

The near-field and ozone impact analyses discussed in **Section 4.2.1.7** was conducted and analyzed using the specifications of the proposed action, which includes the maximum development scenario throughout the life of the project (i.e. 484 wells). Due to the fact that Alternative C would consist of approximately 48 percent less development than the Proposed Action, this alternative would yield equal or lesser impacts than the Proposed Action.

4.2.4 Alternative D – Minimum Development Alternative

Under this alternative, XTO would develop the necessary infrastructure in order to drill and operate 150 wells. The number of new well pads and roads under this alternative would be significantly less than the number of new well pads and roads under the Proposed Action. **Table 4.2-13** and **4.2-14** summarize the annual emissions associated with the various phases of Alternative D.

Table 4.2-13. Annual Emissions for Various Phases of the RBU Infill Alternative D

Pollutant	Development Emissions (tons/year) [a]					Total (tons/yr)
	Construction	Drilling	Completion	Interim Reclamation	Wind Erosion	
NO_X	0.28	125	16.8	0.04	0.00	142
CO	1.48	100	14.4	0.32	0.00	116
VOC	0.18	29.7	11	0.03	0.00	41
SO_2	0.01	0.45	0.20	0.002	0.00	0.7
PM_{10}	10.90	320	135	1.88	0.03	468
$PM_{2.5}$	1.16	35.3	13.7	0.19	3.84E-03	50
Benzene	0.00	0.06	0.04	0.00	0.00	0.1
Toluene	0.00	0.02	0.04	0.00	0.00	0.1
Ethylbenzene	0.00	0.00	0.00	0.00	0.00	0.001
Xylene	0.00	0.02	0.01	0.00	0.00	0.0
n-Hexane	0.00	0.00	0.20	0.00	0.00	0.2
Formaldehyde	0.00	6.49E-03	3.69E-04	0.00	0.00	0.007
Acrolein	0.00	6.48E-04	3.54E-05	0.00	0.00	6.8E-04
CO_2	0	12,722	601	0	0.00	13,323
CH_4	1.06E-02	8.0	57	1.83E-03	0.00	65
N_2O	0	0	0	0	0.00	0
GWP [b]	0	12,890	1,798	0	0.00	14,688

[a] Assumes maximum development scenario (60 wells developed in one year)
[b] Global Warming Potential = CO_2 + 21 x CH_4 + 310 x N_2O. GHG and GWP emissions shown as 0 in the table indicate that there may be a small amount of that specific GHG for that specific operation, but the emission is de minimis in the total GWP. If an emission is shown as 0.00, then that GHG is not emitted for that specific operation (e.g., wind erosion).

Table 4.2-14. Total Annual Production Emissions from Alternative D

Pollutant	Tons/Year [a]							Total (tons/year)
	Pump Unit Engines	Production Heaters	Condensate Tanks	TEG Dehydrators	Operations Vehicle	Pneumatics	Compressor Engines	
NO_X	9	68	0.00	0.00	5.1	0.0	28	110
CO	19	57	0.00	0.00	14.0	0.0	5	95
VOC	5	0.83	304	477	2.92	234.4	13	1,037

Pollutant	Tons/Year [a]							Total (tons/year)
	Pump Unit Engines	Production Heaters	Condensate Tanks	TEG Dehydrators	Operations Vehicle	Pneumatics	Compressor Engines	
SO_2	0.00	0.00	0.00	0.00	0.21	0.0	0.00	0.21
PM_{10}	0.5	5.1	0.00	0.00	0.42	0.0	1.0	7
$PM_{2.5}$	0.5	5.1	0.00	0.00	0.04	0.0	1.0	7
Benzene	0.04	0.00	2.3	50	0.00	0.0	0.01	52
Toluene	0.01	0.00	1.8	113	0.00	0.0	0.01	115
Ethylbenzene	0.00	0.00	0.0	6.7	0.00	0.0	0.00	6.7
Xylene	0.01	0.00	0.3	100	0.00	0.0	0.01	100
n-Hexane	0.00	1.22	6.8	4.1	0.00	0.0	0.03	12
Formaldehyde	0.5	0.05	0.00	0.00	0.00	0.0	1.7	2.2
Acrolein	0.07	0.00	0.00	0.00	0.00	0.0	0.2	0.3
CO_2	12,041	81,205	3.5	0	0	0	11,197	104,447
CH_4	5	1.56	117	51	0.15	1,117.7	127	1,420
N_2O	0	1.49	0	0	0	0	0	1.49
GWP [b]	12,146	81,700	2,461	1,071	3	23,472	13,864	134,729

[a] Assumes maximum development of 150 wells
[b] Global Warming Potential = CO_2 + 21 x CH_4 + 310 x N_2O. GHG and GWP emissions shown as 0 in the table indicate that there may be a small amount of that specific GHG for that specific operation, but the emission is de minimis in the total GWP.

The near-field and ozone impact analyses discussed in **Section 4.2.1.7** was conducted and analyzed using the specifications of the proposed action, which includes the maximum development scenario throughout the life of the project (i.e. 484 wells). Due to the fact that Alternative D would consist of approximately 69 percent less development than the Proposed Action, this alternative would yield equal or lesser impacts than the Proposed Action.

4.2.5 Recommended Mitigation Measures

Monitored ozone exceedances in the Uinta Basin could result in a nonattainment designation for the region. In view of this, and unless otherwise specified, the applicant has committed to employ the following measures at the outset of the proposed project to mitigate possible additional adverse ozone impacts:

- Installation of low emission glycol dehydrators at all existing and new compressor stations and production wells where uncontrolled emissions are over five tons per year;
- Electric compression, if and where feasible;

- Emission controls having a control efficiency of 95 percent on existing condensate tanks with a potential to emit of greater 20 tpy, and on new condensate tanks with a potential to emit of 6 tpy VOCs;
- Low-bleed pneumatic devices would be installed at all new compressor stations and production facilities. Within 6 months after of the Record of Decision (ROD), all existing high-bleed pneumatic devices would be replaced with low bleed pneumatic devices. High-bleed devices may be allowed to remain in service for critical safety and/or process reasons;
- Green completions for all well completion activities;
- Tier 2 drill rig engines;
- Lean burn natural gas-fired stationary compressor engines or equipment with equivalent emission rates;
- Catalyst on all natural gas-fired compressor engines to reduce the emissions of CO and VOCs;
- Dry seals on new centrifugal compressors;
- An annual inspection and maintenance program to reduce VOC emissions, including:
    - Performing inspections of thief hatch seals and Enardo pressure relief valves to ensure proper operations.
    - Reviewing gathering system pressures to evaluate any areas where gathering pressure may be reduced, resulting in lower flash losses from the condensate storage tanks.

Additionally, the applicant commits to developing a project-specific adaptive management strategy, to be informed by periodic emission inventory updates. Implementation of this strategy and associated application of "enhanced" ozone mitigation measures would be required once the proposed project is initiated if:

1) USEPA designates the area "nonattainment" for ozone;
2) There is a monitored exceedance of the ozone NAAQS in a single monitoring year and after BLM and UDEQ review it is determined that oil and gas development caused or meaningfully contributed to the exceedance;
3) The ARMS modeling shows that additional mitigation is needed to prevent future ozone exceedances; or
4) The ARMS group establishes industry-wide mitigation requirements through ongoing modeling.

If implementation of this adaptive management strategy is triggered, the applicant commits to working with the BLM to analyze project-specific "enhanced" mitigation measures and employ them within 1 year. The measures to be considered could include, but would not be limited to, the following:

- Reducing the total number of drill rigs.
- Installing Tier 4 or better drill rig engines.
- Seasonally reducing or ceasing drilling during specified periods.
- Using only lower-emitting drill and completion rig engines during specified time periods.
- Using natural gas-fired drill and completion rig engines.
- Replacing internal combustion engines with gas turbines for natural gas compression.
- Using electric drill rig or compression engines.
- Centralizing gathering facilities.
- Limiting blowdowns or restricting them during specified periods.
- Installing plunger lift systems with smart automation.
- Employing a monthly Forward Looking Infrared, or FLIR, monitoring program to reduce VOCs.
- Enhancing a direct inspection and maintenance program.
- Employing tank load out vapor recovery.

- Employing enhanced VOC emission controls with 95 percent control efficiency on additional production equipment having a potential to emit of greater than 5 tons per year.

In addition to the commitments discussed above, the applicant commits to complying with applicable air pollution control rules and regulations.

Air quality issues are being addressed on a Utah-wide basis through the Utah Air Resource Technical Advisory Group (UTAG) and the BLM's ARMS. The actions outlined below have been designed to address ozone levels possibly associated with oil and gas operations in the Uinta Basin. The actions consist of the following elements:

- Refine air quality modeling predictions;
- Develop a Uinta Basin ozone action plan; and
- Implement a regional ozone action plan.

The first two elements of this strategy are being implemented by the BLM and other agency stakeholders, independent of the decision to be made regarding further development in the Uinta Basin. Regional operators may participate in these initial planning steps, thereby having the opportunity to contribute to the outcome of the process. The third element would require specific action by the applicant and other oil and gas operators in the Uinta Basin following the approval of the ROD. All three elements are described in more detail in the following paragraphs.

4.2.5.1 Refine Air Quality Modeling Predictions

The ARMS adaptive management strategy involves conducting a regional photochemical modeling analysis to compare and evaluate the effect of different mitigation activities on the ozone levels in the Uinta Basin. This modeling would be conducted in consultation with appropriate federal, Tribal, and state stakeholders as well as with regional oil and gas operators. The aim of the modeling effort would be to compare the effect of changes in VOC and NOX emissions, under various control strategies, to model-predicted change in ozone levels. Separate comparisons may be made for winter and summer periods. An updated emissions inventory, observed ozone levels within the basin, and corresponding meteorological data would be used.

Modeling results would provide an estimate of ozone region-wide and depict spatially the effectiveness of different emission controls on ozone formation in the Uinta Basin. The modeling would consider the current emission inventory data, to be updated periodically, current operating practices, applicant committed mitigation, and any applicable Best Available Control Technology (BACT) requirements in place at the time the modeling is conducted. The BLM, in consultation with appropriate federal, state, and Tribal stakeholders, would evaluate the modeling results and identify any needed additional reductions in ozone precursor emissions.

As soon as possible following evaluation of the modeling results, the BLM and appropriate stakeholders would use their respective authorities to implement any needed emission control mitigation measures and/or operating limitations necessary to ensure continued compliance with applicable ambient air quality standards for ozone. Absent an effective technology to implement, reductions in the pace of development may be utilized to ensure ambient air quality standards are met.

4.2.5.2 Develop a Uinta Basin Ozone Action Plan

Based on the results of the photochemical modeling study, the BLM would develop an ozone action plan that would describe mitigation to be enacted to address observed ozone levels above the NAAQS. The plan would be developed in consultation with appropriate federal, Tribal, and state stakeholders. Regional oil and gas operators also may participate in the development of the plan. Specific criteria would be identified within the plan for determining when additional mitigation would be initiated and which measures would be recommended. Criteria also would be specified for when the use of additional mitigation could be suspended based on observed ozone concentrations. Potential mitigation strategies are included in the list of "enhanced mitigation measures" presented above.

4.2.5.3 Implement a Regional Ozone Action Plan

The BLM would evaluate monitored ozone ambient air quality data at sites in the Uinta Basin to determine when to implement the ozone action plan. Monitoring data would be obtained, summarized, and reviewed on an ongoing basis following quality assurance review of each data set. Based on the data review and the criteria set forth in the ozone action plan, the BLM, in consultation with the appropriate federal, Tribal, and state stakeholders, would determine when to trigger implementation of the plan. Following issuance of the ROD for this project, the applicant and other operators in the Uinta Basin would be required to participate in the implementation of the BLM-approved ozone action plan within the Uinta Basin.

The applicant, in consultation with the BLM and appropriate federal, Tribal, and state stakeholders would employ "enhanced mitigation measures" as warranted through the Ozone Action Plan within 1 year of a nonattainment designation or monitored ozone standard exceedance.

The BLM would ensure that appropriate ambient air monitoring is occurring in the Uinta Basin. The BLM and/or the operator, in consultation with the UTAG, would establish monitoring sites in the event that additional monitored data is necessary. These monitors would conform to USEPA monitoring protocols (40 CFR Parts 50 and 58), with emphasis on obtaining measurements that contribute to the formation of secondarily formed pollutants such as $PM_{2.5}$ and ozone, to ensure that monitoring data are valid and useful in calibrating the model, and determining control strategies.

4.3 SOIL RESOURCES

Soils in the RBU Project Area, as described in **Section 3.2.2**, are generally rated poor in reclamation potential. Impacts to soils are typically described in terms of short-term (or initial) and long-term (or residual) impacts. In disturbed areas where interim reclamation is implemented, ground cover by herbaceous species could potentially re-establish within 5 to 7 years following seeding of native plant species and diligent weed control efforts, consequently reducing soil erosion. These reclaimed areas have often been referred to as short-term disturbances. However, it is important to note that all surface disturbances could remain as long-term (or even permanent) impacts on the landscape if reclamation efforts are not successful.

4.3.1 Alternative A – Proposed Action

Construction and operation of the proposed Project under the Proposed Action would result in short- and long-term impacts to soils within the Project Area. Impacts would result from the clearing of vegetation, excavation, salvage, stockpiling, and redistribution of soils during construction and reclamation activities associated with well pad sites, access roads, and proposed pipelines.

Implementation of the Proposed Action would result in the direct disturbance of approximately 1,075 acres of soils in within the Project Area**.** Following construction, approximately 412 acres of initial disturbance (38 percent) associated with construction of proposed well pad, portions of the access road, and pipeline ROW not needed for operational purposes would be reclaimed. This would reduce the long-term disturbance associated with implementation of the Proposed Action to approximately 663 acres. **Table 4.3-1** provides a summary of short-term and long-term surface disturbances associated with each soil mapping unit on Federal, State, and private lands in the Project Area that would be disturbed under the Proposed Action.

Blading or excavation to achieve desired grades could result in slope steepening of exposed soils in cut and fill areas, mixing of topsoil and subsoil materials, and the breakdown of soil aggregates into loose particles. Soil structural aggregates would also be broken down by compaction from vehicular traffic. Removal and stockpiling of topsoil for revegetation purposes could reduce the natural fertility of the soil, and cause a loss of soil profiles by mixing soil horizons and subsequent breakdown in soil structure.

Table 4.3-1. Soil Disturbance by Major Soil Map Units under the Proposed Action

Map Unit Name and Number	Short Term Surface Disturbance (acres)	Long Term Surface Disturbance (acres)
Badland-Rock outcrop complex, 1 to 100 percent slopes (12)	0.0	0.0
Motto-Casmos complex, 2 to 25 percent slopes (152)	349.4	215.5
Motto-Rock outcrop complex, 2 to 25 percent slopes (154)	248.5	153.2
Turzo loam, 0 to 4 percent slopes (242)	0.0	0.0
Cadrina extremely stony loam-Rock outcrop complex, 25 to 50 percent slopes (36)	72.7	44.8
Cadrina-Badland-Rock outcrop complex, 25 to 50 percent slopes (37)	28.3	17.5
Casmos-Cadrina-Badland complex, 4 to 25 percent slopes (42)	23.2	14.3
Crustown-Motto complex, 2 to 25 percent slopes (62)	0.6	0.4
Total	**722.7**[1]	**445.7**

[1] Does not include Tribal land.

4.3.1.1 Erosion and Sedimentation

Soils would also be susceptible to increased erosion in newly disturbed areas. The removal of vegetative cover, steepening of slopes, and the breakdown of aggregates would increase the potential for channelized runoff and accelerated soil erosion. Wind erosion could also increase with removal of vegetation and exposure of soils. Erosion would result in the formation of more rills and gullies and increase sedimentation of surface water. Erosion would be particularly evident if project related activities are conducted during periods of high precipitation. The increased erosion of soils could potentially lead to increased loss of vegetative cover and increased sedimentation in ephemeral drainages, Willow Creek, the Green River and/or other unnamed drainages. The actual amount of additional sedimentation that would reach the drainages with the RBU Project Area would depend on the effectiveness of reclamation and erosion control measures as well as natural factors including the water available for overland flow; the texture of the eroded material, the amount and kind of ground cover; the shape, gradient, and length of the slope; and surface roughness (Barfield et al. 1981).

The water erosion potentials for all of the soils that would be disturbed under the Proposed Action are below 0.15, indicating a low potential for erosion. In addition, the reclamation source material rating for these soils is low, indicating the presence of soil factors that would inhibit the growth of vegetation. It is

expected that following construction activities, re-vegetation, and 5 to 7 growing seasons, erosion rates would decrease to near baseline conditions for the reclaimed portions of the well pads, unused portions of the road corridors, and buried pipeline ROWs. Erosion rates would be expected to remain at slightly elevated levels for the new access roads even in the absence of high traffic volumes.

4.3.1.2 Soil Contamination

Sources of potential soil contamination include leaks or spills of natural gas condensate liquids from wellheads, gas and water lines, produced water sumps, and condensate storage tanks. To reduce the potential for hydrocarbon contamination of soils, gas lines and water lines would be designed to minimize the potential for spills and leaks. Storage tanks would be surrounded by berms capable of holding at least 110 percent of the largest single tank volume. Leaks or spills of saline water, hydrofracturing chemicals, fuels, and lubricants could also result in soil contamination. Depending on the size and type of spill, the effect on soils would primarily consist of the potential loss of soil productivity. Implementation of the project SPCC plan would minimize the risk of such spills by providing safeguards against spills and detailing reporting and cleanup measures to be taken in the event of a spill. Thus, the potential for impacts to soils from spills is considered to be minor.

4.3.1.3 Destruction of Biological Soil Crusts

Mapping of biological soil crusts has not been performed in the RBU Project Area. However, based upon the physical and biological characteristics of the existing soils, biological soil crusts could occur. Biological soil crusts are vulnerable to vehicle traffic, livestock grazing, and pedestrian traffic. The fibers that compose the tensile strength of biological soil crusts are weak in comparison to the compressional strength placed on the crusts by machinery, human footprints, big game, and livestock. The impact of a given surface disturbance on biological soil crusts depends upon its severity, frequency, timing, and type, as well as the weather conditions during and after the disturbance (Belnap et al. 2001). Biological soil crusts occurring in the RBU Project Area have been largely disturbed by previous natural gas development as well as livestock grazing. Surface disturbances associated with the Proposed Action could add to these disturbances by breaking, overturning, and burying soil crusts to various degrees (Belnap et al. 2001).

The recommended mitigation measures for erosion control described in **Section 4.3.5** would be implemented during construction to avoid or minimize soil erosion and off-site deposition. Based on these measures and implementation of ACEPMs, there should be no adverse impact on soil resources as a result of implementation of the Proposed Action.

4.3.2 Alternative B – No Action Alternative

Impacts to soil resources under Alternative B would be similar in nature to those described under the Proposed Action. However, potential impacts would be considerably less under the No Action Alternative, as only 16 new oil and gas wells would be developed on State and Tribal lands in the RBU Project Area. The overall surface disturbance would be approximately 12.7 acres, which is nearly 99 percent less than the Proposed Action. Correspondingly, impacts to soils, including biological soil crusts, related to potential increase in erosion, sediment yield, and spills of hazardous material in the RBU Project Area would be proportionately less under Alternative B.

4.3.3 Alternative C – Agency Preferred Alternative

Impacts to soil resources under Alternative C would be similar in nature to those described under the Proposed Action. Under the Agency Preferred Alternative, 234 fewer wells and associated access roads, pipelines, and other project facilities would be constructed than under the Proposed Action. Alternative C

would result in a total surface disturbance of 924 acres, which is 151 acres less and 911 acres more than would be impacted under the Proposed Action and No Action alternatives, respectively. Following construction, approximately 362 acres of initial disturbance (39 percent) associated with construction of proposed well pad, portions of the access road, and pipeline ROW not needed for operational purposes would be reclaimed. This would reduce the long-term disturbance associated with implementation of the Alternative C to approximately 562 acres. As such, the potential for ground disturbing activities to impact soil resources in the RBU Project Area would be lower.

As with the Proposed Action, the water erosion potential for all of the soils that would be disturbed under the Alternative C is below 0.15, indicating a low potential for erosion. In addition, the reclamation source material rating for these soils is low, indicating the presence of soil factors that would inhibit the growth of vegetation. The recommended mitigation measures described in **Section 4.3.5** would help to improve reclamation success.

4.3.4 Alternative D – Minimum Development Alternative

Impacts to soil resources under Alternative D would be similar in nature to those described under the Proposed Action. Under Alternative D, 334 fewer wells and associated access roads, pipelines, and other project facilities would be constructed than under the Proposed Action. Alternative D would result in a total surface disturbance of 592 acres which is 483 acres less and 579 acres more than would be impacted under the Proposed Action and No Action alternatives, respectively. Following construction, approximately 225 acres of initial disturbance (38 percent) associated with construction of proposed well pad, portions of the access road, and pipeline ROW not needed for operational purposes would be reclaimed. This would reduce the long-term disturbance associated with implementation of the Alternative D to approximately 367 acres. As such, the potential for ground disturbing activities to impact soil resources in the RBU Project Area would be lower than that of any other action alternative.
As with the Proposed Action, the water erosion potential for all of the soils that would be disturbed under the Alternative D is below 0.15, indicating a low potential for erosion. In addition, the reclamation source material rating for these soils is low, indicating the presence of soil factors that would inhibit the growth of vegetation. The recommended mitigation measures described in **Section 4.3.5** would help to improve reclamation success.

4.3.5 Recommended Mitigation Measures

The following recommended mitigation measures would be applied to reduce impacts to soil resources:

1) Erosion and sedimentation would be reduced through the use of BMPs including, but not limited to; mulching, hydroseeding, erosion control blankets, silt fence installation, jute matting, revegetation, interim reclamation, and/or mychorrizal bacteria supplements.
2) In areas with unstable soils where seeding alone may not adequately control erosion, grading would be used to minimize slopes and water bars would be installed on disturbed slopes. Erosion control efforts would be monitored by XTO and, if necessary, modifications would be made to control erosion.
3) All disturbed areas of access roads, other than the driving surface, would be revegetated as directed by the AO. These include, but are not limited to, the shoulders, ditches, and cut and fill slopes of the access roads.
4) Well pads would be bermed to prevent runoff from entering nearby drainages.

4.4 WATER RESOURCES

4.4.1 Alternative A – Proposed Action

Construction and operation of the proposed RBU project under the Proposed Action would result in direct and indirect impacts to water resources. The principal impacts to water resources likely to be associated with the Proposed Action include: (1) increased sedimentation and turbidity of surface water as a result of surface disturbance and increased sediment delivery into streams via runoff; (2) depletion of stream flows in the Green River from the removal of water for drilling and operational activities; (3) increased runoff; (4) effects to water quantity and quality (i.e., potential contamination of surface water resources with drilling fluids or other wastes generated by natural gas drilling and production activities; and (5) direct and indirect impacts to floodplains.

4.4.1.1 Surface Water

The magnitude of potential project-related impacts to surface water resources would depend on a number of factors, including the proximity of surface disturbances to ephemeral tributaries of Willow Creek and the Green River, slope aspect and gradient, soil type, the duration and timing of the construction activity, and the success or failure of reclamation and erosion control measures. The potential for adverse impacts to surface water resources would be greatest during project construction activities and would likely decrease in time due to natural stabilization, interim and final reclamation, and successful revegetation efforts.

Increased Sedimentation

Increased erosion and subsequent increased sedimentation of Willow Creek and other ephemeral drainages within the RBU Project Area is possible. The increased erosion could also potentially lead to an increase in turbidity and salinity in the Green River. Both of these effects could have negative impacts on aquatic habitat within affected drainages.

The actual amount of sediment that would be transported to the ephemeral drainages within the RBU Project Area and on to Willow Creek and the Green River would depend on natural factors and the effectiveness of the erosion control devices employed, but is expected to be minimal based the generally flat nature of the RBU Project Area. Natural factors which attenuate the transport of sediment into creeks include water available for overland flow, the texture of the eroded material, the amount and kind of ground cover, the slope shape, gradient, and length, and surface roughness (Barfield et al. 1981).
Potential increases in construction-related erosion and sedimentation would be minimized by implementing BMPs (e.g., silt fencing, straw bales). During construction, erosion control measures would be implemented to avoid or minimize soil erosion and sedimentation. The erosion control methods used would be specified on a site-specific basis during the APD process for each well pad.

Water Use and Stream Flow Regimes
As described in **Chapter 2**, water would be required in most aspects of project construction and operations. Water would be obtained from a number of the existing sources including springs, groundwater wells, and surface water diversion points listed in **Table 2.1-4**. Approximately 2.7 acre-feet of water would be needed to drill and complete each well. Thus, the total water use for the drilling of all 484 wells under the Proposed Action would be approximately 1,307 acre-feet over the 8-year development period (between 100 and 251 acre-feet per year). In addition, approximately 0.1 acre-feet of water per well pad could be utilized for dust abatement each year during the drilling phase of the project. As such, water utilized for dust abatement for a maximum of 484 well pads and associated roads would be approximately 48.4 acre-feet over the 8-year drilling phase of the project. Another 6.3 acre-feet of

water per year would be used for dust abatement during project operations, or a total of 126 to 189 acre-feet of water for dust suppression during operations over the 20 to 30 year construction and operational period. Based upon these water use estimates, the average annual amount of water depleted from the Green River would be approximately 169.4 acre-feet during the 8-year drilling phase of the project, which would then decrease to an average of approximately 6.3 acre-feet per year thereafter for the remaining 20 to 30 year LOP. In comparison, the average annual flow in the Green River at Ouray is about 4,064,290 acre-feet (based on flow data from the USGS gauging station at Ouray).

Increased Runoff

Soils compacted on well pads and roads contribute slightly greater runoff than undisturbed sites. The increased runoff could lead to slightly higher peak flows in the ephemeral streams in the RBU Project Area and Willow Creek, potentially increasing erosion of the channel banks. The increased erosion could lead to slightly increased turbidity in these streams during storm events.

Water Quality

The Proposed Action could result in accidental spills of fuel, lubricants, hydraulic fluids, drilling fluids, assorted chemicals required for standard well field operations, and produced water. XTO would prudently manage their facilities to minimize the potential for spills and would employ practices described in *Onshore Oil and Gas Order No. 1*, which identifies strategies to reduce and/or eliminate accidental spills and leaks.

4.4.1.2 Groundwater

With respect to groundwater resources, implementation of the Proposed Action is unlikely to impair water quality of shallow freshwater aquifers. The depth at which steel surface casing is set; along with cementing the casing entirely from total depth to surface would provide protection to shallow freshwater aquifers. In addition, the thick impermeable layers of rock encountered between the freshwater aquifers and the hydrocarbon producing zones make it virtually impossible for hydrocarbons, produced water, and stimulation fluids from drilling operations to either contaminate potable water zones or deplete the near surface potable water aquifers.

4.4.1.3 Floodplains

Floodplains are protected by Executive Order 11988 which requires that all Federal agencies take action to reduce the risk of flood loss; to minimize the impact of floods on human safety, health, and welfare; and to restore and preserve the natural and beneficial values served by floodplains. Potential impacts to floodplains from the Proposed Action include increased sedimentation, pollution of surface water due to accidental spills or loss of containment of petroleum products, fuels and other chemicals, and damage to or loss of riparian vegetation. However, under the Proposed Action, no new surface disturbance would occur within the Willow Creek floodplain. Therefore there would be no direct impacts to floodplains under the Proposed Action.

4.4.2 Alternative B – No Action Alternative

Potential impacts to water resources, including erosion, sedimentation, stream flow regimes, runoff, and water quality under the No Action Alternative would be similar in nature as those described under the Proposed Action. However, potential impacts would be considerably less under the No Action Alternative, as only 16 new oil and gas wells would be developed on State and Tribal lands in the RBU

Project Area. The overall surface disturbance would be approximately 12.7 acres, which is nearly 99 percent less than the Proposed Action.

4.4.3 Alternative C – Agency Preferred Alternative

Potential impacts to water resources, including erosion, sedimentation, stream flow regimes, runoff, and water quality under Alternative C would be similar in nature as those described under the Proposed Action. Under the Agency Preferred Alternative, 234 fewer wells and associated access roads, pipelines, and other project facilities would be constructed than under the Proposed Action. Alternative C would result in a total surface disturbance of 924 acres which is 151 acres less and 911 acres more than would be impacted under the Proposed Action and No Action alternatives, respectively. Following construction, approximately 362 acres of initial disturbance (39 percent) associated with construction of proposed well pad, portions of the access road, and pipeline ROW not needed for operational purposes would be reclaimed. This would reduce the long-term disturbance associated with implementation of the Alternative C to approximately 562 acres. As such, the rates for erosion, sedimentation, runoff, and other impacts to water resources in the RBU Project Area would be lower than that of the Proposed Action.

No new surface disturbing activity would occur within the 100-year floodplain. Therefore there would be no impacts to floodplains under Alternative C.

The volume of water needed for drilling and completion of wells proposed under Alternative C would be approximately 675 acre-feet (250 wells x 2.7 acre-feet per well), which is approximately 632 acre-feet (48 percent) less than that of the Proposed Action. An additional 25.6 acre-feet of water would be needed for dust suppression under Alternative C, which is approximately 22.8 acre-feet (53 percent) less than that required under the Proposed Action.

4.4.4 Alternative D – Minimum Development Alternative

Potential impacts to water resources, including erosion, sedimentation, stream flow regimes, runoff, and water quality under Alternative D would be similar in nature as those described under the Proposed Action. Under Alternative D, 334 fewer wells and associated access roads, pipelines, and other project facilities would be constructed than under the Proposed Action. Alternative D would result in a total surface disturbance of 592 acres which is 483 acres less and 579 acres more than would be impacted under the Proposed Action and No Action alternatives, respectively. Following construction, approximately 225 acres of initial disturbance (38 percent) associated with construction of proposed well pad, portions of the access road, and pipeline ROW not needed for operational purposes would be reclaimed. This would reduce the long-term disturbance associated with implementation of the Alternative D to approximately 367 acres. As such, the rates for erosion, sedimentation, runoff, and other impacts to water resources in the RBU Project Area would be lower than that of any other action alternative.

No new surface disturbing activity would occur within the 100-year floodplain. Therefore there would be no impacts to floodplains under Alternative D.

The volume of water needed for drilling and completion of wells proposed under Alternative D would be approximately 405 acre-feet (150 wells x 2.7 acre-feet per well), which is approximately 902 acre-feet (69 percent) less than that of the Proposed Action. An additional 14.9 acre-feet of water would be needed for dust suppression under Alternative C, which is approximately 33.5 acre-feet (69 percent) less than that required under the Proposed Action.

4.4.5 Recommended Mitigation Measures

No additional mitigation measures are recommended under Alternatives A, B, C, or D.

4.5 PALEONTOLOGICAL RESOURCES

4.5.1 Alternative A – Proposed Action

The Uinta and Green River Formations are categorized as Class 4a (high) paleontological formations. Class 4 formations are known to contain vertebrate fossils or noteworthy occurrences of invertebrate or plant fossils. Surface-disturbing activities, such as site and road construction, and secondary surface activities, such as vehicular and pedestrian traffic, can irreversibly damage or destroy sensitive paleontological resources and result in the loss of scientifically important fossils. Alternatively, construction of well pads, access roads, and pipeline corridors may have a positive effect by uncovering or revealing scientifically important fossils.

Where surface-disturbing activities occur on previously disturbed areas, fossil resources would not be affected. However, where surface disturbance is proposed on undisturbed areas, paleontological resources could be at risk. Where fossils occur on the surface within these areas, they may potentially be broken or destroyed during surface-disturbing activities. Disturbance of bedrock for the construction of reserve pits and access roads also results in the potential for exposing, breaking, and destroying fossils. However, as surveys for paleontological resources would be conducted prior to any surface disturbance and appropriate measures would be taken if fossils are discovered (during surveys or excavation), potential impacts to fossil resources in the Uinta Formation would be reduced or eliminated.

4.5.2 Alternative B – No Action Alternative

Potential impacts to paleontological resources under Alternative B would be similar in nature to those described under the Proposed Action. However, the overall potential for exposure of, or damage to, fossils during excavation or construction activities would be considerably less under the No Action Alternative, as only 16 new oil and gas wells would be developed on State and Tribal lands in the RBU Project Area. The overall surface disturbance would be approximately 12.7 acres, which is nearly 99 percent less than the Proposed Action. Further, as surveys for paleontological resources would be conducted prior to any surface disturbance and appropriate measures would be taken if fossils are discovered (during surveys or excavation), potential impacts to fossil resources in the Uinta Formation would be reduced or eliminated.

4.5.3 Alternative C – Agency Preferred Alternative

Potential impacts to paleontological resources under Alternative C would be similar in nature to those described under the Proposed Action. Under the Alternative C, 234 fewer wells and associated access roads, pipelines, and other project facilities would be constructed than under the Proposed Action. Alternative C would result in a total surface disturbance of 924 acres, which is 151 acres less and 911 acres more than would be impacted under the Proposed Action and No Action alternatives, respectively. As such, the potential for ground disturbing activities to impact paleontological resources in the RBU Project Area would be lower. Further, as surveys for paleontological resources would be conducted prior to any surface disturbance and appropriate measures would be taken if fossils are discovered (during surveys or excavation), potential impacts to fossil resources in the Uinta Formation would be reduced or eliminated.

4.5.4 Alternative D – Minimum Development Alternative

Potential impacts to paleontological resources under Alternative D would be similar in nature to those described under the Proposed Action. Under Alternative D, 334 fewer wells and associated access roads, pipelines, and other project facilities would be constructed than under the Proposed Action. Alternative D would result in a total surface disturbance of 592 acres which is 483 acres less and 579 acres more than would be impacted under the Proposed Action and No Action alternatives, respectively. As such, the potential for ground disturbing activities to impact paleontological resources in the RBU Project Area would be lower than that of any other action alternative. As with the Proposed Action, surveys for paleontological resources would be conducted prior to any surface disturbance and appropriate measures would be taken if fossils are discovered (during surveys or excavation), and therefore, potential impacts to fossil resources in the Uinta Formation would be reduced or eliminated.

4.5.5 Recommended Mitigation Measures

No additional mitigation measures are recommended under Alternatives A, B, C, or D.

4.6 CULTURAL RESOURCES

4.6.1 Alternative A – Proposed Action

Direct impacts to cultural resources related to the RBU APE include surface disturbance associated with construction of new well pads and expansion of existing well pads, construction of new roads, installation of co-located gas lines and produced water lines, and construction of new central facilities, which would result in an initial surface disturbance of 1,075 acres. Indirect impacts to cultural resources in the Project Area as a result of the Proposed Action could result from atmospheric, visual, and auditory intrusions; increased visitation and traffic during construction and operation; vandalism; off-highway vehicle (OHV) and other motorized vehicle use; erosion; and unknown impacts to unidentified cultural landscapes, all of which may contribute to an alteration of the overall setting and feeling of the Project Area. Such changes in the Project Area could lead to the damage, destruction, or removal of scientific information, the loss of research potential, the loss of interpretation possibilities, and the destruction of the character or setting of a site.

While the locations of proposed new well pads, access roads, pipelines, and other surface facilities illustrated on Figure 2.1-1 have not been individually inspected, they have been conceptually identified considering topography, land features, vegetation, and operational constraints. Onsite inspections, including an intensive cultural resource inventory of individual well pads, access roads, pipelines, and other surface facility locations by the BLM and operator personnel would occur during the permitting process for individual wells or ROWs, and site-specific adjustments to location and orientation would be made at that time.

As is discussed in **Section 3.2.5** much of the RBU Project Area is developed and has received varying degrees and intensities of archaeological inventories and analysis. Previous natural gas exploration and production and associated projects have driven much of the archaeological inventories conducted on the RBU Project Area. This has resulted in a patchwork of areas that have been intensively surveyed, interspersed with other areas that have not been inventoried for cultural resources. However, it should be noted that under the Proposed Action, the majority of the proposed development would occur in areas that have received considerable scrutiny from cultural resource inventories. Cultural resource surveys have been conducted for past ROW authorizations and individual well pads. In addition, most roads in the

RBU APE have also been surveyed. Taken collectively, these surveys have resulted in a fairly systematic examination of the RBU APE resulting in sufficient data for identifying culturally sensitive areas.

Prior to the initiation of construction activities, a Class III inventory would be conducted in all areas proposed for surface disturbance. Whenever feasible, any prehistoric and historic sites documented during the Class III inventory as eligible for listing on the National Register of Historic Places (NRHP), as well as areas identified as having a high probability of significant subsurface materials, would be avoided by development. If avoidance is not feasible or does not provide the required protection, data recovery will be conducted through excavation. Based on these measures and the implementation of recommended mitigation measures as outlined in **Section 4.6.5**, adverse impacts to cultural resources are unlikely to occur.

4.6.2 Alternative B – No Action Alternative

Impacts to cultural resources under the No Action Alternative would be similar in nature to those described under the Proposed Action. However, potential impacts would be considerably less under the No Action Alternative, as only 16 new oil and gas wells would be developed on State and Tribal lands in the RBU Project Area. The overall surface disturbance would be approximately 12.7 acres, which is nearly 99 percent less than the Proposed Action. As with the Proposed Action, an intensive cultural resource inventory of individual well pads, access roads, pipeline ROWs, and other surface facility locations would occur during the APD process, and site-specific adjustments to the location and orientation of project facilities would be made as appropriate.

4.6.3 Alternative C – Agency Preferred Alternative

Impacts to cultural resources under Alternative C would be similar in nature to those described under the Proposed Action. Under Alternative C, 234 fewer wells and associated access roads, pipelines, and other project facilities would be constructed than under the Proposed Action. Alternative C would result in a total surface disturbance of 924 acres, which is 151 acres less and 911 acres more than would be impacted under the Proposed Action and No Action alternatives, respectively. As with the Proposed Action, an intensive cultural resource inventory of individual well pads, access roads, pipeline ROWs, and other surface facility locations would occur during the APD process, and site-specific adjustments to the location and orientation of project facilities would be made as appropriate.

4.6.4 Alternative D – Minimum Development Alternative

As with Alternative C, direct effects under Alternative D due to surface disturbance would be of the same nature as those described under the Proposed Action. Under Alternative D, 300 fewer wells and associated access roads, pipelines, and other project facilities would be constructed than under the Proposed Action. Alternative D would result in a total surface disturbance of 592 acres which is 483 acres less and 579 acres more than would be impacted under the Proposed Action and No Action alternatives, respectively. As with the Proposed Action, an intensive cultural resource inventory of individual well pads, access roads, pipeline ROWs, and other surface facility locations would occur during the APD process, and site-specific adjustments to the location and orientation of project facilities would be made as appropriate.

4.6.5 Recommended Mitigation Measures

In addition to the ACPEMS for cultural resources, potential mitigation under all alternatives could also include the following:

- As directed by the AO, protective fencing would be placed around the boundaries of historic properties during activities that occur within 150 feet.

- If deemed appropriate by the AO, construction activities within areas having a high site potential would be monitored by a qualified archaeologist for the presence of subsurface cultural material.

4.7 LIVESTOCK GRAZING

4.7.1 Alternative A – Proposed Action

Implementation of the Proposed Action would cause direct and indirect effects on grazing livestock as a result of construction and operational activities. Principle impacts to livestock grazing would include: (1) the direct removal of forage and subsequent reduction in livestock AUMs; (2) increased potential for disrupting livestock operations; (3) increased gas development-related traffic in allotments; and (4) decreased quality and quantity of forage due to potential noxious weed infestations.

The Proposed Action would result in the removal of approximately 580 usable acres (defined as BLM-administered lands on slopes less than 40 percent) of vegetation (involving 261 livestock AUMs) in grazing allotments in the RBU Project Area. Of the 580 useable acres, approximately 470 acres (or 81 percent) would occur as a result of expansion of existing surface disturbance, while approximately 110 acres (or 19 percent) would occur as a result of new surface disturbance. **Table 4.7-1** provides a breakdown of the estimated loss of livestock AUMs by grazing allotment.

The Proposed Action could directly affect range improvements, stock watering, and facilities related to the control of livestock movement. The number of gates to control livestock would increase with the increased level of project-related facilities and access roads. This increase, in tandem with increased traffic levels, would increase the potential for gates to be left open and livestock to get out of the allotment. Fowler and Witte (1985) found that ranches had increased labor requirements from activities, such as gathering cattle, fixing fences, closing gates, removing litter, and repairing vandalism damages that occurred during the occurrence of oil and gas development.

Table 4.7-1. Estimated Allotment Acres and AUMs Affected by the Proposed Action

Allotment Name	Usable[1] Allotment Acres w/in RBU Project Area	Loss of Usable Acres w/in RBU Project Area	Permitted AUMs w/in RBU Project Area	Loss of AUMs w/in RBU Project Area
Green River AMP	157	< 1	6	< 1
Sand Wash	2,592	149	160	13
Wild Horse Bench	9,886	431	3,997	247
TOTAL	12,635	580	4,163	261

Source: BLM 2010
[1] Usable land is defined as BLM land that has a slope lower than 40 percent.

Additionally, the increase in the number of roads constructed to access wells within allotments and the associated use of these roads would increase the level of vehicular traffic within allotments. Although these roads would be constructed for use by XTO employees and their contractors, these roads would also be used by the general public for recreation and other purposes. This increase in use would increase the potential for collisions with and harassment of livestock.

Implementation of the Proposed Action could also increase the potential for noxious weeds which could impact grazing resources within the Project Area. Noxious weeds are generally unpalatable to livestock, and thus their establishment would result in the reduction of available forage.

Under the Proposed Action, design features would be implemented that would reduce impacts to disturbed grazing habitats. These include re-vegetation of disturbed areas and implementation of noxious weed control and monitoring. Where impacts cannot be avoided, any livestock facilities (e.g. fences, cattle guards, gates, drift fences and natural barriers) that are damaged by the Proposed Action would be repaired or replaced. Additional cattle guards or gates would also be installed as needed and maintained for the life of the well.

4.7.2 Alternative B − No Action Alternative

Impacts to livestock grazing under the No Action Alternative would be similar in nature to those described below under the Proposed Action. However, potential impacts would be considerably less under the No Action Alternative, as only 16 new oil and gas wells would be developed on State and Tribal lands in the RBU Project Area. Implementation of the No Action Alternative would not result in any new disturbance to any useable acres within the RBU Project Area.

4.7.3 Alternative C − Agency Preferred Alternative

Impacts to livestock grazing under Alternative C would be similar in nature to those described under the Proposed Action. Alternative C would result in the removal of approximately 499 useable acres (or approximately 3.9 percent) of vegetation in grazing allotments in the RBU Project Area. Of the 499 useable acres impacted, approximately 404 acres (or 81 percent) would occur as a result of expansion of existing surface disturbance, while 95 acres (or 19 percent) would occur as a result of new surface disturbance.

4.7.4 Alternative D − Minimum Development Alternative

Impacts to livestock grazing under Alternative D would be similar in nature to those described under the Proposed Action. Alternative D would result in the removal of approximately 317 useable acres (or approximately 2.5 percent) of vegetation in grazing allotments in the RBU Project Area. Of the 317 useable acres impacted, approximately 250 acres (or 79 percent) would occur as a result of expansion of existing surface disturbance, while 67 acres (or 21 percent) would occur as a result of new surface disturbance.

4.7.5 Recommended Mitigation Measures

No additional mitigation measures are recommended under Alternatives A, B, C, or D.

4.8 VEGETATION INCLUDING SPECIAL STATUS PLANT SPECIES AND INVASIVE OR NOXIOUS WEEDS

4.8.1 Alternative A – Proposed Action

4.8.1.1 General Vegetation

Construction and operation of the proposed RBU Project under the Proposed Action would result in direct and indirect impacts to vegetation communities within the Project Area. Direct effects to vegetation (i.e., modification of structure, species composition, and extent of cover types) would occur from disturbance or removal of vegetation associated with construction and expansion well pad sites, access roads, pipeline corridors, and compressor stations. Indirect effects may include the short-term and long-term increased potential for noxious weed invasion, exposure of soils to accelerated erosion, soil compaction, and shifts in species composition and/or changes in plant density.

Implementation of the Proposed Action would result in the direct disturbance of 1,075 acres of vegetation **(Table 4.8-1).** This includes approximately 831 acres of scrub/shrub, 169 acres of grasslands/herbaceous, 40 acres of woody wetland, and 35 acres of barren land vegetation cover types. Following construction, approximately 412 acres of initial disturbance (38 percent) associated with construction of proposed well pad, portions of the access road, and pipeline ROW not needed for operational purposes would be reclaimed. This would reduce the long-term disturbance associated with implementation of the Proposed Action to approximately 663 acres.

The duration of impacts to vegetation would depend, in part, on the success of mitigation and revegetation efforts and the time needed for natural succession to return revegetated areas to pre-disturbance conditions. Following interim reclamation, ground cover would likely begin to re-establish within 2 to 3 years following seeding using native plant species. An estimated 7 to 10 years would be needed for shrub species to successfully re-vegetate the disturbed portions of the Project Area. Long-term disturbance would remain for the estimated 33 to 43 year LOP, until such time as the abandoned well pads and roads would be restored to near existing conditions.

Interim reclamation for portions of the well pads and access roads not needed for production facilities/operations would be completed within six months following completion of the last well planned for the pad. Pipeline ROWs would be reclaimed within six months of pipeline installation. Seeding of temporarily disturbed areas along roads and pipelines, would be completed within 30 days following completion of construction.

Table 4.8-1. Vegetation Communities Affected by the Proposed Action

Land Cover Type	Vegetation Community	Initial (short-term) Surface Disturbance (acres)	Residual (long-term) Surface Disturbance (acres)
Scrub/Shrub	Colorado Plateau Mixed Low Sagebrush Shrubland	25.7	15.9
	Intermountain Basins Big Sagebrush Shrubland	29.4	18.1
	Inter-Mountain Basins Mat Saltbush Shrubland	6.6	4.1
	Inter-Mountain Basins Mixed Salt Desert Scrub	754.1	465.1
	Colorado Plateau Pinyon-Juniper Shrubland	15.3	9.4
Total		**831.1**	**512.6**
Grasslands/ Herbaceous	Inter-Mountain Basins Semi-Desert Grassland	0.4	0.2
	Inter-Mountain Basins Semi-Desert Shrub Steppe	168.9	104.2
Total		**169.3**	**104.4**
Woody Wetland	Inter-Mountain Basins Greasewood Flat	37.7	23.2
	Rocky Mountain Lower Montane Riparian Woodland and Shrubland	2.2	1.4
Total		**39.9**	**24.6**
Barren Lands	Inter-Mountain Basins Shale Badland	16.5	10.2
	Colorado Plateau Mixed Bedrock Canyon and Tableland	18.0	11.1
Total		**34.5**	**21.3**
Disturbed	Invasive Annual Grassland	0.5	0.3
	Invasive Southwest Riparian Woodland and Shrubland	--	--
	Existing Development (i.e., roads, well pads, other surface facilities)	--	--
Total		**0.5**	**0.3**
Grand Total		**1,075.3**	**663.2**

Implementation of the Proposed Action also would increase the potential for the occurrence of indirect effects. Additional construction related impacts could include soil compaction, an increased potential for wind and water erosion of disturbed surfaces prior to reclamation, and the potential for shifts in species composition and/or changes in plant density.

4.8.1.2 Invasive and Noxious Weeds

Disturbances from construction would increase the potential for the establishment and spread of noxious weeds. Noxious weeds tend to be aggressive colonizers of disturbed areas where the native vegetation has been removed. Therefore, disturbances associated with construction and expansion of well pad sites, access roads, pipelines, and other project facilities would provide opportunities for invasive and noxious weeds to become established. Once established, weeds could increase fuel levels and the potential for increased intensity and numbers of wildfires; contribute to a reduction in the overall visual character of the area; and contribute to the reduction or elimination of native plant species, wildlife habitat, and/or habitat for special status plant species.

In order to minimize the potential for adverse effects from invasive and noxious weed establishment, monitoring for invasive and noxious weeds would be necessary and if found, control and eradication measures would be implemented as outlined in the COAs for the APD for the project. The implementation of these measures along with other ACEPMs would minimize the potential for adverse impacts from noxious weeds.

4.8.1.3 Special-status Plant Species

In general, impacts of the Proposed Action on special-status plant species and their habitats would be similar to those discussed in the preceding section for vegetation communities. However, these impacts can be more severe for special status plant species, if present, since the distribution and abundance of these species are limited in the Project Area and surrounding region.

If present within the development areas, direct effects on the Uinta Basin hookless cactus, clay reed-mustard, and Spanish bayonet would occur from construction activities associated with the Proposed Action, which could directly kill or damage individual plants or populations through right-of-way clearing earth-moving activities, and vehicle traffic. Areas of permanent disturbance would remove portions of the seed bank, and areas of temporary disturbance also can alter the seed bank.

<u>Uinta Basin Hookless Cactus</u>

Implementation of the Proposed Action would result in the direct disturbance of approximately 980 acres of potential habitat for the Uinta Basin hookless cactus within the Project Area. Following construction, approximately 363 acres of initial disturbance (38 percent) associated with construction of proposed well pad, portions of the access road, and pipeline ROW not needed for operational purposes would be reclaimed. This would reduce the long-term disturbance associated with implementation of the Proposed Action on Uinta Basin hookless cactus habitat to approximately 617 acres.

Under the Proposed Action, approximately 3 proposed wells would be drilled within Level 1 core conservation areas for the Uinta Basin hookless cactus. Approximately 11 proposed wells would be drilled within Level 2 core conservation areas for the Uinta Basin hookless cactus. The development of these wells along with associated road and pipeline installation would initially result in direct short-term loss of approximately 14 acres of Level 1 core habitat and 58 acres of Level 2 core habitat within the Project Area. Following construction, approximately 38 percent of the disturbance associated with construction of proposed well pads, portions of access roads, and pipeline ROWs not needed for operational purposes would be reclaimed. This would reduce the long-term disturbance to Level 1 and 2 core conservation areas associated with implementation of the Proposed Action to approximately 8.7 and 36.0 acres, respectively.

The majority (77 percent) of this surface disturbance under the Proposed Action would only occur as an expansion of existing infrastructure and in Level 2 core conservation areas that are already fragmented by past oil and gas activity. In fact, the RBU Project Area already contains some 324 well pads, 108 miles of road, and 137 miles of pipelines and associated central facilities.

Implementation of the Proposed Action also would increase the potential for occurrence of indirect and dispersed direct effects to this species, if present. Disturbances from construction could increase the potential for the invasion and establishment of noxious weed species. Invasion by non-native species is particularly problematic as they are capable of effective competition with native species for space, water, light, nutrients, and subsequent survival. Over time, the successful establishment of non-native species can choke out native vegetation and eventually dominate large areas. An increase in weedy annual grasses

also increases the potential for fire by increasing the density and flammability of available fuels. Grasses are more flammable, and establish in denser populations, than woody and non-woody native vegetation.

Additional indirect construction-related impacts could include an increased potential for wind erosion of disturbed areas creating airborne dust that could be transported into suitable habitat for this species. Airborne dust generated by vehicles could inhibit photosynthesis and transpiration in this species. Inhibited and reduced rates of photosynthesis could affect the rate of growth, the reproductive capacity of individual plants, and ultimately the ability of these individuals to persist in adjacent areas. Thompson et al. (1984) and Farmer (1992) have indicated that varying amounts of dust settling on vegetation can block stomata, increase leaf temperature, and reduce photosynthesis.

Clay Reed-mustard

Since clay reed-mustard generally grows on steep, nearly inaccessible slopes and canyon walls, direct disturbance to potential habitat for this species is unlikely. Implementation of the Proposed Action could however, increase the potential for occurrence of indirect and dispersed direct effects to this species, if present. Disturbances from construction could increase the potential for the limited invasion and establishment of noxious weed species, and increased potential for wind erosion of disturbed areas creating airborne dust that could be transported into suitable habitat for this species, as described previously for the Uinta Basin hookless cactus.

Spanish Bayonet

Implementation of the Proposed Action could result in the direct disturbance of potential habitat for the spanish bayonet, if present within the Project Area. Under the Proposed Action, approximately 831 acres of scrub/shrub vegetation, which serves as potential habitat for the Spanish bayonet, would be impacted. Following construction, approximately 316 acres of initial disturbance (38 percent) associated with construction of proposed well pad, portions of the access road, and pipeline ROW not needed for operational purposes would be reclaimed. This would reduce the long-term disturbance of scrub/shrub vegetation associated with implementation of the Proposed Action to approximately 515 acres.

As with the Uinta Basin hookless cactus and clay-reed mustard, implementation of the Proposed Action could also increase the potential for indirect and dispersed direct effects to this species, if present. Disturbances from construction could increase the potential for the limited invasion and establishment of noxious weed species, and increased potential for wind erosion of disturbed areas creating airborne dust that could be transported into suitable habitat for this species, as described previously for the Uinta Basin hookless cactus.

Impact Determinations

Design features set out under the Proposed Action would reduce impacts to special status plant species. These actions include: noxious and invasive species control and monitoring, use of existing roads when possible, minimizing new surface disturbance, dust abatement, pre-construction surveys in potential habitat, and adherence to species-specific conservation measures on BLM-administered lands (**Appendix B**). The species-specific conservation measures for the Uinta Basin hookless cactus, clay reed-mustard, and Spanish bayonet include provisions to avoid occupied habitat, employ the use of spatial buffers between surface activities and known populations of plants, limit off-road travel, and monitor the effectiveness of these measures.

Given the identified impacts and the adherence to the above-mentioned actions, the Proposed Action ***"may affect, is not likely to adversely affect"*** the clay reed-mustard and **"may affect, but is not likely to**

lead to need federally list" Spanish bayonet. Based upon the level of surface disturbance, habitat fragmentation, and dispersed negative impacts to the species' suitable habitat, ,including within proposed in Level 1 core conservation areas, under the Proposed Action, the Proposed Action ***"may affect, is likely to adversely affect"*** the Uinta Basin hookless cactus.

4.8.2 Alternative B – No Action Alternative

Impacts to vegetation resources, noxious weeds, and special status plant species under the No Action Alternative would be similar in nature as those described below under the Proposed Action. However, potential impacts would be considerably less under the No Action Alternative, as only 16 new oil and gas wells would be developed on State and Tribal lands in the RBU Project Area. The overall disturbance to vegetation would be approximately 12.7 acres, which is nearly 99 percent less than the Proposed Action. Correspondingly, impacts from noxious weeds and to special status plant species in the RBU Project Area would be proportionately less under Alternative B.

4.8.3 Alternative C – Agency Preferred Alternative

Impacts to vegetation resources including special status plant species under Alternative C would be similar in nature to those described under the Proposed Action. Under the Agency Preferred Alternative, 234 fewer wells and associated access roads, pipelines, and other project facilities would be constructed than under the Proposed Action. Alternative C would result in a total surface disturbance of 924 acres, which is 151 acres less and 911 acres more than would be impacted under the Proposed Action and No Action alternatives, respectively. This includes approximately 714 acres of scrub/shrub, 144 acres of grasslands/herbaceous, 37 acres of woody wetland, and 28 acres of barren land vegetation cover types. Following construction, approximately 362 acres of initial disturbance (39 percent) associated with construction of proposed well pad, portions of the access road, and pipeline ROW not needed for operational purposes would be reclaimed. This would reduce the long-term disturbance to vegetation associated with implementation of the Alternative C to approximately 562 acres. As such, the potential for impacts from noxious weeds and to special status plant species in the RBU Project Area would be proportionately less than that of the Proposed Action.

Under Alternative C, no new surface disturbance would occur with USFWS proposed Level 1 or 2 core conservation areas for Uinta Basin hookless cactus. In addition, a minimum 300-foot buffer would be maintained between the edge of new surface disturbance and identified populations of Uinta Basin hookless cactus.

As with the Proposed Action, interim and final reclamation of disturbed areas, control and eradication measures for noxious and invasive species, pre-construction surveys for Uinta Basin hookless cactus, clay reed-mustard, and Spanish bayonet, and adherence to species-specific conservation measures on BLM-administered lands including provisions to avoid occupied habitat and employ the use of spatial buffers between surface activities and known populations of special status plant species would reduce impacts to vegetation and special status plant species.

Given the identified impacts and the adherence to the above-mentioned actions, Alternative C ***"may affect, is not likely to adversely affect"*** the clay reed-mustard and **"may affect, but is not likely to lead to need federally list"** Spanish bayonet. Based upon the level of surface disturbance, habitat fragmentation, and dispersed negative impacts to the species' suitable habitat outside of Core Conservation Area, Alternative C ***"may affect, is likely to adversely affect"*** the Uinta Basin hookless cactus.

4.8.4 Alternative D – Minimum Development Alternative

Impacts to vegetation resources including special status plant species under Alternative D would be similar in nature to those described under the Proposed Action and would be the least of all action alternatives considered. Under Alternative D, 334 fewer wells and associated access roads, pipelines, and other project facilities would be constructed than under the Proposed Action. Alternative D would result in a total surface disturbance of 592 acres which is 483 acres less and 579 acres more than would be impacted under the Proposed Action and No Action alternatives, respectively. This includes approximately 455 acres of scrub/shrub, 102 acres of grasslands/herbaceous, 19 acres of woody wetland, and 16 acres of barren land vegetation cover types. Following construction, approximately 225 acres of initial disturbance (38 percent) associated with construction of proposed well pad, portions of the access road, and pipeline ROW not needed for operational purposes would be reclaimed. This would reduce the long-term disturbance associated with implementation of Alternative D to approximately 367 acres. As such, the potential for impacts from noxious weeds and to special status plant species in the RBU Project Area would be proportionately less than that of the Proposed Action.

Under Alternative D, no new surface disturbance would occur with USFWS proposed Level 1 or 2 core conservation areas for Uinta Basin hookless cactus. In addition, a minimum 300-foot buffer would be maintained between the edge of new surface disturbance and identified populations of Uinta Basin hookless cactus.

As with the Proposed Action, interim and final reclamation of disturbed areas, control and eradication measures for noxious and invasive species, pre-construction surveys for Uinta Basin hookless cactus, clay reed-mustard, and Spanish bayonet, and adherence to species-specific conservation measures on BLM-administered lands including provisions to avoid occupied habitat and employ the use of spatial buffers between surface activities and known populations of special status plant species would reduce impacts to vegetation and special status plant species.

Given the identified impacts and the adherence to the above-mentioned actions, Alternative D ***"may affect, is not likely to adversely affect"*** the clay reed-mustard and **"may affect, but is not likely to lead to need federally list"** Spanish bayonet. Based upon the level of surface disturbance, habitat fragmentation, and dispersed negative impacts to the species' suitable habitat outside of Core Conservation Area, Alternative D ***"may affect, is likely to adversely affect"*** the Uinta Basin hookless cactus.

4.8.5 Recommended Mitigation Measures

No additional mitigation beyond what is proposed under the ACEPMs is recommended for vegetation and special-status plant species under the Proposed Action or other alternatives.

4.9 FISH AND WILDLIFE INCLUDING SPECIAL STATUS SPECIES

4.9.1 Alternative A – Proposed Action

4.9.1.1 General Wildlife and Wildlife Habitats

Construction and operation of the proposed RBU Project under the Proposed Action would result in direct and indirect impacts to wildlife and wildlife habitats. The principal impacts to terrestrial wildlife likely to be associated with the Proposed Action include: (1) the loss of certain wildlife habitats due to construction activities such as earth-moving associated with proposed well pads, access roads, and pipeline corridors; (2) habitat fragmentation; (3) vehicle-related mortality, (4) displacement of some

wildlife species; and (5) an increase in the potential for illegal kill and harassment of wildlife. The magnitude of impacts to wildlife and wildlife habitats would depend on a number of factors including the type and duration of disturbance, the species of wildlife present, time of year, and implementation of recommended and required mitigation measures.

Implementation of the Proposed Action would result in the direct disturbance of 1,075 acres of wildlife habitat **(see Table 4.8-1).** This includes approximately 831 acres of scrub/shrub, 169 acres of grasslands/herbaceous, 40 acres of woody wetland, and 35 acres of barren land vegetation cover types. Direct disturbance to wildlife habitat includes activities such as ground surface grading and excavation, tree and shrub removal, and/or scraping of road surfaces that disturbs surface and subsurface soils. Each of these activities could effectively remove and/or degrade existing habitat, thereby reducing its availability to local wildlife populations.

Following construction, approximately 412 acres of initial disturbance (38 percent) associated with construction of proposed well pad, portions of the access road, and pipeline ROW not needed for operational purposes would be reclaimed. These areas would be revegetated with seed mixes approved by the BLM, some of which are specifically oriented to enhance wildlife use. The duration of impacts to vegetation would depend, in part, on the success of mitigation and reclamation efforts and the time needed for natural succession to return revegetated areas to pre-disturbance conditions. Grasses and forbs are expected to become established within the first several years following reclamation; however, an estimated 7 to 10 years would be required for shrub establishment and production of useable forage. Thus, under the Proposed Action, total habitat disturbance would be reduced from approximately 1,075 acres to 663 acres.

Permanent and temporary loss of habitat as a result of construction activities could affect some small mammal, reptile, and/or amphibian species with very limited home ranges and mobility. Although there is no way to accurately quantify these effects, the impact is likely to be moderate in the short term and be reduced over time as reclaimed areas produce suitable habitats. Most of these wildlife species would be common and widely distributed throughout the Project Area and the loss of some individuals as a result of habitat removal would have a negligible impact on populations of these species throughout the region.

Indirect effects due to displacement of wildlife also would occur as a result of construction activities associated with the proposed project. In response to the increase in human activity (e.g., equipment operation, vehicular traffic, and noise) wildlife may avoid or move away from the sources of disturbance to other habitats. This avoidance or displacement could result in underutilization of the physically unaltered habitats adjoining the disturbances. The net result would be that the value of habitats near the disturbances would be decreased and previous distributional patterns would be altered. The habitats would not support the same level of use by wildlife as before the onset of the disturbance. Additionally, some wildlife would be displaced to other habitats leading to some degree of overuse and degradation to those habitats.

Public vehicle use of roads reconstructed to access the Project Area can have an additive, or possibly a synergistic influence on reducing wildlife use of adjacent habitats, as well as causing additional impacts. Public access to reconstructed roads in the Project Area would increase the potential for mortality and general harassment of wildlife. Seasonal closures of some existing roads to public use following construction would be one of the most effective measures that could be implemented to offset this impact.

4.9.1.2 Big Game

<u>Pronghorn Antelope</u>

The greatest direct impact to pronghorn under the Proposed Action would be due to direct habitat loss and fragmentation. Under the Proposed Action, 457 of the 484 proposed wells would be drilled within crucial value, year-long fawning pronghorn habitat. The development of these wells along with associated road and pipeline installation would initially result in direct short-term loss of approximately 1,001 acres of year-long scrub/shrub, grasslands/herbaceous, and barren land habitats within the Project Area (**Table 4.9-1**). Following construction, approximately 380 acres of initial disturbance (38 percent) associated with construction of proposed well pads, portions of access roads, and pipeline ROWs not needed for operational purposes would be reclaimed. This would reduce the long-term disturbance to pronghorn crucial value, year-long fawning habitat associated with implementation of the Proposed Action to approximately 621 acres.

The majority (77 percent) of this surface disturbance under the Proposed Action would only occur as an expansion of existing infrastructure and in habitats that are already fragmented by past oil and gas activity. In fact, the RBU Project Area already contains some 324 well pads, 108 miles of road, and 137 miles of pipelines and associated central facilities.

Table 4.9-1. Surface Disturbances to UDWR-designated Big Game Ranges Under the Proposed Action

Habitat	Total Range in RBU Project Area (Acres)	Disturbance Associated with the Proposed Action in RBU Project Area		
		Number of Proposed Wells	Initial (short-term) Surface Disturbance (acres)	Residual (long-term) Surface Disturbance (acres)
Mule Deer – Crucial Value Year-Long Fawning Habitat	149	2	8	5
Pronghorn – Crucial Value Year-Long Fawning Habitat	16,478	457	1,001	621
Rocky Mtn. Bighorn Sheep – Crucial Value Year-Long Habitat	6,806	192	384	237

The proposed 74 new well pads located in previously undisturbed habitat would require the construction of new access roads that would increase habitat fragmentation in an already disturbed landscape. Surface-disturbing activities that remove vegetation in crucial value, year-long fawning habitat for pronghorn could affect pronghorn fawn activities in the RBU Project Area. The removal of vegetation could also reduce relative habitat values for pronghorn fawning sites, if fawning habitat no longer offers concealment and exposes fawns to predators.

However, the majority (77 percent) of the surface disturbance under the Proposed Action would occur as an expansion of existing infrastructure and in habitats that are already fragmented by past oil and gas activity. In fact, the RBU Project Area already contains some 324 well pads, 108 miles of road, and 137 miles of pipelines and associated central facilities. It is also important to note that numbers of pronghorn within the Project Area and surrounding region are exceeding low, as the number of antelope within the entire Book Cliffs herd unit (Herd Unit #10) is estimated at approximately 244 animals. This translates to an estimated average density of one pronghorn per 10.7 square miles. Therefore impacts are unlikely to reach significant levels.

Additional impacts to pronghorn would result from increases in noise levels and human presence during construction and development activities. Activities associated with the construction phase of the project are likely to temporarily displace pronghorn from adjacent habitats, lowering the overall habitat effectiveness of these areas. These zones are not likely to be completely abandoned by these species, but the effective use of these areas could be reduced depending on a number of factors such as time of year, social structure of individual herds, and whether populations are resident or migratory. However, once construction is completed and facilities are put into operation and subsequent human activities reduced, pronghorn are likely to return to pre-disturbance activity patterns, because most resident animals would have already been acclimated to the relatively high level of human activity associated with past oil and gas operations in the Project Area.

The potential for vehicle collisions with pronghorn during the spring, summer, and fall months would be increased by a commensurate increase in vehicle traffic during construction and would continue (although at a much reduced rate) throughout all phases of the well operations. In addition, the short-term influx of temporary construction workers and the long-term use of the area by gas field employees would increase the potential for poaching and general harassment of pronghorn and other big game.

Successful interim reclamation of areas not utilized for production activities as well as final reclamation efforts could re-establish some pronghorn seasonal ranges over time. In addition, ACEPMs that include measures to reduce speeding on area roads and to prevent harassment and/or poaching of pronghorn and other big game species would further reduce potential impacts associated with the Proposed Action.

Mule Deer

Under the Proposed Action, only 2 of the 484 proposed wells would be drilled within habitats designated as crucial for mule deer. None of the other 482 proposed wells and associated access roads and pipelines would be located within designated mule deer range. The development of these wells along with associated road and pipeline installation would initially result in direct short-term loss of approximately 8 acres of crucial value year-long fawning habitat within the Project Area (**see Table 4.9-1**). Following construction, approximately 3 acres of initial disturbance (38 percent) associated with construction of proposed well pads, portions of access roads, and pipeline ROWs not needed for operational purposes would be reclaimed. This would reduce the long-term disturbance to mule deer crucial value, year-long fawning habitat associated with implementation of the Proposed Action to approximately 5 acres. No adverse impacts to mule deer are expected as a result of direct habitat disturbance under the Proposed Action because only a small percentage of designated crucial habitats will be affected.

Rocky Mountain Bighorn Sheep

Bighorn sheep generally prefer areas with rugged topography surrounded by cliffs and tall bluffs and many of these areas are sheltered from the effects of noise and human presence associated with construction and development activities. The Project Area supports a year-round resident population of Rocky Mountain bighorn sheep. However, only 41 percent (6,806 acres) of the Project Area is classified as bighorn range. Under this alternative, an estimated 192 of the 484 proposed wells (40 percent) would be drilled within year-long, crucial bighorn sheep range. The development of these wells along with associated road and pipeline installation would initially result in direct short-term loss of approximately 384 acres of habitat within the Project Area (**see Table 4.9-1**). The majority (77 percent) of this surface disturbance under the Proposed Action would only occur as an expansion of existing infrastructure and in habitats that are already fragmented by past oil and gas activity. Following construction, approximately 146 acres of initial disturbance (38 percent) associated with construction of proposed well pads, portions of access roads, and pipeline ROWs not needed for operational purposes would be reclaimed. This would

reduce the long-term disturbance to bighorn sheep year-long, crucial habitat associated with implementation of the Proposed Action to approximately 237 acres.

Surface-disturbing activities that remove vegetation in year-long, crucial habitat for bighorn sheep would reduce the amount of forage availability in higher elevation areas. Of particular concern for bighorn sheep would be the loss/fragmentation of winter concentration areas, lambing grounds, and migration corridors. Disturbance of migration corridors could preclude some individuals from accessing habitats specific to their winter and summer life cycles, which could lead to a decrease in overall production or fitness.

Similar to pronghorn, additional impacts to bighorn sheep would result from increases in noise levels and human presence during construction and development activities. Activities associated with the construction phase of the project are likely to temporarily displace bighorn sheep from adjacent habitats, lowering the overall habitat effectiveness of these areas. However, once construction is completed and facilities are put into operation and subsequent human activities reduced, bighorn sheep are likely to return to pre-disturbance activity patterns, albeit at slightly lower local densities.

4.9.1.3 Migratory Birds

The intensity of impacts from the Proposed Action on migratory birds that utilize the RBU Project Area and surrounding region would be dependent upon the seasons of construction and the drilling of each well. If construction and drilling of the proposed well pad and wells were completed in the late summer months (i.e., August – September), many of the migratory species would have left the immediate Project Area for southern wintering grounds, or at least will have fledged and left their nests. Disturbance during this time would be temporary, and project-related impacts would not likely have an appreciable impact on migratory bird populations as a whole or individual species in general. If the proposed well construction and drilling were to occur during the peak nesting months in spring/summer, the Proposed Action could result in at least some degree of nest abandonment, direct mortality, reproductive failure, displacement of birds, and destruction of nests. This would have a greater impact on High-Priority migratory bird species that may be nesting in the Project Area due to the smaller population size and limited distribution found in these species.

Construction, drilling, and completion activities, as well as production and maintenance activities, would result in the fragmentation of habitat and associated edge avoidance by migratory birds, which has been documented as leading to lower levels in productivity (Renfrew et al. 2005). Associated noise and increased human presence would cause displacement from foraging and nesting habitats. If displaced, birds could move to less suitable habitats which could cause an increase in competition and deteriorated physical condition. Increased roads and vehicle traffic levels could also lead to the increased potential for collisions between migratory birds and vehicles. However as mentioned previously, much of the surface disturbance under the Proposed Action would only occur as an expansion of existing infrastructure and in locations where birds either already encounter visual and noise disruptions or have previously abandoned these areas altogether.
Successful interim and final reclamation efforts would re-establish some migratory bird habitat over time. Provisions to remove visible accumulation of oil from reserve pits would prevent exposure of migratory birds and other wildlife to petroleum products.

4.9.1.4 Raptors

The principal impacts of the Proposed Action on raptors are: (1) nest desertions and/or reproductive failure caused by project-related disturbances, (2) increased public access and subsequent human disturbance resulting from new road construction, and (3) temporary reductions in prey populations.

Based on aerial and ground inventories conducted by a number of organizations prior to 2008, 7 raptor nests were identified within the Project Area.

Direct impacts to raptors could result from surface-disturbing activities or areas with concentrated human activity, in close proximity to an active raptor nest. This could lead to temporary displacement from nesting sites, avoidance of affected areas, and deterrence from establishing other nesting sites. Steidl and Anthony (2000) suggest that the greatest energetic costs from disturbance occur in nestlings, potentially decreasing overall reproductive success. Displacement could also lead to increased use of adjacent habitats, which could lead to increased inter- and intra-specific competition for resources.

It is important to note that the RBU Project Area already contains 324 well pads, 108 miles of roads, 137 miles of pipelines, and seven compressor stations. Much of the surface disturbance under the Proposed Action would only occur as an expansion of existing infrastructure and in locations where raptors already encounter at least some degree of visual and noise disruptions. In addition, as increased noise levels and visual disturbances associated with construction and drilling activities would be localized and short-term, displacement to adjacent habitats would likely be temporary in nature and would not likely alter the productivity of current raptor populations within the RBU Project Area. In addition, the cliffs on which the 7 raptor nests were found provide a moderate to high degree of topographic screening which provide increased insulation from facilities, human activity, and altered habitat.

The creation of new roads outlined in the Proposed Action would increase public access to areas within the Project Area. As use of the Project Area by both workers and recreationists increases, the potential for encounters between raptors and humans would also increase and could result in increased disturbance to nests and foraging areas, vehicle collisions, and shooting incidences. Closures of some new and existing roads to public vehicle use following construction would be one of the most effective measures that could be implemented to offset this potential impact.

The development of proposed well pads and associated roads and pipelines would initially disturb an estimated 1,075 acres of potential habitat for several species of small mammals that serve as prey items for raptors. This short-term moderate impact would affect approximately 6.4 percent of the Project Area and is not likely to be the determining factor in the level of use the Project Area receives by raptors because the small amount of short-term change in prey base populations created by the construction associated with the Proposed Action is minimal in comparison to the overall status of the rodent and lagomorph cycles which is controlled over the region and state by natural forces. While prey populations on the Project Area would likely sustain some stress during the initial phase of the project, prey numbers would be expected to soon rebound to pre-disturbance levels following reclamation of approximately 38 percent of the total initial disturbance area involving pipelines, unused portions of well pads and roads, and wells that are no longer productive. Once reclaimed, these areas will likely promote an increased density and biomass of small mammals that is comparable to those of undisturbed areas (Hingten and Clark 1984). For these reasons, implementation of the Proposed Action is not expected to produce any appreciable long-term negative changes to the raptor prey base within the Project Area.

Prior to any new surface disturbance, formal raptor surveys would be conducted to search for possible undocumented nests and provide needed information on the current activity status of nests on and adjacent to the Project Area. The surveys would be conducted by a BLM-approved biologist in all areas scheduled for construction. If an occupied nest is found, construction would be postponed until after the young have fledged and left the nest, generally accepted to be August 31 (refer to ACEPM in **Section 2.1.12.3**).

Consideration of topography and vegetative screening when locating well pads and project-related facilities could further reduce or minimize indirect impacts to raptor species within the RBU Project Area.

Successful interim reclamation of areas not utilized for production activities, as well as final reclamation efforts, could reestablish some raptor and prey habitat over time. Measures to reduce speeding and remove carrion on area roads could reduce direct impacts associated with the Proposed Action.

4.9.1.5 Special-status Fish and Wildlife Species

In general, construction and operational impacts of the Proposed Action on special-status fish and wildlife species and their habitats would be similar to those discussed in the preceding sections for vegetation communities and wildlife. However, these impacts can be more severe for special-status fish and wildlife species, if present, since the distribution and abundance of many of these species are limited in the Project Area and surrounding region. An adverse impact to special-status fish and wildlife species would be considered to occur if construction and/or operation of any component of the proposed Project would cause substantial changes to the existing abundance, distribution, or habitat value for a special-status fish and wildlife species.

White-tailed Prairie Dog

While there are no documented white-tailed prairie dog colonies within the RBU Project Area, it is likely that at least some smaller, more sparsely populated colonies exist within the Project Area boundary. 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 small amount of white-tailed prairie dog colonies potentially present and 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.

Specific measures under the Proposed Action, including the ACEPMs, would reduce impacts to the white-tailed prairie dog. Successful interim and final reclamation efforts could re-establish some the white-tailed prairie dog habitat over time. ACEPMs to reduce speeding on area roads would reduce the potential for collisions between prairie dogs and vehicles. Weed control would reduce habitat degradation. In addition, implementation of recommended mitigation measure that includes provisions to avoid active white-tailed prairie dog colonies during construction could further reduce impacts related to habitat loss and fragmentation in the RBU Project Area. Overall, the Proposed Action may indirectly impact the white-tailed prairie dog, but would not likely result in a trend towards Federal-listing of this species.

Greater Sage Grouse

No sage grouse leks are known to occur in the Project Area, nor is any part of the Project Area known to be within a 2-mile buffer zone of a lek. The nearest document lek is located approximately 6.8 miles southeast of the Project Area. In addition, no surface disturbance to Preliminary Priority Habitat, or habitats designated as occupied, brood rearing, or winter habitats for sage grouse would occur under the Proposed Action. Although most of the habitat within the Project Area is marginal for sage grouse breeding and nesting, it is possible that a few individual sage grouse occasionally use portions of the Project Area.

No adverse impacts to sage grouse are expected as a result of direct habitat disturbance under the Proposed Action because no leks or designated habitats will be affected and the relatively small number of sage grouse that are likely to occur within the Project Area. For the same reasons, disturbance from

project-related activities, vehicle collisions, and poaching/harassment impacts to sage grouse are expected to be minimal.

Yellow-billed Cuckoo

Riparian habitat that could be utilized by the yellow-billed cuckoo occurs west, but outside, of the RBU Project Area along the Green River. Therefore the Proposed Action would not have direct impacts to this species or its habitat. However, indirect impacts to potential yellow-billed cuckoo habitat could result under the Proposed Action from increased soil erosion and potential for spills and leaks. These impacts would be reduced with interim reclamation, recommended mitigation measures for erosion control to avoid or minimize soil erosion and off-site deposition, and spill containment measures.

Bald Eagle

Although no bald eagle nesting has been reported to occur within or near the RBU Project Area, bald eagles have been documented to roost in cottonwood trees along the Green River within 0.5 mile of the RBU Project Area. Impacts to roosting bald eagles from implementation of the Proposed Action would be similar to those identified and assessed in **Section 4.9.1.4** for raptors including increased public access and subsequent human disturbance resulting from new road construction and temporary reductions in prey populations.

It is important to note that the RBU Project Area already contains 324 well pads, 108 miles of roads, 137 miles of pipelines, and seven compressor stations. Much of the surface disturbance under the Proposed Action would only occur as an expansion of existing infrastructure and in locations where eagles already encounter at least some degree of visual and noise disruptions. In addition, as increased noise levels and visual disturbances associated with construction and drilling activities would be localized and short-term, they would not be likely alter the current use of cottonwood trees along the Green River as roost sites for bald eagles. In addition, the cliffs and trees which occur along the Green River which would provide a moderate level of topographic screening, which would provide increased insulation from facilities, human activity, and altered habitat near the westernmost portion of the RBU Project Area.

In addition to fish taken along the Green River, bald eagles would be expected to feed on carrion during the winter, including deer and pronghorn using winter range within portions of the Project Area. The potential for vehicle collisions with big game could increase as a result of increased vehicular traffic associated with the presence of construction crews and activities in the Project Area. Measures to control speed limits and adherence to the removal of big game carcasses from roadsides would be implemented to reduce the potential for vehicle-related collisions with bald eagles.

As with raptors in general, XTO would conduct current year raptor surveys within the species specific buffer from the proposed surface disturbance (per Appendix A of the Vernal RMP ROD) (refer to ACEPM in **Section 2.1.12.3**). The surveys would be conducted by a BLM-approved biologist on all areas scheduled for construction. If an occupied nest is found, construction would be postponed until after the young have fledged and left the nest. Implementation of this ACEPM, as well as other measures including interim and final reclamation, adherence to speed limits, and measures to contact the County for carrion removal. Based on adherence to these measures, the Proposed Action would not likely result in a trend toward re-listing of this species, nor would it result in an appreciable loss of bald eagle populations or density within the RBU Project Area.

Golden Eagle

All of the raptor nests identified in the Project Area were those of golden eagles. Impacts to golden eagles from implementation of the Proposed Action would be very similar to those identified and assessed in **Section 4.9.1.4** for raptors including nest desertions and/or reproductive failure caused by project-related disturbances, increased public access and subsequent human disturbance resulting from new road construction, and temporary reductions in prey populations. As with the raptors in general, XTO would conduct current year raptor surveys within the species specific buffer from the proposed surface disturbance (per Appendix A of the Vernal RMP ROD) (refer to ACEPM in **Section 2.1.12.3**). The surveys would be conducted by a BLM-approved biologist on all areas scheduled for construction. If an occupied nest is found, construction would be postponed until after the young have fledged and left the nest. Implementation of this ACEPM, as well as other measures including interim and final reclamation, adherence to speed limits, and measures to contact the County for carrion removal. Based on adherence to these measures, the Proposed Action would not likely result in a trend toward Federal listing of this species, nor would it result in an appreciable loss of golden eagle populations or density within the RBU Project Area.

Burrowing Owl

The primary impact to burrowing owls under the Proposed Action would be the loss and increased fragmentation of potential nesting and foraging habitat within the RBU Project Area. Surface-disturbing activities or areas with concentrated human activity in proximity of an active burrowing owl nest could lead to nest abandonment, thereby affecting the breeding pair and their annual productivity. Since burrowing owls alternate between nest sites within a breeding territory, any surface facilities where ongoing traffic or human presence occurs in or near active prairie dog colonies could prevent burrows from being used as nest sites in the future.

Construction, drilling, and completion activities would also result in visual disturbance on the landscape, increased noise from equipment use, and increased vehicle traffic, all of which could cause burrowing owls to avoid disturbed areas. Such displacement and avoidance could lead to an increased use of adjacent habitat, which could then lead to increased inter-specific and intra-specific competition for resources in these areas.

Under the Proposed Action, ACEPMs that include provisions for site-specific field surveys for raptors prior to surface-disturbing activities, spatial/temporal buffers around active nests, and adherence to speed limits, could reduce or minimize displacement or nest abandonment of burrowing owls. In addition, implementation of recommended mitigation measures that include provisions to avoid active white-tailed prairie dog colonies during construction could further reduce impacts related to the loss of potential nesting habitat in the RBU Project Area.

Colorado River Fish Species

As discussed in **Chapter 3**, habitat for four Federally-listed fish species (the humpback chub, bonytail chub, razorback sucker, and Colorado pikeminnow) and three conservation agreement fish species (flannelmouth sucker, bluehead sucker, and roundtail chub) is located in the Green River west of the RBU Project Area. Although no ground-disturbing activities would occur in aquatic habitat for these species as a result of the Proposed Action, these fish could be impacted by water depletion activities, increased siltation due to soil erosion, and hazardous substances in the case of an accidental spill or leak.

Water Depletions

The proposed project would utilize water from the Upper Colorado River system (i.e., Green River, Willow Creek, and underground wells that potentially draw water from the system) for drilling and completion activities, as well as dust abatement. The drilling of all 484 proposed wells under the Proposed Action would consume about 1,307 acre-feet of water over a period of 8 years (between 100 and 251 acre-feet per year). In addition, approximately 0.1 acre-feet of water per well pad would be utilized for dust abatement each year. As such, water utilized for dust abatement for a maximum of 484 well pads and associated roads would be approximately 48 acre-feet over a 8-year development period. Based upon these water-use estimates, between 104 and 260 acre-feet of water per year could be used for drilling, completion, and dust abatement over the first 8 years of the project. Following drilling and completion activities, water usage would then be limited to approximately 6.3 acre-feet per year for dust abatement for the remainder of the project life. Depletions can reduce the ability of the Green River to create and maintain the physical habitat (areas inhabited or potentially habitable to special status fish for use of spawning, development of fish larvae, feeding, or serving as corridors between these areas) and the biological environment required by the fish. Water depletions can also contribute to alterations in flow regimes that favor non-native fish.

In order to address depletion (and other) impacts to the endangered Colorado River fish, a Recovery Implementation Program for Endangered Fish Species in the Upper Colorado River Basin (Recovery Program) was initiated on January 22, 1988. Under the 1988 Recovery Program, any water depletions from tributary waters within the Colorado River drainage are considered to "*jeopardize the continued existence"* of these fish. In order to further define and clarify the recovery processes in the Recovery Program, a Section 7 agreement was implemented on October 15, 1993, by Recovery Program participants. Incorporated into this agreement is a Recovery Implementation Program Recovery Action Plan (RIPRAP). The RIPRAP identifies actions currently required to recover the endangered fish species in the most expeditious manner. Included in the RIPRAP was the requirement that a one-time depletion fee would be paid to help support the Recovery Program for all non-historic water depletions (i.e., occurring after January 1988) from the Upper Colorado River Basin. The depletion fees as amended were intended to be the reasonable and prudent alternative to avoid jeopardy to the endangered fishes by depletion of the Upper Colorado River Basin (USFWS 2009).

Similar to the Colorado River fish, the above-mentioned water depletion impacts could also affect the flannelmouth sucker, bluehead sucker, and roundtail chub, but would not likely result in a loss of viability, nor cause a trend towards Federal listing of these species. It should be noted that some depletion-related impacts to these species would be reduced as XTO and/or their contractors have voluntarily committed to avoid pumping water from low flow environments and would use a maximum of 0.25-inch mesh screening on the pump intake while pumping water. If impinged fish are observed on the intake, XTO would immediately stop work and contact the USFWS and UDWR. Furthermore, if implemented, ACEPMs described in **Section 2.1.12.3** to limit pumping and avoid entrainment would also reduce the potential for impacts to fish species in the Green River.

Other Project Activities

Implementation of the Proposed Action could also degrade USFWS-designated critical habitat for the Colorado River fish in the Green River by increasing erosion, sediment yield, and the potential for exposure to hazardous substances in the case of an accidental spill. Turbidity and salinity would be expected to increase as well. However, these impacts would be minimized by implementation of ACEPMs under the Proposed Action which include provisions to minimize surface disturbance, implement interim and final reclamation, implement a SPCC plan, utilize appropriate erosion control

measures, and utilize closed-loop drilling systems for all proposed wells located in the 100-year floodplain of Willow Creek and in all named drainages within 5 river miles of the Green River.

Conclusion

The estimated 1,356 acre-feet of water needed for the proposed drilling, completion and fugitive dust control actions would result in a depletion of surface and groundwater within the Green River Watershed, thus directly affecting the Colorado River endangered fish and the Conservation Agreement fish species and their habitats. Therefore, the Proposed Action **"*may affect, is likely to adversely affect*"** the humpback chub, bonytail chub, razorback sucker, and Colorado pikeminnow and their USFWS-designated critical habitat.

4.9.2 Alternative B – No Action Alternative

Impacts to fish and wildlife resources under the No Action Alternative would be similar in nature to those described for the Proposed Action. However, potential impacts would be considerably less under the No Action Alternative, as only 16 new oil and gas wells would be developed on State and Tribal lands in the RBU Project Area. The overall surface disturbance would be approximately 12.7 acres, which is nearly 99 percent less than the Proposed Action. Correspondingly, impacts to general wildlife, wildlife habitat, big game, migratory birds, raptors, and special-status wildlife species in the RBU Project Area would be proportionately less under Alternative B.

4.9.3 Alternative C – Agency Preferred Alternative

Impacts to fish and wildlife resources under Alternative C would be similar in nature, but less in extent, than those described under the Proposed Action. Under Alternative C, 234 fewer wells and associated access roads, pipelines, and other project facilities would be constructed than under the Proposed Action. Alternative C would result in the direct disturbance of 924 acres of general wildlife habitat which is 151 acres less and 911 acres more than would be impacted under the Proposed Action and No Action alternatives, respectively. This includes approximately 714 acres of scrub/shrub, 144 acres of grasslands/herbaceous, 37 acres of woody wetland, and 28 acres of barren land vegetation cover types. Following construction, approximately 363 acres of initial disturbance (38 percent) associated with construction of proposed well pad, portions of the access road, and pipeline ROW not needed for operational purposes would be reclaimed. This would reduce the long-term disturbance to vegetation associated with implementation of the Alternative C to approximately 562 acres.

Alternative C would result in the direct disturbance of approximately 882 acres of critical year-long fawning habitat for antelope and approximately 322 acres of critical year-long fawning habitat for bighorn sheep, which is 119 acres and 62 acres less than that of the Proposed Action, respectively. Additionally, impacts to general migratory birds, raptors, and special-status wildlife species in the RBU Project Area would be proportionately less under Alternative C.

An estimated 701 acre-feet of water would be needed for the proposed drilling, completion and fugitive dust control actions under Alternative C, which is approximately 655 acre-feet (48 percent) less than that of the Proposed Action. Implementation of Alternative C would result in a depletion of surface and groundwater within the Green River Watershed, which can reduce the ability of the Green River to create and maintain the physical habitat (areas inhabited or potentially habitable to special status fish for use of spawning, development of fish larvae, feeding, or serving as corridors between these areas) and the biological environment required by the fish. Water depletions can also contribute to alterations in flow regimes that favor non-native fish.

As with the Proposed Action, interim and final reclamation of disturbed areas, pre-construction surveys for special status wildlife, and adherence to species-specific conservation measures on BLM-administered lands including provisions to avoid occupied habitat and employ the use of spatial buffers between surface activities and known populations of special status wildlife species would reduce impacts to wildlife including special status species.

Conclusions

Since any appreciable amount of surface and groundwater depletions within the Green River Watershed can affect habitat for listed Colorado River fish species, Alternative C **"*may affect, is likely to adversely affect*"** the humpback chub, bonytail chub, razorback sucker, and Colorado pikeminnow and their USFWS-designated critical habitat.

4.9.4 Alternative D – Minimum Development Alternative

Impacts to fish and wildlife resources under Alternative D would be similar in nature to those described under the Proposed Action and would be the least of all action alternatives considered. Under Alternative D, 334 fewer wells and associated access roads, pipelines, and other project facilities would be constructed than under the Proposed Action. Alternative D would result in a total surface disturbance of 592 acres of general wildlife habitat which is 483 acres less and 579 acres more than would be impacted under the Proposed Action and No Action alternatives, respectively. This includes approximately 455 acres of scrub/shrub, 102 acres of grasslands/herbaceous, 19 acres of woody wetland, and 16 acres of barren land vegetation cover types. Following construction, approximately 225 acres of initial disturbance (38 percent) associated with construction of proposed well pad, portions of the access road, and pipeline ROW not needed for operational purposes would be reclaimed. This would reduce the long-term disturbance associated with implementation of Alternative D to approximately 367 acres.

Alternative D would result in the direct disturbance of 558 acres of critical year-long fawning habitat for antelope and 165 acres of critical year-long fawning habitat for bighorn sheep, which is 443 acres and 219 acres less than that of the Proposed Action, respectively. No crucial year-long fawning habitat would be affected under Alternative D. Additionally, impacts to general migratory birds, raptors, and special-status wildlife species in the RBU Project Area would be proportionately less under Alternative D.

The volume of water needed for drilling and completion of wells proposed under Alternative D would be approximately 405 acre-feet (150 wells x 2.7 acre-feet per well), which is approximately 902 acre-feet (69 percent) less than that of the Proposed Action. An additional 14.9 acre-feet of water would be needed for dust suppression under Alternative C, which is approximately 33.5 acre-feet (69 percent) less than that required under the Proposed Action.

An estimated 420 acre-feet of water would be needed for the proposed drilling, completion and fugitive dust control actions under Alternative D, **which is approximately 936 acre-feet (69 percent) less than that of the Proposed Action and 281 acre-feet (40 percent) less than that required under Alternative C.** Implementation of Alternative D would result in a depletion of surface and groundwater within the Green River Watershed, (albeit at a substantially lower level than that under the Proposed Action or Alternative C).

As with the Proposed Action, interim and final reclamation of disturbed areas, pre-construction surveys for special status wildlife, and adherence to species-specific conservation measures on BLM-administered lands including provisions to avoid occupied habitat and employ the use of spatial buffers between surface activities and known populations of special status wildlife species would reduce impacts to wildlife including special status species.

Conclusions

Since any appreciable amount of surface and groundwater depletions within the Green River Watershed can affect habitat for listed Colorado River fish species, Alternative D **"*may affect, is likely to adversely affect*"** the humpback chub, bonytail chub, razorback sucker, and Colorado pikeminnow and their USFWS-designated critical habitat.

4.9.5 Recommended Mitigation Measures

No additional mitigation beyond what is proposed under the ACEPMs is recommended for wildlife or special-status terrestrial species under the Proposed Action or other alternatives. The following recommended mitigation measures would be applied to reduce impacts to listed Colorado River fish species.

1) To address the depletion associated with this project, XTO would be responsible for paying a one-time payment, which will be calculated by multiplying the project's average annual depletion by the depletion charge that is in effect at the time payment is made. Ten percent of the total payment will be provided to the USFWS's designated agent, the National Fish and Wildlife Foundation at the time of issuance of the Federal Approvals. The balance will be due at the time construction commences.

4.10 VISUAL RESOURCES

4.10.1 Alternative A – Proposed Action

The potential direct adverse impacts to visual resources would include the visual contrasts created by construction equipment, pipelines, well pads, temporary and permanent access roads, and other forms of infrastructure associated with gas exploration and development. In general, drilling rigs and equipment, construction and maintenance vehicles, development infrastructure, and surface disturbance, including roads, would impact an area's scenic quality and appearance of naturalness with human-made form, color, and linear contrasts. The visual impacts from producing wells (including permanent access roads, permanent well pads, pipelines, maintenance vehicles, and related infrastructure such as electrical generators, and dehydrators) would have similar visual contrasts with the natural landscape, and would persist throughout the production lifetime of the wells and during the life of the project.

Long-term fugitive dust generation by production-well maintenance vehicles and well-drilling activities could adversely impact long-distance scenic quality because these fugitive dust–producing activities would continue throughout the life of the project. However, air-quality modeling indicates that these impacts would not exceed PSD visibility standards (primarily affected by PM_{10} and $PM_{2.5}$) under the Proposed Action. Also, ACEPMs for dust abatement along access roads (see **Section 2.2.12.1**) would limit the potentially adverse effects of long-term, dust-related haze to long-distance scenic quality.

Additional impacts would include artificial light and associated sky glow from night lighting required for night-time drilling. This would be of greater concern in the high-recreation-use areas of the Green River corridor. Night lighting would degrade scenic quality in some relatively undeveloped area by introducing intrusive, artificial lighting into an otherwise unlit natural landscape. Short-term visual impacts from both gas flaring and horizontal and vertical lighting at the well-pad locations would occur during the drilling period of 30 to 40 days. The locations of these temporary impacts would shift across the project area as each individual well is completed. Short-term impacts would also include drilling rig visibility at site-specific drilling locations during the day and night, as the rigs would be moved weekly or monthly depending on site-specific drilling depths. Long-term impacts (for the lifetime of the project) would

include pipeline, infrastructure, and well-pad visibility; surface disturbances from well-pad construction; and access road construction.

Table 4.10-1 shows the acres of potential direct surface-disturbing impacts within each VRM class under the Proposed Action. Implementation of the Proposed Action would result in the direct disturbance of 184 and 491 acres within designated VRM Class III and Class IV areas, respectively. The proposed development within designated VRM Class III and Class IV areas would be consistent with management objectives because the VRM objectives for these visual classes would permit moderate to major changes to the characteristic landscape that would accommodate the level of surface disturbances and visual contrasts created by proposed project activities.

The same proposed development activities would take place in designated VRM Class II areas. Under the Proposed Action, approximately 10 acres of surface disturbance would occur within designated VRM Class II areas. Class II management objectives would allow only minor changes to the characteristic landscape, and any long-term, development-related surface disturbances and visually intrusive structures would be required to comply with those objectives. Under the Proposed Action, at least some of the proposed wells would be in the vicinity of the Green River. Drilling rigs would likely be visible in the short-term within portions of the VRM Class II areas, and project-related infrastructure would potentially be visible in the long-term. Site-specific mitigation (e.g., topographic screening, camouflage coloring) measures as described below would likely reduce the impacts to comply with VRM Class II objectives on BLM-administered lands in Class II areas.

Table 4.10-1. Acreage of VRM Classes Affected Under the Proposed Action

VRM Class	Acres Affected	Percent of Total Proposed Disturbance
Class I	0	0
Class II	10	2.8
Class III	184	7.2
Class IV	491	5.4

4.10.2 Alternative B – No Action Alternative

Impacts to visual resources under the No Action Alternative would be similar in nature to those described for the Proposed Action. However, potential impacts VRM class areas would not occur under the No Action Alternative, as no new wells would be developed on BLM administered lands and only 16 new oil and gas wells would be developed on State and Tribal lands in the RBU Project Area. The overall surface disturbance would be approximately 12.7 acres, which is nearly 99 percent less than the Proposed Action.

4.10.3 Alternative C – Agency Preferred Alternative

Impacts to visual resources under Alternative C would be similar in nature, but less in extent, than those described under the Proposed Action. Under Alternative C, 234 fewer wells and associated access roads, pipelines, and other project facilities would be constructed than under the Proposed Action. Alternative C would result in a total surface disturbance of 924 acres, which is 151 acres less and 911 acres more than would be impacted under the Proposed Action and No Action alternatives, respectively.

Alternative C would result in the direct disturbance of approximately 171 acres of VRM Class III areas and 414 acres of VRM Class IV areas. No Class II areas would be affected under Alternative C, as no new surface disturbance would occur in these areas.

4.10.4 Alternative D – Minimum Development Alternative

Impacts to visual resources under Alternative D would be similar in nature to those described under the Proposed Action and would be the least of all action alternatives considered. Under Alternative D, 334 fewer wells and associated access roads, pipelines, and other project facilities would be constructed than under the Proposed Action. Alternative D would result in approximately 592 acres of surface disturbance which is 483 acres less and 579 acres more than would be impacted under the Proposed Action and No Action alternatives, respectively.

Alternative D would result in the direct disturbance of approximately 122 acres of VRM Class III areas and 242 acres of VRM Class IV areas. No Class II areas would be affected under Alternative D, as no new surface disturbance would occur in these areas.

4.10.5 Recommended Mitigation Measures

The following mitigation measures would reduce potential impacts to Class II areas under the Proposed Action. On-site visual reviews during the APD process would determine if sufficient mitigation could be applied to meet VRM II class objectives. No additional mitigation beyond what is proposed under the ACEPMs is recommended for visual resources under the other alternatives

- Camouflage coloring, facility design, low-profile structures, proper placement, edge feathering along access roads and vegetation/road boundaries, and/or topographic screening would be used to reduce or eliminate the observable effects of well pads, roads, and infrastructure. Topographic screening and proper placement could include hiding the facilities behind ridge lines, in natural depressions, behind vegetation, or behind rock outcrops.
- Interim site and access road reclamation would occur to reduce the visual size of surface disturbance.
- Surface disturbances would be minimized by sharing ROWs, off-site directional drilling, and off-site placement of storage tanks.
- When feasible, pipelines would be buried in the road.
- The proposed well-pad size would be reduced to the minimum necessary.
- Night-lighting and light pollution skyglow impacts would be reduced as feasible by using only the minimal lighting required for safety and security, installing lights at the minimal heights required, and installing hoods on lights to reduce light diffusion.
- To preserve the integrity of viewsheds, during the APD processing, and as feasible, the Operator and AO would: jointly determine the use of topographic features to serve as visual screens; place facilities away from highly visible points such as ridgelines; use low-profile tanks to reduce visibility where taller tanks would be more visible; and avoid excessive side-casting of earth materials from ridgelines and steep slopes.
- As feasible and in order to reduce visual impacts, the Operator would use centralized tank locations for water and condensate tanks. The feasibility of centralizing tank facilities would be determined on a site-specific basis.

4.11 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE

This section considers the socioeconomic impacts of implementing the Proposed Action and alternatives in terms of Tribal, State, and local government revenue as well as Tribal employment and employment within the regional economy.

Oil and gas development within the RBU Project Area has been occurring since the 1950s. During the past 10 years, approximately 173 wells have been developed in the RBU Project Area, which is an average of slightly more than 17 wells per year. If given approval, XTO could increase activity from its current level to the level described under the Proposed Action (an average of approximately 62 wells per year). Because drilling and production activity is ongoing within the RBU Project Area, some of the economic effects described in this section would be a continuation of effects rather than an addition of effects. For example, implementation of the Proposed Action could result in a sustained level of employment and reinforced support for the oil and gas field services sectors, which is well established in both Uintah and Duchesne Counties.

4.11.1 Alternative A - Proposed Action

For the Proposed Action, it is assumed that XTO would construct approximately 484 natural gas wells over an 8 year period. Average daily and annual production estimates for an individual well within the RBU Project Area were provided by XTO and are used as the basis for this economic analysis. As shown in **Figure 4.11-1**, production rates are greatest within the first three years of well development.

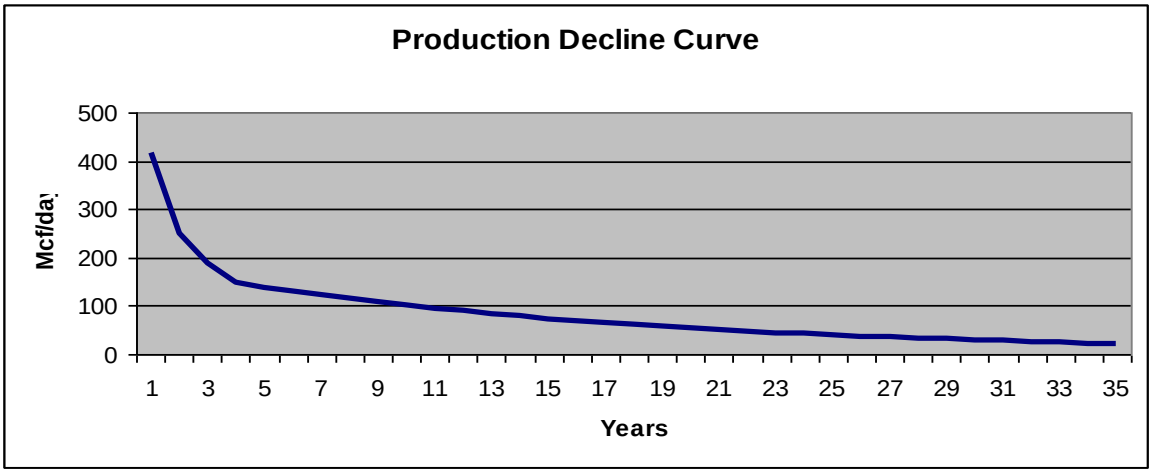


Figure 4.11-1. Production Decline for an Individual Well within the RBU Project Area

For the purposes of analysis, estimated annual average field production and estimated total field production were calculated by taking the production of an individual well (see **Figure 4.11-1**) and multiplying by the number of wells projected to be drilled during each year of the development phase (see **Table 2.1-3**). **Table 4.11-1** shows estimated annual field production and total field production over the life of the project.

Table 4.11-1. Estimated Annual and Total Field Production under the Proposed Action

Year	2010 (Mcf)	2011 (Mcf)	2012 (Mcf)	2013 (Mcf)	2014 (Mcf)	2015 (Mcf)	2016 (Mcf)	2017 (Mcf)	Total (Mcf)
1	7,003,713								7,003,713
2	4,212,537	9,135,277							13,347,814
3	3,159,402	5,494,613	14,159,680						22,813,695
4	2,488,994	4,120,960	8,516,651	8,678,513					23,805,117
5	2,311,373	3,246,514	6,387,487	5,219,883	10,048,805				27,214,061
6	2,172,691	3,014,834	5,032,096	3,914,912	6,044,075	9,744,296			29,922,903
7	2,042,330	2,833,945	4,672,992	3,084,188	4,533,056	5,860,921	9,287,532		32,314,963
8	1,919,790	2,663,908	4,392,615	2,864,092	3,571,165	4,395,690	5,586,190	6,394,694	31,788,145
9	1,804,602	2,504,074	4,129,058	2,692,248	3,316,317	3,462,948	4,189,642	3,846,229	25,945,119
10	1,696,326	2,353,829	3,881,315	2,530,713	3,117,340	3,215,823	3,300,622	2,884,672	22,980,639
11	1,594,547	2,212,600	3,648,435	2,378,870	2,930,299	3,022,875	3,065,081	2,272,560	21,125,266
12	1,498,874	2,079,844	3,429,529	2,236,137	2,754,482	2,841,502	2,881,178	2,110,384	19,831,930
13	1,408,941	1,955,053	3,223,759	2,101,970	2,589,212	2,671,012	2,708,307	1,983,762	18,642,015
14	1,324,405	1,837,750	3,030,332	1,975,852	2,433,860	2,510,751	2,545,809	1,864,736	17,523,493
15	1,244,942	1,727,485	2,848,512	1,857,300	2,287,829	2,360,106	2,393,059	1,752,852	16,472,085
16	1,170,244	1,623,837	2,677,602	1,745,862	2,150,558	2,218,500	2,249,476	1,647,680	15,483,760
17	1,100,030	1,526,405	2,516,947	1,641,111	2,021,525	2,085,389	2,114,508	1,548,820	14,554,735
18	1,034,027	1,434,821	2,365,927	1,542,645	1,900,234	1,960,266	1,987,637	1,455,891	13,681,449
19	971,987	1,348,731	2,223,973	1,450,085	1,786,221	1,842,651	1,868,379	1,368,537	12,860,563
20	913,667	1,267,809	2,090,533	1,363,080	1,679,045	1,732,093	1,756,277	1,286,425	12,088,929
21	858,847	1,191,739	1,965,104	1,281,294	1,578,304	1,628,165	1,650,901	1,209,240	11,363,594
22	807,316	1,120,235	1,847,196	1,204,419	1,483,604	1,530,476	1,551,845	1,136,686	10,681,776
23	758,877	1,053,020	1,736,364	1,132,152	1,394,590	1,438,646	1,458,735	1,068,483	10,040,869
24	713,345	989,840	1,632,182	1,064,223	1,310,913	1,352,330	1,371,210	1,004,375	9,438,417
25	670,544	930,450	1,534,252	1,000,369	1,232,258	1,271,188	1,288,939	944,112	8,872,113
26	630,311	874,622	1,442,198	940,348	1,158,322	1,194,917	1,211,602	887,466	8,339,786
27	592,493	822,145	1,355,665	883,928	1,088,824	1,123,222	1,138,905	834,217	7,839,398
28	556,943	772,817	1,274,324	830,891	1,023,495	1,055,829	1,070,571	784,164	7,369,035
29	523,527	726,448	1,197,866	781,037	962,085	992,480	1,006,337	737,114	6,926,894
30	492,115	682,861	1,125,994	734,176	904,359	932,931	945,958	692,888	6,511,281
31	462,588	641,889	1,058,435	690,125	850,098	876,954	889,199	651,315	6,120,604
32	434,832	603,375	994,928	648,718	799,092	824,338	835,847	612,236	5,753,367

Year	2010 (Mcf)	2011 (Mcf)	2012 (Mcf)	2013 (Mcf)	2014 (Mcf)	2015 (Mcf)	2016 (Mcf)	2017 (Mcf)	Total (Mcf)
33	408,743	567,173	935,231	609,795	751,147	774,877	785,697	575,501	5,408,165
34	384,219	533,143	879,118	573,206	706,078	728,385	738,555	540,972	5,083,676
35	361,165	501,155	826,372	538,814	663,713	684,682	694,242	508,513	4,778,656
36		471,085	776,790	506,486	623,890	643,600	652,587	478,003	4,152,441
37			730,182	476,097	586,458	604,984	613,431	449,322	3,460,475
38				447,531	551,270	568,686	576,626	422,363	2,566,475
39					518,194	534,565	542,029	397,021	1,991,809
40						502,491	509,507	373,200	1,385,199
41							478,937	350,808	829,745
42								329,760	329,760
Total									**528,643,924**

Estimated annual production values presented in **Table 4.11-1** were used to calculate the estimated value of production in the RBU Project Area. The estimated value of natural gas was derived by multiplying the annual gas field production by forecasted wellhead prices in the lower 48 states. This was considered to be the average wellhead price of natural gas between 2008 and 2011, based on information from the Energy Information Administration (EIA). The average wellhead price during this time period was $5.02 per million cubic feet. All values are expressed in 2011 U.S. dollars. The estimated value of production under the Proposed Action would be an annual average of about $63.2 million and about $2.65 billion cumulatively (undiscounted).

4.11.1.1 Tribal and Public Revenues

Taxes, royalties, and other revenues generated by natural gas development in the RBU Project Area are directly tied to the value of gas produced, which varies with both the amount of production and price. As discussed in **Section 3.2.10**, revenues generated by natural gas development are important revenue sources for the Ute Tribe, Uintah County, and the State of Utah. **Table 4.11-2** includes a detailed summary of the estimated revenues that would be generated if the Proposed Action were selected. An explanation of each of these revenues is included after the table.

As discussed in **Section 3.2.10.3**, the RBU Project Area contains some split-estate. For confidentiality reasons, mineral right ownership beneath Tribal lands has not been disclosed. Based on sub-surface mineral ownership patterns, and for the purposes of analysis in this EA, it is assumed that of the wells proposed on Tribal land; approximately four percent would be on Tribal minerals, five percent on State minerals, and 91 percent on Federal minerals.

4.11.1.2 Public Revenues

<u>Mineral Lease Royalties</u>

Federal mineral lease royalties are collected from oil and gas extraction operations located on Federally-held minerals at a rate of 12.5 percent. Federal mineral leasing regulations require that 50 percent of royalties collected from mineral lease royalties are returned to the state of origin. Within the State of Utah, close to 80 percent of State revenue is returned to impacted counties through the Permanent

Community Impact Fund (PCIF) or through county special service districts. As shown in Table 4.11.3, annual average mineral lease royalties on Federal lands would be approximately $9.1 million. Cumulative mineral lease royalties on Federal lands would be approximately $380.4 million.

Mineral lease royalties on State lands are also collected at a rate of approximately 12.5 percent. According to Table 4.10.3, annual average mineral lease royalties on State lands would be approximately $379,113 and cumulative mineral lease royalties on State lands would be approximately $15.9 million.

State Severance Tax

Utah Severance Tax (Utah Code 59-05) is paid to the Utah Tax Commission and promptly remitted to the State Treasurer. With the exception of taxes collected on certain Indian lands, severance monies collected are credited to the General Fund, where it is subject to appropriation by the legislative process.

As discussed in **Section 3.2.10.1**, within Utah, natural gas severance tax rates are administered on a sliding scale basis. The rate is three percent of the value up to, and including, the first $1.50 per mcf and five percent of the value in excess of the first $1.50. There are several exemptions and stipulations for taxable

Table 4.11-2. Estimated Annual, Average, and Total Public and Tribal Revenues from the Proposed Action

Production Estimates and Values			Public and Tribal Revenues									
			Federal Mineral Royalty and State of Utah Appropriations (Dollars)					State Royalties and Revenues (Dollars)			Tribal Royalties and Revenues (Dollars)	
Year	Annual Field Production (mcf)	Total Production Value (Dollars)[1]	Total Federal Mineral Royalty	State of Utah (50% of Federal Mineral Royalty)	UDOT for Special Service Districts (40% of State Allocation)	PCIF (32.5% of State Allocation)	Department of Community and Cultural for Special Service Districts (5% of State Allocation)	SITLA Mineral Royalties	State Severance Tax	State Conservation Tax	Tribal Mineral Royalty	Tribal Severance Tax
1	7,003,713	35,158,637	3,839,323	1,919,662	767,865	623,890	31,195	210,952	1,406,345	70,317	253,142	84,381
2	13,347,814	67,006,027	7,317,058	3,658,529	1,463,412	1,189,022	59,451	402,036	2,680,241	134,012	482,443	160,814
3	22,813,695	114,524,751	12,506,103	6,253,051	2,501,221	2,032,242	101,612	687,149	4,580,990	229,050	824,578	274,859
4	23,805,117	119,501,690	13,049,585	6,524,792	2,609,917	2,120,557	106,028	717,010	4,780,068	239,003	860,412	286,804
5	27,214,061	136,614,587	14,918,313	7,459,156	2,983,663	2,424,226	121,211	819,688	5,464,583	273,229	983,625	327,875
6	29,922,903	150,212,974	16,403,257	8,201,628	3,280,651	2,665,529	133,276	901,278	6,008,519	300,426	1,081,533	360,511
7	32,314,963	162,221,117	17,714,546	8,857,273	3,542,909	2,878,614	143,931	973,327	6,488,845	324,442	1,167,992	389,331
8	31,788,145	159,576,489	17,425,753	8,712,876	3,485,151	2,831,685	141,584	957,459	6,383,060	319,153	1,148,951	382,984
9	25,945,119	130,244,495	14,222,699	7,111,349	2,844,540	2,311,189	115,559	781,467	5,209,780	260,489	937,760	312,587
10	22,980,639	115,362,809	12,597,619	6,298,809	2,519,524	2,047,113	102,356	692,177	4,614,512	230,726	830,612	276,871
11	21,125,266	106,048,837	11,580,533	5,790,267	2,316,107	1,881,837	94,092	636,293	4,241,953	212,098	763,552	254,517
12	19,831,930	99,556,286	10,871,546	5,435,773	2,174,309	1,766,626	88,331	597,338	3,982,251	199,113	716,805	238,935
13	18,642,015	93,582,913	10,219,254	5,109,627	2,043,851	1,660,629	83,031	561,497	3,743,317	187,166	673,797	224,599

Table 4.11-2. Estimated Annual, Average, and Total Public and Tribal Revenues from the Proposed Action

Production Estimates and Values			Public and Tribal Revenues									
			Federal Mineral Royalty and State of Utah Appropriations (Dollars)					State Royalties and Revenues (Dollars)			Tribal Royalties and Revenues (Dollars)	
Year	Annual Field Production (mcf)	Total Production Value (Dollars)[1]	Total Federal Mineral Royalty	State of Utah (50% of Federal Mineral Royalty)	UDOT for Special Service Districts (40% of State Allocation)	PCIF (32.5% of State Allocation)	Department of Community and Cultural for Special Service Districts (5% of State Allocation)	SITLA Mineral Royalties	State Severance Tax	State Conservation Tax	Tribal Mineral Royalty	Tribal Severance Tax
14	17,523,493	87,967,936	9,606,099	4,803,049	1,921,220	1,560,991	78,050	527,808	3,518,717	175,936	633,369	211,123
15	16,472,085	82,689,866	9,029,733	4,514,867	1,805,947	1,467,332	73,367	496,139	3,307,595	165,380	595,367	198,456
16	15,483,760	77,728,473	8,487,949	4,243,975	1,697,590	1,379,292	68,965	466,371	3,109,139	155,457	559,645	186,548
17	14,554,735	73,064,769	7,978,673	3,989,336	1,595,735	1,296,534	64,827	438,389	2,922,591	146,130	526,066	175,355
18	13,681,449	68,680,873	7,499,951	3,749,976	1,499,990	1,218,742	60,937	412,085	2,747,235	137,362	494,502	164,834
19	12,860,563	64,560,025	7,049,955	3,524,977	1,409,991	1,145,618	57,281	387,360	2,582,401	129,120	464,832	154,944
20	12,088,929	60,686,421	6,626,957	3,313,479	1,325,391	1,076,881	53,844	364,119	2,427,457	121,373	436,942	145,647
21	11,363,594	57,045,240	6,229,340	3,114,670	1,245,868	1,012,268	50,613	342,271	2,281,810	114,090	410,726	136,909
22	10,681,776	53,622,514	5,855,579	2,927,789	1,171,116	951,532	47,577	321,735	2,144,901	107,245	386,082	128,694
23	10,040,869	50,405,160	5,504,243	2,752,122	1,100,849	894,440	44,722	302,431	2,016,206	100,810	362,917	120,972
24	9,438,417	47,380,853	5,173,989	2,586,995	1,034,798	840,773	42,039	284,285	1,895,234	94,762	341,142	113,714
25	8,872,113	44,538,005	4,863,550	2,431,775	972,710	790,327	39,516	267,228	1,781,520	89,076	320,674	106,891
26	8,339,786	41,865,725	4,571,737	2,285,869	914,347	742,907	37,145	251,194	1,674,629	83,731	301,433	100,478

Table 4.11-2. Estimated Annual, Average, and Total Public and Tribal Revenues from the Proposed Action

Production Estimates and Values			Public and Tribal Revenues									
			Federal Mineral Royalty and State of Utah Appropriations (Dollars)					State Royalties and Revenues (Dollars)			Tribal Royalties and Revenues (Dollars)	
Year	Annual Field Production (mcf)	Total Production Value (Dollars)[1]	Total Federal Mineral Royalty	State of Utah (50% of Federal Mineral Royalty)	UDOT for Special Service Districts (40% of State Allocation)	PCIF (32.5% of State Allocation)	Department of Community and Cultural for Special Service Districts (5% of State Allocation)	SITLA Mineral Royalties	State Severance Tax	State Conservation Tax	Tribal Mineral Royalty	Tribal Severance Tax
27	7,839,398	39,353,778	4,297,433	2,148,716	859,487	698,333	34,917	236,123	1,574,151	78,708	283,347	94,449
28	7,369,035	36,992,554	4,039,587	2,019,793	807,917	656,433	32,822	221,955	1,479,702	73,985	266,346	88,782
29	6,926,894	34,773,008	3,797,212	1,898,606	759,442	617,047	30,852	208,638	1,390,920	69,546	250,366	83,455
30	6,511,281	32,686,630	3,569,380	1,784,690	713,876	580,024	29,001	196,120	1,307,465	65,373	235,344	78,448
31	6,120,604	30,725,431	3,355,217	1,677,609	671,043	545,223	27,261	184,353	1,229,017	61,451	221,223	73,741
32	5,753,367	28,881,900	3,153,903	1,576,952	630,781	512,509	25,625	173,291	1,155,276	57,764	207,950	69,317
33	5,408,165	27,148,987	2,964,669	1,482,335	592,934	481,759	24,088	162,894	1,085,959	54,298	195,473	65,158
34	5,083,676	25,520,053	2,786,790	1,393,395	557,358	452,853	22,643	153,120	1,020,802	51,040	183,744	61,248
35	4,778,656	23,988,853	2,619,583	1,309,791	523,917	425,682	21,284	143,933	959,554	47,978	172,720	57,573
36	4,152,441	20,845,255	2,276,302	1,138,151	455,260	369,899	18,495	125,072	833,810	41,691	150,086	50,029
37	3,460,475	17,371,582	1,896,977	948,488	379,395	308,259	15,413	104,229	694,863	34,743	125,075	41,692
38	2,566,475	12,883,707	1,406,901	703,450	281,380	228,621	11,431	77,302	515,348	25,767	92,763	30,921
39	1,991,809	9,998,880	1,091,878	545,939	218,376	177,430	8,872	59,993	399,955	19,998	71,992	23,997

Table 4.11-2. Estimated Annual, Average, and Total Public and Tribal Revenues from the Proposed Action

Production Estimates and Values			Public and Tribal Revenues									
			Federal Mineral Royalty and State of Utah Appropriations (Dollars)					State Royalties and Revenues (Dollars)			Tribal Royalties and Revenues (Dollars)	
Year	Annual Field Production (mcf)	Total Production Value (Dollars)[1]	Total Federal Mineral Royalty	State of Utah (50% of Federal Mineral Royalty)	UDOT for Special Service Districts (40% of State Allocation)	PCIF (32.5% of State Allocation)	Department of Community and Cultural for Special Service Districts (5% of State Allocation)	SITLA Mineral Royalties	State Severance Tax	State Conservation Tax	Tribal Mineral Royalty	Tribal Severance Tax
40	1,385,199	6,953,696	759,344	379,672	151,869	123,393	6,170	41,722	278,148	13,907	50,067	16,689
41	829,745	4,165,320	454,853	227,426	90,971	73,914	3,696	24,992	166,613	8,331	29,990	9,997
42	329,760	1,655,393	180,769	90,384	36,154	29,375	1,469	9,932	66,216	3,311	11,919	3,973
Total	**528,643,924**	**2,653,792,499**	**289,794,141**	**144,897,071**	**57,958,828**	**47,091,548**	**2,354,577**	**15,922,755**	**106,151,700**	**5,307,585**	**19,107,306**	**6,369,102**
Average Annual	**12,586,760**	**63,185,536**	**6,899,861**	**3,449,930**	**1,379,972**	**1,121,227**	**56,061**	**379,113**	**2,527,421**	**126,371**	**454,936**	**151,645**

[1]Total production value is based on annual field production multiplied by the average wellhead price of natural gas from the Energy Information Administration (EIA) between 2008 and 2011.
Source: EIA 2012.

value per the State Tax Commission's regulations. For example, the first $50,000 of annual production per well is tax exempt.

Despite the State's sliding rate structure for severance taxes, this analysis assumes that the effective State severance tax rate on XTO would be four percent.

In the Supreme Court case Cotton Petroleum Corporation v. New Mexico (490 U.S. 163), the court upheld the legality of imposing State severance taxes on production of oil and gas resources on Tribal lands by non-Indian lessees. Therefore, XTO would pay State and Tribal severance tax for development occurring on Tribal minerals within the RBU Project Area.

As shown in **Table 4.11-2**, XTO would pay an annual average of approximately $2.5 million in State severance taxes over the 42-year production LOP and $106.2 million cumulatively.

Conservation Fees

A conservation tax is collected by the Utah State Tax Commission at a rate of two-tenths of one percent (0.002) of the value of oil and gas produced, sold, or transported from any oil and gas field in Utah. Revenue generated from the conservation tax is paid to the Utah State Tax Commission and deposited into the State's general tax fund.

As shown in **Table 4.11-2**, on average, the State would collect approximately $126,371 annually in conservation fees over the LOP. Over the 42-year production life, XTO would pay approximately $5.3 million.

Sales and Use Taxes

Sales and use taxes on purchases of taxable goods in the region would also be collected in Uintah County. Some purchases made by XTO, plus retail purchases by contractors and the holders of secondary jobs, would generate sales tax revenues. Sales taxes are an important revenue source for Utah local government. There is insufficient information available to estimate the amount of sales and use taxes that would be generated by the Proposed Action.

4.11.1.3 Tribal Revenues

Tribal Mineral Royalties

Tribal royalty rates can vary from approximately 12.5 percent to 25 percent. For calculation purposes, an average royalty rate of 18 percent was used. As shown in **Table 4.11-2**, if the Proposed Action were implemented, the Ute Tribe would collect an annual average of $454,936 and a cumulative amount of $19 million, over the production life of the project.

Tribal Severance Tax

Severance taxes are also paid to the Ute Tribe for all oil and gas, produced, sold, or transported from Tribal minerals at rate of approximately six percent. Within the RBU Project Area, the Tribe would collect an annual average of $151,645 over the production life of the project, which equals approximately $6.4 million cumulatively.

4.11.1.4 Surface-Use Agreements

In cases where mineral and surface ownership are held in split estate, mineral developers (XTO) and the surface land owner (Ute Tribe) may enter into a surface use agreement. The specific details of a surface use agreement are negotiable.

In general, the compensation agreed upon through surface use agreements exceeds the direct and indirect financial losses that occur from surface disturbance. Some agreements may specify that the land owner would collect an overriding royalty interest (ORI) payment, in which case a certain percentage of oil and gas revenue would be paid to the Tribe. In other cases, the Tribe may collect surface use and damage payments on a per acre or annual basis. Because surface use agreements are confidential, no attempt has been made to calculate what revenues would be created for the Tribe.

4.11.1.5 Employment

Uintah and Duchesne County

For the Proposed Action, an IMPLAN (Impact Analysis for Planning) economic model was used to estimate the impacts that could occur in Uintah and Duchesne Counties as a result of implementing this project. The IMPLAN software automatically integrates economic data from both counties into a single economic unit known as a study area. The benefit of this approach is that the interaction between counties is captured in the economic analyses. The limitation is that it is that impacts cannot be apportioned to individual counties within the study area. Based on the location of this project, the level of impact to Uintah County would be larger than the impacts to Duchesne County. Nonetheless, by including Duchesne County, the majority of the impacts that would occur from oil and gas development in the RBU Project Area are taken into consideration.

Employment estimates for construction, drilling, completion, and production activities which provide the basis of the analysis were provided by XTO. Many of the personnel employed in different phases of the project would not be full-time, but would be employed for short periods of time as needed. For the modeling exercise, the employment estimates for each phase were converted into full-time equivalent employment by dividing by 2,080 (average hours worked by one employee in a year) or 260 (average days worked by one employee in a year), as appropriate.

Employment numbers for each phase are also presented as annual averages. As was shown in **Table 2.1-3**, the number of wells drilled each year could vary during the development phase. Therefore, employment would be the highest during peak-development. **Table 4.11-3** shows the average full-time equivalent employment required for each phase of the project.

Employment numbers presented in **Table 4.11-3** were used to estimate the direct effects of the Proposed Action. However, the direct effect is just the beginning of the economic impacts. For example, if the Proposed Action were implemented, XTO would need materials, supplies, and services from other businesses in order to produce oil and gas. These suppliers would also need to purchase materials and supplies needed by their businesses. The sum of these increases in spending for materials, equipment, and supplies from businesses to other businesses is the indirect effect. Finally, wages and salaries paid to workers in the oil and gas industry and their supplier industries generate household expenditures for items such as housing, food, and utilities. This is the induced effect. As personal income rises, households spend more on housing, food, transportation, clothing, entertainment, and other items, which stimulates the local economy. **Table 4.11-4** shows total estimated employment impacts from implementation of the Proposed Action.

Table 4.11-3. Average Annual Equivalent Full-Time Employment

Project Phase	Full-Time Equivalent Employment[1]
Development	
Pre-Construction	7
Construction	35
Drilling	133
Completion	84
Total	**259**
Production	
Total Production[2]	45

[1]Full-time equivalent employment includes both direct employment by XTO and employment by XTO contractors.
[2]Production employment includes employment associated with production activities as well as with workovers.

Table 4.11-4. Estimated Average Annual Employment during the Development and Production Phase

Project Phase	Employment	
Development	Direct Employment	259
	Indirect Employment	60
	Induced Employment	103
	Total	**422**
Production	Direct Employment	45
	Indirect Employment	8
	Induced Employment	19
	Total	**72**

As was shown in **Table 3.2-14**, in 2008, total employment across all non-agricultural sources of employment in the study area was approximately 23,701. Based on employment projections shown in **Table 4.11-4**, during the development phase, total employment would increase by approximately 2.1 percent.

Study area information contained within the IMPLAN data shows that the total value of all employment sectors within the study area is approximately 2.7 billion dollars annually. The addition of 422 jobs during the development phase would add 50.5 million dollars into the study area annually, which is approximately two percent.

Ute Tribe

Projected employment effects due to the Proposed Action have not been quantified in this analysis due to the lack of available data. However, it should be noted that the Ute Tribe passed a "Contracting Preference Ordinance" in 1992 which "is intended to facilitate and enhance economic opportunities for businesses owned and operated by members of the Ute Indian Tribe by establishing a procedure by which enterprises doing business with the Tribe on the Reservation may locate and contract and subcontract with member-owned businesses." More specifically, the Ordinance would generally obligate XTO by contract, lease, or other agreement to employ, to the greatest extent possible, Tribal members and to contact and subcontract with Tribally owned businesses. The Ordinance requires any employer conducting work on the Reservation to give preference in awarding contracts and subcontracts to Indian-owned businesses that have been certified by the Ute Employment Commission. Indian preference means that qualified Indian-owned businesses and individuals would be hired before qualified non-Indian individuals and businesses.

In addition, as required by the Tribe, XTO would post a notice of staking at the BIA office for five days during which time Tribal members could apply for jobs in the RBU Project Area. If qualified, Tribal members would be given preference over non-members.

4.11.1.6 Population and Housing

As shown in **Table 4.11-4**, average annual employment (direct, indirect, and induced) during the development phase would be approximately 422 full-time equivalents. However, it should be noted that employment could be approximately 33 percent (561 full-time equivalents) higher during peak development. Actual employment would fluctuate with drilling patterns throughout the development phase. In order to conduct an impact analysis that is representative of the various phases of oil and gas development, population and housing demand were calculated during the peak year of development *and* the average year of development.

Total population increase due to implementation of the Proposed Action was estimated by calculating a population to employment ratio. Based on data from Utah's DEA as presented in **Section 3.2.10.1**, every one employee in the study area represents 1.9 individuals in the general population. Therefore, an employment increase of 422 full time equivalents during an average year of well development implies an annual population increase of 802 individuals in the study area. Likewise, adding 561 jobs to the economy during a peak development year would create an estimated population increase of 1,066 individuals. Based on a 2010 population of 51,195 in Duchesne and Uintah Counties, the population increase from the Proposed Action represents 1.5 to 2.1 percent of the current population.

The above analysis can be extended further to forecast the increase in housing demand as a direct result of a population increase in the study area. Data in Section 3.2.9.1 show an average of 2.8 persons per household in Uintah and Duchesne Counties. Based on a population increase of between 802 and 1,066 individuals per year, there would be a demand for between 286 and 380 housing units in the study area. **Table 4.11-5** below summarizes the demographic impacts to the study area from the Proposed Action.

According to DEA projections, from 2008 to 2015 (the 8-year development phase), the average annual increase in housing units would be 2.3 percent. Numerically, this equates to approximately 341 new housing units a year. The Proposed Action would increase annual demand for housing units over forecasted levels by approximately 286 to 380 housing units, or 1.2 to 1.6 percent.

Table 4.11-5. Demographic Impacts to the Study Area from the Proposed Action

	Annual Peak Development	Average Development
Employment Increase	561	422
Population Increase	1,066	802
Demand for Housing Units	380	286

It should be noted that housing demand due to oil and gas development is likely implicit in the State's projection models. A proportion of the 341 housing units in the study area are likely a result of forecasted oil and gas development. However, in order to provide the most conservative analysis, it was assumed that the Proposed Action would create an additive impact to the State's forecasted housing units.

As previously discussed, for this analysis, employment estimates were converted into full-time equivalent employment. However, it should be recognized that many personnel would not be employed full-time, but would be employed for short periods of time, as needed. Short-term employment, as well as a fluctuating pattern of economic activity during the development phase, would lead to a demand for temporary housing (e.g., motel rooms and RV spaces).

Current housing stock in both Duchesne and Uintah Counties totals approximately 21,465. The annual demand for housing generated from the Proposed Action represents approximately 1.2 percent of the current housing stock. The ability of the current housing market to meet the increased demand for housing depends on a multitude of factors including housing vacancy rates, new residential construction rates. According to the 2010 U.S. Census, the vacancy rate in Uintah and Duchesne Counties was 11 and 37 percent respectively (US Census Bureau 2010b). For comparison purposes, the State of Utah and the Nation as a whole had residential vacancy rates of 10 and 11.4 percent, respectively (U.S. Census Bureau 2000c). Therefore, at the time the housing vacancy rate in the study area was considerably higher than the State and the nation.

In 2010, eighty percent of Duchesne County's and twenty-two percent of Uintah County's vacant housing units were for seasonal, recreational or occasional use. This proportion is significantly higher than the vacant seasonal, recreation or occasional use housing in the State and the nation (47 and 31 percent, respectively) (U.S. Census Bureau 2000c). This characteristic of the vacant housing units in the study area likely reflects the transient nature of oil and gas workers. Census data also reveal that 21 and 13 percent of vacant housing units in Duchesne and Uintah Counties, in 2010 were mobile homes (U.S. Census Bureau 2000b). This housing unit type is often ideal for oil and gas employees. Therefore, the housing demand created by the Proposed Action could partially be filled by existing vacant units. The vacant housing units together with new construction and motel rooms would likely fulfill the demand for housing created by the Proposed Action.

4.11.1.7 Social Impacts

As discussed in the preceding section, implementation of the Proposed Action would lead to an increase in transient workforce and population within Uintah and Duchesne Counties.

Research provides empirical support that increases in population can have a disruptive effect on the social well-being of some segments of the local population within a rural community. Negative social consequences could include: a collapse of informal social structures; conflict and tension between advocates and opponents of growth; the absence of social integration; changes in neighboring ties; decreases in community satisfaction, and deteriorating quality of life.

On a more specific level, rural communities impacted by boom periods have observed increases in school drop-out rates, juvenile delinquency, criminal activity, domestic/family violence, and drug and alcohol problems, which can in turn affect police and social services (Smith et al. 2001).

A 2001 study which focused on patterns of population change in four rural communities that have experience extremely rapid growth due to energy-related development in the past, showed that social disruptive effects may not be permanent. As stated in the study, the disruptive effects associated with boom growth dissipate in the years after the boom phase has ended, with no evidence of lasting disruption. Vernal, which is the largest community with multi-county study area, was one of the communities evaluated in the study (Smith et al. 2001).

4.11.1.8 Environmental Justice

Information contained in **Table 3.2-18** show that the members of the Ute Tribe located on the Uintah and Ouray Indian Reservation constitute both a minority and low income population.

In the memorandum that accompanied Executive Order 12898, the President specifically recognized the importance of procedures under NEPA for identifying and addressing environmental justice concerns. The memorandum particularly emphasizes the importance of NEPA's public participation process, direction "each agency shall provide opportunities for community input in the NEPA process."

As discussed in **Section 6.2**, Native American Tribes with cultural ties to the Uinta Basin, including the Ute Tribe, were consulted during the scoping process for this EA. In addition, public scoping was conducted in compliance with CEQ regulations.

Although Tribal lands are included in the RBU Project Area, there are no Tribal members living on, or adjacent to, these lands. Minority and low-income populations within the Tribal communities of Fort Duchesne, White Rocks, and Randlett would not be disproportionately adversely affected by implementation of the Proposed Action.

The economic effects of development in RBU Project Area would be positive for the Ute Tribe. Tribal severance tax would benefit individuals needing Tribal services, such as housing, educational assistance, loans, and social services. Tribal minerals revenue also benefits Tribal households because the Tribe makes per capita payments to enrolled members.

In addition, the Ute Contracting Preference Ordinance requires that employers give preference to qualified Tribal contractors and subcontractors before employing non-Indians.

In terms of health and safety, it should be realized that natural gas development and production are inherently hazardous activities. As such, Tribal employees are likely to be exposed to the occupational hazards associated with construction, drilling, completion, and production activities in proportion to their positions of employment.

4.11.2 Alternative B – No Action Alternative

Under the No Action Alternative, only 16 new oil and gas wells would be developed on State and Tribal lands in the RBU Project Area. Oil and gas extraction would likely continue at the present rate of development over the short-term, which would only temporarily sustain the current level of employment and reinforce support for an already established oil and gas field service sector in the Project Area. Direct project employment of construction workers would be reduced over the construction phase of the project.

In addition, the overall economic benefits of the Project direct at Uintah and Duchesne Counties would be reduced relative to the Proposed Action. With no additional federal wells, there would be no additional royalties.

For the purposes of analysis, it is assumed that total employment and the amount of taxes and royalties generated by production would be reduced in proportion to reductions in the amount of proposed development. Alternative B would represent an approximately 97 percent reduction in development from the Proposed Action, therefore, employment and revenue are expected to be reduced by the same percentage. **Table 4.11-6** shows the revenue, employment and other figures for Alternative B, in comparison with the Proposed Action. The categories are those used in **Table 4.11-2** and **Table 4.11-5**.

Table 4.11-6. Socioeconomic Impacts Under Alternative B

Category	Proposed Action (Alternative A)	Alternative B
Total Production Value	$2,653,792,498	$87,728,678
Total Federal Mineral Royalties	$289,794,141	$9,579,972
State of Utah	$144,897,071	$4,789,986
UDOT for Special Service Districts	$57,958,828	$1,915,994
PCIF	$47,091,548	$1,556,745
Dept. of Community for Special Services Districts	$2,354,577	$77,837
SITLA Mineral Royalties	$15,922,755	$526,372
State Severance Tax	$106,151,700	$3,509,147
State Conservation Tax	$5,307,585	$175,457
Tribal Mineral Royalty	$19,107,306	631,646
Tribal Severance Tax	$6,369,102	$210,549
Average Employment Increase	422	14
Average Population Increase	802	27
Average Demand for Housing Units	286	9

4.11.3 Alternative C – Agency Preferred Alternative

Taxes, royalties, and other revenues generated by oil and natural gas development in the RBU Project Area under Alternative C would be similar to those described for the Proposed Action. However, under Alternative C, 234 fewer wells and associated access roads, pipelines, and other project facilities would be constructed than under the Proposed Action.

For the purposes of analysis, it is assumed that total employment and the amount of taxes and royalties generated by production would be reduced in proportion to reductions in the amount of proposed wells and associated development. Therefore, the estimated value of production under Alternative C would be approximately 48 percent less than the production value that would be generated under the Proposed Action. **Table 4.11-7** shows the revenue, employment and other figures for Alternative C, in comparison with the Proposed Action. The categories are those used in **Table 4.11-2** and **Table 4.11-5**.

Table 4.11-7. Socioeconomic Impacts Under Alternative C

Category	Proposed Action (Alternative A)	Alternative C
Total Production Value	$2,653,792,498	$1,370,760,588
Total Federal Mineral Royalties	$289,794,141	$149,687,056
State of Utah	$144,897,071	$74,843,528
UDOT for Special Service Districts	$57,958,828	$29,937,411
PCIF	$47,091,548	$24,324,147
Dept. of Community for Special Services Districts	$2,354,577	$1,216,207
SITLA Mineral Royalties	$15,922,755	$8,224,564
State Severance Tax	$106,151,700	$54,830,424
State Conservation Tax	$5,307,585	$2,741,521
Tribal Mineral Royalty	$19,107,306	$9,869,476
Tribal Severance Tax	$6,369,102	$3,289,825
Average Employment Increase	422	218
Average Population Increase	802	414
Average Demand for Housing Units	286	148

4.11.4 Alternative D – Resource Protection Alternative

Taxes, royalties, and other revenues generated by oil and natural gas development in the RBU Project Area under Alternative D would be similar to those described for the Proposed Action. However, under Alternative D, 334 fewer wells and associated access roads, pipelines, and other project facilities would be constructed than under the Proposed Action.

For the purposes of analysis, it is assumed that total employment and the amount of taxes and royalties generated by production would be reduced in proportion to reductions in the amount of proposed wells and associated development. Therefore, the estimated value of production under Alternative D would be approximately 69.0 percent less than the production value that would be generated under the Proposed Action. **Table 4.11-8** shows the revenue, employment and other figures for Alternative D, in comparison with the Proposed Action. The categories are those used in **Table 4.11-2** and **Table 4.11-5**.

Table 4.11-8. Socioeconomic Impacts Under Alternative D

Category	Proposed Action (Alternative A)	Alternative D
Total Production Value	$2,653,792,498	$822,456,353
Total Federal Mineral Royalties	$289,794,141	$89,812,234
State of Utah	$144,897,071	$44,906,117

UDOT for Special Service Districts	$57,958,828	$17,962,447
PCIF	$47,091,548	$14,594,488
Dept. of Community for Special Services Districts	$2,354,577	$729,724
SITLA Mineral Royalties	$15,922,755	$4,934,738
State Severance Tax	$106,151,700	$32,898,254
State Conservation Tax	$5,307,585	$1,644,913
Tribal Mineral Royalty	$19,107,306	$5,921,686
Tribal Severance Tax	$6,369,102	$1,973,895
Average Employment Increase	422	131
Average Population Increase	802	249
Average Demand for Housing Units	286	89

4.11.5 Recommended Mitigation Measures

No mitigation measures were recommended for socioeconomic resources under Alternatives A, B, C or D.

5.0 CUMULATIVE IMPACT ANALYSIS

As defined by CEQ regulations, cumulative impacts result from the incremental impacts of an action when added to past, present, and reasonably foreseeable future actions, regardless of who takes the action (40 CFR 1508.7). Concurrently, the ESA defines cumulative impacts as effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation (50 CFR §402.02). The ESA definition only applies to Section 7 analysis and should not be confused with the broader use of this term in NEPA or other environmental laws.

This chapter discusses cumulative impacts as the incremental effect to specific resources or issues that would occur from the Proposed Action or alternatives, in conjunction with other cumulative actions (i.e., past, ongoing, recently approved, and reasonably foreseeable actions).

Cumulative actions include, but are not limited to, rangeland management, livestock grazing, habitat treatments, recreation, wildlife management, and mineral development. In the sections that follow, and where applicable, oil and gas activities are generally discussed on a quantitative basis, whereas all other actions are discussed on a qualitative basis. Collective review of all of these actions provides an estimate of cumulative impacts in a given area. It also provides a framework for forecasting and evaluating future environmental changes that may affect the quality and extent of the natural and human environment.

5.1 CUMULATIVE IMPACT ASSESSMENT AREAS

Although the Vernal Planning Area may be loosely used as a generalized cumulative impact assessment area (CIAA), cumulative impacts may be more accurately assessed using resource-specific CIAAs. As such, cumulative impacts in this EA were analyzed using CIAAs with spatial boundaries that vary by resource. **Table 5.1-1** defines the CIAA for each resource examined in this EA, provides rationale for selecting each CIAA boundary, and lists interrelated projects that intersect each CIAA.

Table 5.1-1. Cumulative Impact Assessment Areas

Resource	Cumulative Impacts Study Area	Study Area Rationale
Air Quality	Uinta Basin, Nearby Class I areas	Construction, development and production activities from implementation of the Proposed Action would cumulatively contribute to changes in air quality occurring immediately adjacent to the Project Area and within the greater Uinta Basin.
Cultural Resources	RBU Project Area and the Willow Creek area (i.e., from the creek bottoms to adjacent ridgetops)	Construction activities impacting cultural resources would only affect those present in the RBU Project Area and would not cause additive affects to those occurring elsewhere. Indirect impacts from traffic activities would add to impacts created from other projects utilizing Willow Creek roads for access.

Resource	Cumulative Impacts Study Area	Study Area Rationale
Fish and Wildlife[1]	Uintah and Duchesne Counties	Besides neotropical migratory birds, the home ranges of wildlife species analyzed in this document are contained within Uintah and Duchesne Counties.
Livestock Grazing	Green River AMP, Sand Wash, and Wild Horse Bench Grazing allotments	As all project activities on BLM-administered lands would occur on these allotments, impacts associated with these activities would only affect these areas and would not cause additive effects to those occurring elsewhere.
Paleontology	RBU Project Area and the Willow Creek area (i.e., from the creek bottoms to adjacent ridgetops)	Project activities impacting paleontological resources would only affect those present in the RBU Project Area and would not cause additive affects to those occurring elsewhere.
Socioeconomics and Environmental Justice	Uintah and Duchesne Counties	Fiscal benefits and costs related to project activities would be felt at the county and municipal levels. Communities that house labor, as well as provide goods and services necessary for this project are located within these counties. Minority, low-income, and Tribal communities potentially impacted by the project would occur in Uintah and Duchesne Counties.
Soil Resources	Hill Creek and Willow Creek watersheds	Project activities impacting soils would only affect soil types present in the Hill Creek and Willow Creek watersheds, and would not cause additive affects to those occurring elsewhere.
Special Status Plant Species	Extent of potential habitat for the Uinta Basin hookless cactus and clay-reed mustard in the Vernal Planning Area[2]	Only activities occurring within potential habitat for the Uinta Basin hookless cactus and clay-reed mustard would contribute to potential impacts to these species. However, conservation measures would reduce impacts to the Uinta Basin hookless cactus and clay reed-mustard.
Vegetation[3]	Hill Creek and Willow Creek watersheds	Project activities impacting vegetation would only affect species present in the Hill Creek and Willow Creek watersheds, and would not cause additive affects to those occurring elsewhere.
Visual Resources	RBU Project Area and the Willow Creek area (i.e., from the creek bottoms to adjacent ridgetops)	Project activities impacting visualresources would only affect those present in the RBU Project Area and would not cause additive affects to those occurring elsewhere.
Water Resources[4]	Hill Creek and Willow Creek watersheds	As all project activities would occur in the Hill Creek and Willow Creek watersheds, impacts associated with these activities would only affect these watersheds and would not cause additive affects to those occurring elsewhere.

[1] Includes Special Status wildlife species.
[2] The CIAA does not include the extent of potential habitat for the clay reed-mustard (plus a 300-foot buffer) because potential habitat for this species has not been comprehensively delineated in the Vernal Planning Area.
[3] Includes noxious and invasive weeds, and wetland/riparian zones.
[4] Includes floodplains.

5.2 CUMULATIVE IMPACTS

Cumulative impacts would occur under all four alternatives presented in this EA (Alternative A – Proposed Action; Alternative B – No Action Alternative; Alternative C – Agency Preferred Alternative; Alternative D – Resource Protection Alternative). These impacts are discussed below on a resource-specific basis. Surface disturbance estimates were derived by first determining the spatial extent of existing, ongoing, and pending projects that fall within a given CIAA. These percentages were then used to estimate the number of wells, well pads, and surface disturbance for each project and alternative considered in this EA. For example, if 10 percent of the project area for any particular project falls within a given CIAA, it was assumed that 10 percent of the project's total development would also occur within the CIAA.

5.2.1 Air Quality

Cumulative air quality impacts are defined as the combination of emissions resulting from the Proposed Project, existing nearby permitted sources, and Reasonably Foreseeable Development (RFD) within the region. Areas of concern include the Uinta Basin, the High Uinta Wilderness Area, as well as nearby PSD Class I areas such as Arches and Canyonlands National Parks and Flat Tops Wilderness. Potential Air Quality Related Value (AQRV) impacts to sensitive areas include regional impacts on visibility and acid deposition.

Cumulative impacts of potential oil and gas and other emission sources in the region of the RBU have been extensively evaluated in two recent Final EISs: Greater Natural Buttes (BLM 2011a) and Gasco Energy (BLM 2011b). Both the Greater Natural Buttes FEIS (GNB) and Gasco Energy FEIS (Gasco) evaluated the potential impact of existing, proposed, and reasonably foreseeable development (RFD) in the Uinta Basin. The RFD in GNB and Gasco included the RBU Proposed Action. The GNB analysis was completed after Gasco, and included a larger number of known NEPA projects as well as projections for sources based on the WRAP Phase III inventory. Accordingly, only results from the GNB analysis will be presented here. GNB analyzed the cumulative air quality impact of 8,196 gas wells (Table 3-2 of GNB Appendix G) plus the 3,675 wells proposed to be developed by GNB by calendar year 2018. The 484 wells in the proposed RBU constitute 4 percent of the total cumulative sources analyzed in GNB.

5.2.1.1 Impact of Criteria Pollutants Other Than Ozone

The threshold of concern for near-field impacts are the NAAQS. GNB evaluated both near-field and long range transport potential impacts with respect to the NAAQS for NO_2, CO, SO_2, PM_{10}, and $PM_{2.5}$. GNB concluded that the near-field cumulative impact of GNB, RFD, and existing background concentrations due to natural emissions and emissions from existing sources would not cause an exceedance of a NAAQS. The maximum cumulative impacts with respect to the NAAQS were for the 1-hour NO_2 and annual $PM_{2.5}$ impacts. The majority of the maximum 1-hour NO_2 impacts result from local impacts of the proposed GNB project (87 percent of the total). On the other hand, the proposed GNB project represents only 6 percent of the total $PM_{2.5}$ impact, with 94 percent from existing sources and natural background. For all except 1-hour NO_2, the incremental RFD source (i.e., the 8,196 gas wells that would be developed without GNB; which includes the 484 RBU Proposed Action wells) contribution to the maximum NAAQS impacts is essentially zero. For 1-hour NO_2, the RFD sources (not including GNB, but including the RBU) contributed a one-tenth of one percent incremental increase over the maximum impacts of GNB alone. The GNB analysis demonstrated that, when evaluating maximum NO_2, CO, SO_2, PM_{10}, and $PM_{2.5}$, cumulative impacts from distant sources are de minimis. Thus the cumulative impacts of the proposed RBU will not be different than the impacts presented in **Chapter 4** for the RBU alone; and the cumulative impacts with RBU and all other sources will be less than the applicable NAAQS.

Far-field impacts at areas of special interest are assessed by comparison to the NAAQS and regulatory PSD allowed increments. To assess potential cumulative air quality impacts for NO_2, CO, SO_2, PM_{10}, and $PM_{2.5}$ at distant areas of interest, GNB analyzed the cumulative impacts of the proposed GNB plus RFD (including the proposed RBU) at 12 distant Class I areas (including the closest Class I areas of Arches and Canyonlands National Parks and the Flat Tops Wilderness Area) and 8 Class II areas of special interest (including the High Uinta Wilderness Area and Dinosaur National Monument). The analysis demonstrated that the cumulative impacts at these Class I and Class II areas were all much less than the NAAQS and the PSD increments. Thus the proposed RBU will not contribute to an exceedance of the NAAQS at these areas of interest.

5.2.1.2 Impact of Ozone

Potential ozone impacts are evaluated by comparing maximum potential ozone concentrations to the NAAQS and by determining the maximum incremental increase of ozone concentrations. Potential cumulative impacts of emissions from GNB, Gasco, RBU, and RFD emissions on regional ozone concentrations were evaluated in the GNB and Gasco FEISs and this RBU EA. All three of these analyses use a combination of emissions from existing plus proposed action and RFD; although the total emission estimate values for the combined emissions may vary due to differences in the time at which the emission estimates were prepared.

The results of the RBU cumulative ozone assessment were reported in **Chapter 4**. The RBU analysis showed that cumulative impact of the proposed RBU plus existing plus RFD did not cause an exceedance of the 75 ppb NAAQS, and the maximum "relative non-monitored area" incremental impact of the Proposed Action was zero for one of the two meteorological years modeled (2005) and less than 0.4 ppb for the second meteorological year (2006). The RBU results are consistent with the Gasco and GNB analyses. None of the emission scenarios in the GNB and Gasco analyses indicated an exceedance of the 75 ppb NAAQS.

The GNB, Gasco, and RBU ozone impact assessments all used the current state of the art photochemical models. These models have been demonstrated reasonable for traditional ozone formation, which typically occurs during the summer when photochemical reactions in the atmosphere are the largest. However, during the winters of 2009-2010 and 2010-2011, prior to initiation of the GNB, Gasco, and RBU projects, monitored ozone concentrations in the Uinta Basin exceeded the 8-hour NAAQS of 75 ppb; even though none of the summer days exceeded the NAAQS. Winter-time exceedance of the ozone standard is a new phenomenon and is not well understood nor modeled. Accordingly as discussed in **Chapter 4**, the BLM has established an Ozone Action Plan, and is conducting an updated ozone modeling study and other efforts as part of an ARMS to help ensure that winter time ozone is mitigated.

5.2.1.3 Regional Haze

In this EA, the potential cumulative impacts of the Proposed Action and other development and operations in the region was not explicitly conducted. However, the GNB EIS analyzed the impacts of cumulative emissions, including the XTO RBU Proposed Action , on 12 Class I areas and 8 Class II areas of interest. Although the analysis showed that GNB alone (3,675 wells)would not cause an incremental increase over the baseline greater than the 1.0 deciview threshold at Class I areas, cumulative emissions from all current and future development could cause an exceedance of the 1.0 deciview threshold on from 223 to 365 days per year at several of the Class I areas. The lowest value, 223 days per year, was for Canyonlands National Park. Similar results were found for the Class II areas of interest, with the lowest number of days (206) being at the Browns Park National Wildlife Reserve. The cumulative impacts are dominated by the non-GNB Project related sources (over 98 perecent at the Class I areas and 83 percent at

the Class II areas). Since the XTO RBU Proposed Action is only 484 wells (less than 15 percent of the GNB total), virtually all of the cumulative impact will be from non-XTO RBU sources.

5.2.1.4 Acid Deposition

Potential acid deposition is analyzed in two different forms: deposition of nitrogen and sulfur and change in acid neutralizing capacity (ANC). The threshold of concern used in the GNB FEIS for nitrogen deposition was 3 kilograms per hectare per year (kg/ha-yr) and 5 kg/ha-yr of sulfur deposition. The threshold for change in ANC is a change of more than 10 percent for lakes with a background ANC of 25 micro equivalents per liter (ueq/l) or less than 1.0 ueq/l change in ANC for lakes with background ANC of less than 25 ueq/l. GNB analyzed the cumulative and incremental impacts of GNB on acid deposition at 12 distant Class I areas and 8 Class I areas of interest. The maximum nitrogen deposition for emissions from GNB was 0.06 kg/ha-yr (less than 2 percent of the threshold) and maximum sulfur deposition from GNB was 0.0017 kg/ha-yr (less than 0.03 percent of the threshold). Since RBU consists of less than 15 percent of the wells of GNB, the potential nitrogen and sulfur deposition from RBU would be much smaller. GNB assessed the potential for ANC change at 23 different lakes in both Class I and II areas. The maximum impact of GNB was less than 0.5 percent change in ANC, less than one-twentieth the threshold of concern. Accordingly, the maximum impact of RBU would be less than one one-hundredth of the threshold.

5.2.1.5 Greenhouse Gases

Many elements of human society and the environment are sensitive to climate variability and change. Human health, agriculture, natural ecosystems, coastal areas, and heating and cooling requirements are examples of climate-sensitive systems.

Rising average temperatures are already affecting the environment. Some observed changes include shrinking of glaciers, thawing of permafrost, later freezing and earlier break-up of ice on rivers and lakes, lengthening of growing seasons, shifts in plant and animal ranges and earlier flowering of trees (IPCC 2007).

Global temperatures are expected to continue to rise as human activities continue to add carbon dioxide, methane, nitrous oxide, and other greenhouse (or heat-trapping) gases to the atmosphere. Most of the United States is expected to experience an increase in average temperature (IPCC 2007). Precipitation changes, which are also very important to consider when assessing climate change effects, are more difficult to predict. Whether or not rainfall will increase or decrease remains difficult to project for specific regions.

The extent of climate change effects, and whether these effects prove harmful or beneficial, will vary by region, over time, and with the ability of different societal and environmental systems to adapt to or cope with the change.

The Intergovernmental Panel on Climate Change (IPCC) concludes that “impacts of climate change will vary regionally but, aggregated and discounted to the present, they are very likely to impose net annual costs which will increase over time as global temperatures increase.” The IPCC estimates that for increases in global mean temperature of less than 1-3°C (1.8-5.4° F) above 1990 levels, some places and sectors will see beneficial impacts while others will experience harmful ones. Some low-latitude and polar regions are expected to experience net costs even for small increases in temperature. For increases, in temperature greater than 2-3°C (3.6-5.4°F), the IPCC says it is very likely that all regions will experience either declines in net benefits or increases in net costs. “Taken as a whole,” the IPCC

concludes, "the range of published evidence indicates that the net damage costs of climate change are likely to be significant and to increase over time."

Figure 5.2-1 shows the trend in global and United States total greenhouse gas and CO_2 from fossil fuel combustion from 1990 to 2004 (EPA 2008a). United States emissions rose until 2000, and then have been relatively constant to present. However, worldwide greenhouse gas emissions have steadily risen from approximately 8.5 billion metric tons per year in 1990 to 10.8 billion metric tons per year in 2004, an increase of 27.1 percent. Although data are not readily available, it is reasonable to expect international greenhouse gas emissions have continued to increase beyond 2004 levels because of the economic development especially in China and India. EPA data indicate that United States emissions have been relatively constant beyond 2004 levels (EPA 2008a).

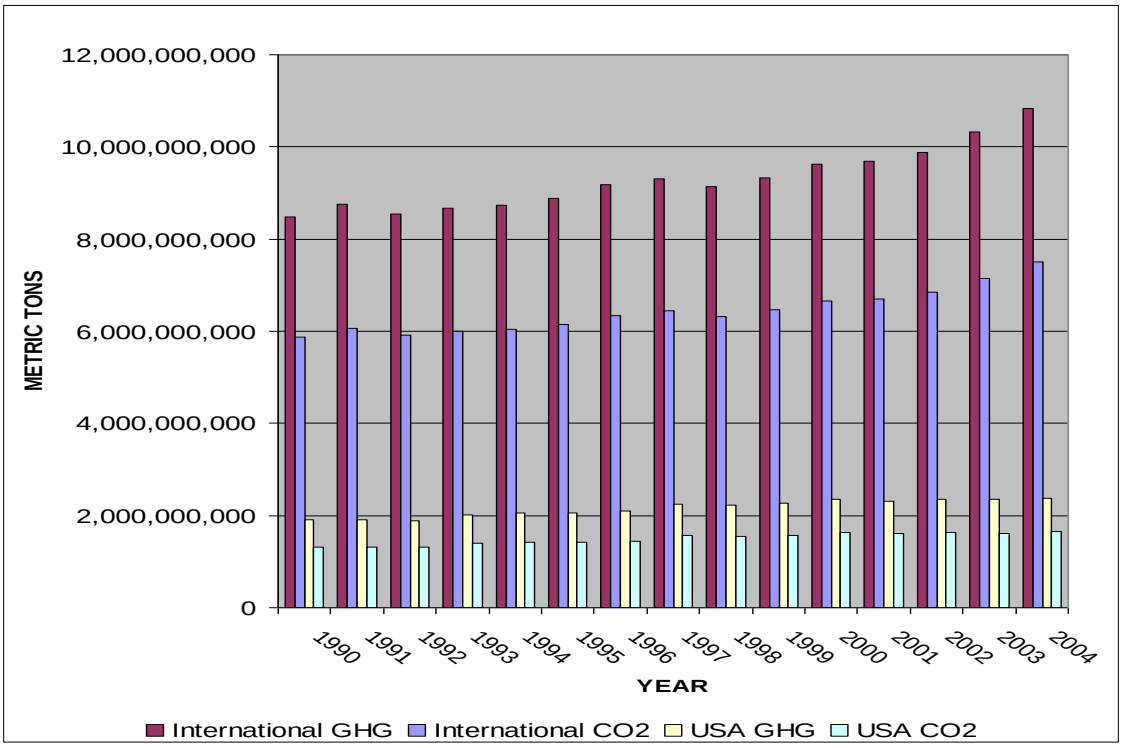


Figure 5.2.-1. Greenhouse Gas Emissions CO2 Equivalents 1990-2004

Estimated maximum greenhouse gas emissions from the RBU Proposed Action are reported in Table 4.2-1 as approximately 342,200 tons. This converts to approximately 310,600 metric tons. The global warming potential (GWP) is shown in Table 4.2-1 as approximately 536,500 tons or 487,000 metric tons GWP.

Climate change analyses are comprised of several factors including, but not limited to, GHGs, land use management practices, and the albedo effect. While emissions from oil and gas activities may contribute to the effects of climate change to some extent, it currently is not possible to associate any of these particular actions with the creation of any specific climate-related environmental effects. The tools necessary to quantify climatic impacts presently are unavailable. As a consequence, impact assessment of specific effects of anthropogenic activities cannot be determined. Additionally, specific levels of significance have not yet been established. Therefore, climate change analysis for the purpose of this

document focuses on GHG emissions for the Proposed Project in comparison to other projects and global/regional totals.

The RBU Proposed Action GHG emissions are approximately one one-thousandth of the US total shown in Figure 5.2-1 for 2004. The GNB EIS has estimated maximum GHG cumulative emissions for the Project Area, including GNB and the RBU Proposed Action as 2.8 to 5.5 million metric tons GWP. The RBU Proposed Action emissions are approximately 9 to 17 percent of this regional total. The State of Utah has estimated emissions of GHG for calendar year 2020 to be 96.1 million metric tons GWP. The Proposed RBU Action emissions are less than 0.5 percent of the state-wide total.

5.2.1.6 Impacts to Air Quality under Proposed Alternatives

Under the No Action Alternative, cumulative emissions and impacts on criteria pollutants (included ozone), regional haze, acid deposition, and greenhouse gases would be less than discussed above since proposed RBU emissions would no longer be part of the RFD impacts analyzed in GNB and Gasco. Likewise under Alternatives B, C, and D, the RBU emissions are less than the Proposed Action. Thus the cumulative impacts under those scenarios would be slightly less than for the Proposed Action.

5.2.2 Soil Resources

The CIAA for soil resources is defined as the Hill Creek and Willow Creek watersheds. Any surface-disturbing activity that removes native vegetation and topsoil from these watersheds may cumulatively and incrementally affect soil resources by increasing erosion and sediment yield, thereby reducing soil productivity and stability as measured by the amounts and types of vegetative cover and forage. Past, present, and reasonably foreseeable actions that could result in increased erosion and sediment yield within the CIAA include oil and gas development, forage use for livestock grazing and wildlife, recreation, mining activities (gilsonite, sand and gravel, and, potentially oil shale), and county and private road construction. Of these actions, impacts related to road construction are the highest concern. Because active roadways would not be reclaimed for the long term, it is assumed sediment yield from existing roads and proposed road construction, including those roads used for oil and gas development, would continue at rates two to three times above background rates into the indefinite future, as compared to other authorized actions.

As shown in **Table 5.2-1.**, surface disturbance associated with the Proposed Action, when added to past, present, and other reasonably foreseeable actions, would cumulatively and incrementally affect soil resources across the CIAA. Approximately 4,742 acres have been or will be disturbed in the past, present, and reasonably foreseeable future from oil and gas activities. Depending on the alternative selected, XTO's proposed infill project would incrementally increase the total cumulative disturbance in the CIAA to 5,497 acres (Alternative A - Proposed Action), 4,750 acres (Alternative B - No Action Alternative), 5,390 acres (Alternative C - Agency Preferred Alternative), or 5,157 acres (Alternative D – Resource Protection Alternative). Throughout the CIAA, disturbed soil acreages and reduced soil productivity would last for the lifetime of oil and gas development and production, until such time that reclamation is deemed successful. Depending on reclamation requirements, drought conditions and other factors may affect reclamation success in the CIAA.

Table 5.2-1. Surface Disturbance Estimates for Existing, Ongoing, and Pending Oil and Gas Projects in the CIAA for Soil Resources, Water Resources, and General Vegetation Including Invasive or Noxious Weeds

Project Name	Totals per Project				Totals in CIAA	
	Project Area (acres)[1]	Wells (#)[2]	Well Pads (#)[3]	Surface Disturbance (acres)	Portion of Project Area in CIAA (acres)	Estimated Surface Disturbance in CIAA (acres)
Existing Development within the RBU Project Area	16,719	805	306	861	11,756	605
KMG Love Unit EA	12,229	125	125	706	1,452	84
WRR North Hill Creek EA	24,893	150	150	560	24,893	560
Enduring Resources Big Pack EA	34,437	644	292	1,620	220	10
KMG Greater Natural Buttes EIS	162,855	3,675	1,484	8,147	16,488	1,282
XTO Hill Creek Unit EA	5,418	144	108	287	5,418	287
XTO Kings Canyon EA	25,027	297	166	1,131	997	45
XTO Little Canyon Unit EA	32,367	510	362	1,882	32,134	1,869
Total Existing, Operational, and Proposed Projects	**-**	**6,350**	**5,184**	**19,705**	**-**	**4,742**
XTO River Bend Unit Infill EA (If Proposed Action is Selected)	16,719	484	106	1,075	11,756	756
Grand Total (If Proposed Action is Selected)	**-**	**6,834**	**5,290**	**20,780**	**-**	**5,498**
XTO River Bend Unit Infill EA (If No Action is Selected)	16,719	16	1	13	11,756	9
Grand Total (If No Action is Selected)	**-**	**6,366**	**5,185**	**19,718**	**-**	**4,751**
XTO River Bend Unit Infill EA (If Alternative C Selected)	16,719	250	70	924	11,756	650
Grand Total (If Alternative C Selected)	**-**	**6,600**	**5,254**	**20,628**	**-**	**5,391**
XTO River Bend Unit Infill EA (If Alternative D Selected)	16,719	150	42	592	11,756	416
Grand Total (If Alternative D Selected)	**-**	**6500**	**5,226**	**20,297**	**-**	**5,158**

[1] Acreage for each project area was compiled from various notices and NEPA documents;
[2] Number of proposed wells for each project was compiled from various notices and NEPA documents; and
[3] Number of well pads includes development of new pad locations and expansion of existing pads. If the number of pads was not stated, all wells were assumed to be drilled vertically (i.e., one well per pad).

For the projects listed above, soil compaction due to construction activities at well pads, along access roads, and in other disturbed areas would result in a small increase in surface runoff from the area. This increased runoff could in turn cause increased sheet, rill, and gully erosion. The construction and operation of each well would also incrementally increase the chance that leaks or spills of saline water, hydro-fracturing chemicals, fuels, and lubricants would occur within the CIAA. Spills of this nature could increase the loss of soil productivity within the area.

Under the No Action Alternative, site-specific mitigation measures for soil resources would be implemented on a well-by-well basis as part of the APD approval process. Under the action alternatives, certain design features (**Sections 2.1**) and ACEPMs (**Section 2.1.12.4**) including berms, sediment control structures, and proper grading of well pads and access roads would reduce impacts to soil resources by minimizing soil erosion, and by reducing the potential for soil contamination.

5.2.3 Water Resources

The CIAA for water resources (including floodplains) is defined as the Hill Creek and Willow Creek watersheds. Any surface-disturbing activity that removes native vegetation and topsoil from these watersheds may cumulatively and incrementally affect water resources by increasing erosion and sediment yield to area drainages and surface water features. Past, present, and reasonably foreseeable actions that could result in increased erosion and sediment yield within the CIAA include oil and gas development, forage use for livestock grazing and wildlife, recreation, mining activities (gilsonite, sand and gravel, and, potentially oil shale), and county and private road construction. Of these actions, surface disturbing activities such as construction of oil and gas facilities and associated infrastructure would likely have the greatest potential impact on water resources due to increased erosion and sedimentation rates and an increased number of road/pipeline water crossings.

As shown in **Table 5.2-1**, surface disturbance associated with the Proposed Action and alternatives when added to past, present, and other reasonably foreseeable actions would cumulatively and incrementally affect water resources (including floodplains) across the CIAA. Approximately 4,742 acres of surface disturbance have been or will be disturbed in the past, present, and reasonably foreseeable future from oil and gas activities. Depending on the alternative selected, XTO's proposed infill project would incrementally increase the total cumulative disturbance in the CIAA to 5,497 acres (Alternative A - Proposed Action), 4,750 acres (Alternative B - No Action Alternative), 5,390 acres (Alternative C – Agency Preferred Alternative), or 5,157 acres (Alternative D – Resource Protection Alternative). Throughout the CIAA, increased erosion and sediment yield, and the risk of spills, would last for the lifetime of oil and gas development and production, until such time that reclamation is deemed successful. Depending on reclamation requirements, drought conditions and other factors may affect reclamation success in the CIAA.

For the projects listed in **Table 5.2-1**, soils compacted on existing roads, new access roads, and well pads would contribute to slightly greater runoff than undisturbed sites. The increased runoff could lead to slightly higher peak flows in the CIAA drainage system, potentially increasing erosion of the channel banks. Such increased erosion, when combined with increased erosion from other authorized actions, could have negative impacts on aquatic habitat within affected drainages and on the proper functioning condition of floodplains. These impacts include increased turbidity and salinity, the covering of stream substrates with fine sediment and clogging of the interstitial pores of the substrate, increased transport of pollutants, including trace metals, herbicides, and petroleum constituents, and increased down-cutting of the channel and bank destabilization. The construction and operation of each well would also incrementally increase the potential for leaks or spills of saline water, hydro-fracturing chemicals, fuels, and lubricants to occur within the CIAA. Spills of this nature could contaminate surface water or shallow alluvial groundwater within the area.

Under Alternative B - No Action Alternative, site-specific mitigation measures for soil resources would be implemented on a well-by-well basis as part of the APD approval process. Under the remaining alternatives, certain design features (**Section 2.1**) including closed-loop drilling in floodplains, cleanup procedures for spills, berms, sediment control structures, and proper grading of well pads and access roads would reduce impacts to water resources by minimizing soil erosion, and by reducing the potential for soil contamination.

5.2.4 Paleontological Resources

The CIAA for paleontological resources is defined as the existing RBU Project Area and the Willow Creek area (i.e., from the creek bottoms to adjacent ridgetops). Cumulative impacts to paleontological resources are defined as any damage to, or destruction of, paleontological resources which result from the incremental impact of the action when added to other past, present, and reasonably foreseeable actions (40 CFR 1508.7). The magnitude of impacts may be greater or lesser depending on 1) the paleontological resource site densities present in the areas of project-related activity; 2) the importance of the paleontological resources present; and 3) the final magnitude and scope of reasonably foreseeable actions over the next 20 years. However, it is important to remember that destruction to, or damage of, paleontological resources is often site-specific and not additive in nature.

Impacts to paleontological resources in the CIAA would primarily result from past, present, and reasonably foreseeable activities associated with surface and subsurface disturbance of fossiliferous rocks for oil and gas development. These activities could damage or destroy fossils. Destruction of scientifically-important fossils would irreversibly and irretrievably damage the paleontological information base and destroyed fossils would not be available for future analysis. In addition, increased vandalism and theft of fossils could result from improved vehicle and pedestrian access to fossil localities and increased visitation to the area.

Table 5.2-2. Surface Disturbance Estimates for Existing, Ongoing, and Pending Oil and Gas Projects in the CIAA for Cultural and Paleontological Resources

Project Name	Totals per Project				Totals in CIAA	
	Project Area (acres)[1]	Wells (#)[2]	Well Pads (#)[3]	Surface Disturbance (acres)	Portion of Project Area in CIAA (acres)	Estimated Surface Disturbance in CIAA (acres)
Existing Development within the RBU Project Area	16,719	805	306	861	16,719	861
KMG Love Unit EA	12,229	125	125	706	71.5	4
WRR North Hill Creek EA	24,893	150	150	560	1,813.3	41
EOG North Alger II EA	2,390	22	22	110	21	1
Gasco Uinta Basin EIS	206,829	1,298	575	3,604	172	9
KMG Greater Natural Buttes EIS	162,855	3,675	3,675	12,658	2,798	218
XTO Hill Creek Unit EA	5,418	144	108	287	1,440	76
XTO Kings Canyon EA	25,027	297	166	1,131	44	2
XTO Little Canyon Unit EA	32,367	510	362	1,882	5,654	329
Total Existing, Operational, and Proposed Projects	**-**	**7,266**	**6,452**	**28,497**	**-**	**1,541**
XTO River Bend Unit Infill	16,719	484	106	1,075	16,719	1,075

Project Name	Totals per Project				Totals in CIAA	
	Project Area (acres)[1]	Wells (#)[2]	Well Pads (#)[3]	Surface Disturbance (acres)	Portion of Project Area in CIAA (acres)	Estimated Surface Disturbance in CIAA (acres)
EA (If Proposed Action is Selected)						
Grand Total (If Proposed Action is Selected)	**-**	**7,750**	**6,558**	**29,572**	**-**	**2,616**
XTO River Bend Unit Infill EA (If No Action is Selected)	16,719	16	1	13	16,719	13
Grand Total (If No Action is Selected)	**-**	**7,282**	**6,453**	**28,510**	**-**	**1,554**
XTO River Bend Unit Infill EA (If Alternative C Selected)	16,719	250	70	924	16,719	924
Grand Total (If Alternative C Selected)	**-**	**7,516**	**6,522**	**26,420**	**-**	**2,464**
XTO River Bend Unit Infill EA (If Alternative D Selected)	16,719	150	42	592	16,719	592
Grand Total (If Alternative D Selected)	**-**	**7,416**	**6,494**	**29,089**	**-**	**2,133**

[1] Acreage for each project area was compiled from various notices and NEPA documents;
[2] Number of proposed wells for each project was compiled from various notices and NEPA documents; and
[3] Number of well pads includes development of new pad locations and expansion of existing pads. If the number of pads was not stated, all wells were assumed to be drilled vertically (i.e., one well per pad).

As shown in **Table 5.2-2**, approximately 1,541 acres of surface disturbance have been or will be disturbed in the past, present, and reasonably foreseeable future from oil and gas activities. Depending on the alternative selected, XTO's proposed infill project would incrementally increase the cumulative disturbance in the CIAA to 2,616 acres (Alternative A - Proposed Action), 1,554 acres (Alternative B - No Action Alternative), 2,464 acres (Alternative C – Agency Preferred Alternative), or 2,133 acres (Alternative D – Resource Protection Alternative).

Where surface-disturbing activities occur on previously-disturbed areas, fossil resources would not be directly affected. However, specific direct impacts to presently unknown paleontological resources in the CIAA, as a result of the proposed project or other reasonably foreseeable actions, would not be known until surveys are completed for all areas proposed for surface disturbance. While the potential for direct impacts to fossils is likely to increase with increased surface disturbance in the CIAA, these impacts would be mitigated by preparation and execution of appropriate mitigation measures, approved by the responsible Federal, State, and Tribal agencies. Surface-disturbing activities could also have a beneficial effect on paleontological resources by drawing the attention of a qualified paleontologist to areas that are not currently being researched, and may result in the collection of specimens and data that would not otherwise be recovered.

Although paleontological sites located within disturbance areas would be avoided or mitigated, sites located outside of and adjacent to disturbance areas would be vulnerable to indirect impacts. When considered in addition to other past, present, and reasonably foreseeable actions, implementation of the Proposed Action or alternatives could cumulatively affect unknown paleontological resources in the CIAA by introducing atmospheric intrusions and increasing visitation and pedestrian traffic during well field development and operation. It is anticipated that these changes could result in a cumulative increase in vandalism, illegal collection, and damage from increased dust and erosion at sites located in the

vicinity of well pads, roads, and pipelines where vegetation cover has been reduced or eliminated. All of these impacts would incrementally and cumulatively add to the loss of scientifically-important fossils across the CIAA. These types of impacts present consequences for the breadth, completeness, and value of the paleontological record.

Under the No Action Alternative, paleontological resources would be protected because site-specific mitigation measures would be implemented on a well-by-well basis as part of the APD approval process. The remaining alternatives would also protect paleontological resources, as these alternatives each incorporate several ACEPMs (**Section 2.1.12**) that are intended to reduce, minimize, or avoid project-specific and cumulative impacts to paleontological resources. In addition, for all alternatives, many potential cumulative impacts to paleontological resources would be reduced or eliminated through the implementation of Federal regulatory laws, actions, and guidelines designed to protect paleontological resources, and through the coordination with the appropriate SMA.

5.2.5 Cultural Resources

The CIAA for cultural resources is defined as the existing RBU Project Area and the Willow Creek area (i.e., from the creek bottoms to adjacent ridgetops). Cumulative impacts to cultural resources are defined as any damage to, or destruction of, cultural resources which result from the incremental impact of the action when added to other past, present, and reasonably foreseeable actions (40 CFR 1508.7). The magnitude of impacts may be greater or lesser depending on 1) the cultural resource site densities present in the areas of project-related activity; 2) the importance of the cultural resources present; and 3) the final magnitude and scope of reasonably foreseeable actions over the next 20 years. However, it is important to remember that destruction to, or damage of, cultural resources is often site-specific and not additive in nature.

Impacts to the cultural resources in the CIAA would primarily result from past, present, and reasonably foreseeable activities associated with surface and subsurface disturbance. Impacts to cultural resources in the CIAA may also result from specific cultural resource management decisions and from non-surface-disturbing activities that create atmospheric, visual, and/or auditory effects. These latter impacts would apply to sites or locations that together comprise the overall cultural experience for all visitors to the area, and especially to those deemed sacred or traditionally important by Native American Tribes and used by these groups in such a manner that atmospheric changes, visual obstructions, and/or noise levels impinge upon that use. These types of impacts cumulatively affect not only the historic setting, feeling, and viewshed of cultural properties, but also their eligibility potential for nomination to the NRHP.

As shown in **Table 5.2-2**, approximately 1,541 acres have been or will be disturbed in the past, present, and reasonably foreseeable future from oil and gas activities. Depending on the alternative selected, XTO's proposed infill project would incrementally increase the cumulative disturbance in the CIAA to 2,616 acres (Alternative A - Proposed Action), 1,554 acres (Alternative B - No Action Alternative), 2,464 acres (Alternative C – Agency Preferred Alternative), or 2,133 acres (Alternative D – Resource Protection Alternative)..

As discussed in **Section 3.2.5**, there are 51 known archaeological sites within the RBU Project Area. Specific direct impacts to presently unknown cultural resources as a result of reasonably foreseeable actions in the CIAA would not be known until surveys are completed for all of the areas proposed for surface disturbance and cultural resource properties are evaluated for their eligibility for listing on the NRHP. While the potential for direct impacts to eligible cultural resources is likely to increase with increased surface disturbance, these impacts can be mitigated by preparation and execution of appropriate mitigation measures approved by the responsible Federal, State, and Tribal agencies. As cultural resource surveys would occur prior to any surface-disturbing activities in the RBU Project Area, and as all NRHP

eligible cultural resources would be avoided or appropriately mitigated, direct cumulative impacts to these resources are expected to be minimal.

Although archaeological sites located within disturbance areas would be avoided or mitigated, sites located outside of and adjacent to disturbance areas would be vulnerable to indirect impacts. When considered in addition to other past, present, and reasonably foreseeable actions, implementation of the Proposed Action or No Action Alternative could cumulatively affect unknown cultural resources in the RBU Project Area by introducing atmospheric, visual, and auditory intrusions; increased visitation and pedestrian traffic during well field development and operation; OHV and other motorized vehicle use; and unknown impacts to unidentified TCPs and cultural landscapes. It is anticipated that there would be a cumulative increase in vandalism, illegal collection, and dust due to the increase in roads throughout the CIAA, and increased erosion at sites located in the vicinity of well pads, roads, and pipelines where vegetation cover has been reduced or eliminated. All of these impacts may contribute to an alteration of the overall historic setting and feeling of the CIAA. Generally speaking, project-related activities incrementally and cumulatively add to the loss of important cultural resources across the CIAA. These types of impacts present consequences for the breadth, completeness, and interpretive value of the archaeological record. Beneficial cumulative impacts would also likely occur as undocumented cultural resources could be discovered and preserved.

Under the No Action Alternative, cultural resources would be protected because site-specific mitigation measures would be implemented on a well-by-well basis as part of the APD approval process. The remaining alternatives would also protect cultural resources, as these alternatives each incorporate several design features (**Section 2.1**) that are intended to reduce, minimize, or avoid project-specific and cumulative impacts to cultural resources. In addition, for all alternatives, many potential cumulative impacts to cultural resources would be reduced or eliminated through the implementation of Federal regulatory laws, actions, and guidelines designed to protect cultural resources, and through the consultation process with the SHPO and Native American Tribal representatives.

5.2.6 Livestock Grazing

The CIAA for livestock grazing is defined as the combined Green River AMP, Sand Wash, and Wild Horse Bench Grazing Allotments. Cumulative impacts from oil and gas development to livestock grazing would include the direct loss of usable acres during the life of the disturbance. Recreation activities, mining activities, and prescribed burns also contribute to the direct loss of useable acres, but the incremental contribution is impossible to quantify.

As shown in **Table 5.2-3**, approximately 5,889 acres have been or will be disturbed in the past, present, and reasonably foreseeable future from oil and gas activities. Depending on the alternative selected, XTO's proposed infill project would incrementally increase the cumulative disturbance to grazing allotments in the CIAA to 6,738 acres (Alternative A - Proposed Action), 5,899 acres (Alternative B - No Action Alternative), 6,609 acres (Alternative C – Agency Preferred Alternative), or 6,351 acres (Alternative D – Resource Protection Alternative).

Table 5.2-3. Surface Disturbance Estimates for Existing, Ongoing, and Pending Oil and Gas Projects in the CIAA for Livestock Grazing

Project Name	Totals per Project				Totals in CIAA	
	Project Area (acres)[1]	Wells (#)[2]	Well Pads (#)[3]	Surface Disturbance (acres)	Portion of Project Area in CIAA (acres)	Estimated Surface Disturbance in CIAA (acres)
Existing Development within the RBU Project Area	16,719	805	306	861	13,041	674
KMG Love Unit EA	12,229	125	125	706	10,551	609
Enduring Resources Big Pack EA	34,437	644	292	1,620	11	<1
XTO Kings Canyon EA	25,027	297	166	1,131	6,257	283
XTO Little Canyon Unit EA	32,367	510	362	1,882	4,653	271
EOG North Alger II EA	2,390	22	22	110	831	38
KMG Greater Natural Buttes EIS	162,855	3,675	3,675	12,658	51,332	3,990
Gasco Uinta Basin EIS	206,829	1,538	1,538	10,302	24	1
XTO Hill Creek Unit EA	5,418	144	108	287	437	23
Total Existing, Operational, and Proposed Projects	**-**	**7,760**	**6,594**	**29,557**	**-**	**5,889**
XTO River Bend Unit Infill EA (If Proposed Action is Selected)	16,719	484	106	1,075	13,041	839
Grand Total (If Proposed Action is Selected)	**-**	**8,244**	**6,700**	**30,632**	**-**	**6,728**
XTO River Bend Unit Infill EA (If No Action is Selected)	16,719	16	1	13	13,041	10
Grand Total (If No Action is Selected)	**-**	**7,776**	**6,595**	**29,570**	**-**	**5,899**
XTO River Bend Unit Infill EA (If Alternative C Selected)	16,719	250	70	924	13,041	721
Grand Total (If Alternative C Selected)	**-**	**8,010**	**6,664**	**30,460**	**-**	**6,609**
XTO River Bend Unit Infill EA (If Alternative D Selected)	16,719	150	42	592	13,041	462
Grand Total (If Alternative D Selected)	**-**	**7,910**	**6,636**	**30,149**	**-**	**6,351**

[1] Acreage for each project area was compiled from various notices and NEPA documents;
[2] Number of proposed wells for each project was compiled from various notices and NEPA documents; and
[3] Number of well pads includes development of new pad locations and expansion of existing pads. If the number of pads was not stated, all wells were assumed to be drilled vertically (i.e., one well per pad).

In addition to loss of useable forage, increased road development within the RBU Project Area would cumulatively contribute to difficulties in controlling livestock as more natural barriers to livestock movement are removed, and as more livestock use roads as travel routes.

Other impacts that may cumulatively affect livestock would include reduced flows to livestock ponds caused by changes to water flow regimes from construction activities; and increased livestock

displacement as a result of increased vegetation loss, traffic, and human activity in the RBU Project Area. If displaced, livestock could move to adjacent undisturbed areas, thereby leading to additional livestock impacts on vegetation in those locations.

Under the No Action Alternative, livestock grazing would be protected because site-specific mitigation measures would be implemented on a well-by-well basis as part of the APD approval process. The remaining alternatives would also impact livestock grazing, as these alternatives each incorporate several ACEPMs (**Section 2.1.12.8**) that are intended to reduce, minimize, or avoid project-specific and cumulative impacts to livestock grazing. Specifically, XTO would be responsible for repairing or replacing barriers used to control livestock that are damaged as a result of the proposed project. In addition, cattleguards or gates would be installed for livestock control on roads when fences are crossed. These structures would be maintained by XTO for the life of the wells.

5.2.7 Vegetation including Special Status Plant Species and Invasive or Noxious Weeds

5.2.7.1 General Vegetation

The CIAA for general vegetation is defined as the Hill Creek and Willow Creek watersheds. Any surface-disturbing activity that removes native vegetation and topsoil from these watersheds may cumulatively and incrementally affect general vegetation by fragmenting plant communities and increasing competition with invasive and noxious weeds. Surface-disturbing activities that compact soil, increase erosion and sediment yield, and increase fugitive dust may also cumulatively and incrementally affect general vegetation, as such changes to the landscape may decrease plant productivity and composition in the CIAA. Past, present, and reasonably foreseeable actions that could result in adverse impacts to general vegetation within the CIAA include oil and gas development, forage use for livestock grazing and wildlife, recreation, mining activities (gilsonite, sand and gravel, and, potentially oil shale), and county and private road construction. Of these actions, impacts related to road construction are the highest concern. Because active roadways would not be reclaimed, it is assumed sediment yield from existing roads and proposed road construction, including those roads used for oil and gas development, would continue at rates two to three times above background rates into the indefinite future, as compared to other authorized actions.

As shown in **Table 5.2-1**, surface disturbance associated with the Proposed Action and No Action Alternative, when added to past, present, and other reasonably foreseeable actions, would cumulatively and incrementally affect vegetation communities across the CIAA. Approximately 4,742 acres have been or will be disturbed in the past, present, and reasonably foreseeable future from oil and gas activities. Depending on the alternative selected, XTO's proposed infill project would incrementally increase the total cumulative disturbance in the CIAA to 5,497 acres (Alternative A - Proposed Action), 4,750 acres (Alternative B - No Action Alternative), 5,390 acres (Alternative C – Agency Preferred Alternative), or 5,157 acres (Alternative D – Resource Protection Alternative). Throughout the CIAA, disturbed vegetation communities and reduced plant productivity would last for the lifetime of oil and gas development and production, until such time that reclamation is deemed successful. Depending on reclamation requirements, drought conditions and other factors may affect reclamation success in the CIAA.

Under the No Action Alternative, site-specific mitigation measures for vegetation would be implemented on a well-by-well basis as part of the APD approval process. Under the remaining alternatives, interim and final reclamation, in combination with mitigation measures including noxious weed management and erosion control, would reduce impacts to vegetation communities by minimizing soil erosion, decreasing fragmentation of plant communities, and reducing the potential for competition with invasive and noxious weed species.

5.2.7.2 Invasive and Noxious Weeds

The CIAA for invasive and noxious weeds is defined as the Hill Creek and Willow Creek watersheds. Any surface-disturbing activity that removes native vegetation and topsoil from these watersheds may cumulatively and incrementally contribute to the introduction and/or spread of invasive and noxious species. Specific negative impacts associated with the introduction and/or spread of invasive and noxious species include: 1) a reduction in the overall visual character of an area; 2) competition with, or elimination of native plants; 3) a reduction or fragmentation of forage for livestock and wildlife use; and 4) increased soil erosion. Weeds infestations may enter previously undisturbed areas, or increase the size or density of existing weed populations. These impacts would be expected to be greatest along road corridors, which often provide a major conduit for the spread of weeds into natural areas.

As shown in **Table 5.2-1**, surface disturbance associated with the Proposed Action and No Action Alternative, when added to past, present, and other reasonably foreseeable actions, would cumulatively and incrementally affect vegetation communities across the CIAA. Approximately 4,742 acres have been or will be disturbed in the past, present, and reasonably foreseeable future from oil and gas activities. Depending on the alternative selected, XTO's proposed infill project would incrementally increase the total cumulative in the CIAA to 5,497 acres (Alternative A - Proposed Action), 4,750 acres (Alternative B - No Action Alternative), 5,390 acres (Alternative C – Agency Preferred Alternative), or 5,157 acres (Alternative D – Resource Protection Alternative). Throughout the CIAA, disturbed areas would last for the lifetime of oil and gas development and production, until such time that reclamation is deemed successful. Depending on reclamation requirements, drought conditions and other factors may affect reclamation success and timelines in the CIAA.

Under the No Action Alternative, site-specific mitigation measures for weeds would be implemented on a well-by-well basis as part of the APD approval process. Under the remaining alternatives, interim and final reclamation, in combination with mitigation measures including noxious weed management and erosion control, would reduce the introduction or spread of invasive and noxious species into native vegetation communities.

5.2.7.3 Special Status Plant Species

In this section, the Uinta Basin hookless cactus and clay reed-mustard are hereinafter referred to as special status plant species. The CIAA for special status plant species is the extent of potential habitat for the Uinta Basin hookless cactus in the Vernal Planning Area. The CIAA does not include the extent of potential habitat for the clay reed-mustard because potential habitat for the clay reed-mustard has not been mapped throughout the Vernal Planning Area. As such, cumulative impacts to the Uinta Basin hookless cactus are discussed both qualitatively and quantitatively, whereas cumulative impacts to the clay reed-mustard are only discussed qualitatively.

Cumulative impacts to special status plant species would be similar in nature to those discussed above for general vegetation. However, given their ongoing habitat losses, sensitivity to disturbance and declining population numbers, special status plant species would be expected to be more sensitive than other, more common plant species to impacts related to development and land uses in the CIAA.

Uinta Basin Hookless Cactus

Cumulative effects to the cactus include direct and indirect impacts as discussed above for general vegetation. Direct impacts would result from the trampling and crushing of individuals, temporary or permanent removal of above ground cover, the temporary or permanent loss of suitable habitat, and soil

compaction as the result of construction and operation activities, grazing, and recreational use. Indirect impacts include habitat fragmentation, increased dust effects, introduction and spread of invasive species, temporary or permanent loss of suitable habitat, and changes to the composition of the native vegetative community from surface disturbance activities such as oil and gas development, grazing, road construction, seismic surveys, well staking, cultural resources surveys, biological surveys, and other human activities. Changes in land use patterns or increased human encroachment also would adversely impact occupied and suitable habitats. In addition, recovery and reclamation of suitable habitats could be compounded by limiting reclamation conditions (e.g., drought).

According to the latest potential habitat polygon for the Uinta Basin hookless cactus, the total area of potential habitat is currently 530,270 acres and includes federal, tribal, state, and private lands. The most current geographic data for the Uinta Basin hookless cactus includes over 18,400 points representing approximately 40,528 individual cacti. These numbers include both living and dead plants, but do not include hybrids of the Uinta Basin hookless cactus and Pariette cactus, which occur outside of the area where these two species overlap. Based on recent survey data (BLM and USFWS, 2011) and extrapolation to unsurveyed suitable habitat, the total count for the Uinta Basin hookless cactus is predicted to be at least 50,000 individuals.

To estimate the approximate amount of surface disturbance currently existing within the potential habitat polygon for the Uinta Basin hookless cactus, GIS data was used from UDOGM that show approximately 5,161 oil and gas well locations within the Uinta Basin hookless cactus potential habitat polygon **(Table 5.2-4).** A conservative estimate of 5 acres of surface disturbance for each well, which includes associated roads and pipelines was used to calculate the amount of habitat within the Uinta Basin hookless cactus potential habitat polygon that is already disturbed by energy development. Based on this information its estimated that over 25,805 acres (5 percent) of habitat within the Uinta Basin hookless cactus potential habitat polygon is currently disturbed by energy development. A yet undetermined number of additional wells are planned for development in the Uinta Basin in upcoming years, and thus the amount of surface disturbance across Uinta Basin hookless cactus habitat can be expected to increase substantially.

Table 5.2-4. Summary of Impacts to Uinta Basin Hookless Cactus Habitat within the CIAA.

Habitat Type	Area (Acres)	Estimated Number of Wells within Habitat	Estimated Acreage of Disturbance from Past, Present, and Future Oil and Gas Activity	Disturbance from Proposed Action (Acres)	Cumulative Total Disturbance (Acres)
Potential Habitat	530,270	5,161	25,805	980	26,785
Level 1 Core Habitat	38,769	647	3,235	14	3,249
Level 2 Core Habitat	85,134	1,487	7,435	58	7,493

GIS data from UDOGM was also used to evaluate the number of oil and gas wells within Level 1 and 2 core conservation areas for the Uinta Basin hookless cactus. Based on this information, approximately 524 and 1,270 wells currently exist within Level 1 and Level 2 core conservation areas, respectively. Another 123 and 217 wells are proposed to be drilled in Level 1 and Level 2 core conservation areas, respectively at some future date. Again, using the conservative estimate of 5 acres of surface disturbance for each well, which includes associated roads and pipelines, an estimated 3,235 acres (8.3 percent) in

Level 1 and 7,435 acres (8.7 percent) in Level 2 core conservation areas has been or will be disturbed by past, present, and reasonably foreseeable future oil and gas activities **(Table 5.2-4).**

Implementation of the Proposed Action would result in the direct disturbance of approximately 980 acres of potential habitat for the Uinta Basin hookless cactus within the Project Area. This would incrementally increase the total cumulative disturbance of potential habitat for the Uinta Basin hookless cactus within the Project Area to 26,780 acres.

Under the Proposed Action, approximately 3 proposed wells would be drilled within Level 1 core conservation areas for the Uinta Basin hookless cactus and approximately 11 proposed wells would be drilled within Level 2 core conservation areas. The development of these wells along with associated road and pipeline installation would initially result in the direct loss of approximately 14 acres of Level 1 core habitat and 58 acres of Level 2 core habitat within the Project Area. This would incrementally increase the total cumulative disturbance of Level 1 and 2 core conservation areas to 3,249 acres and 7,493 acres, respectively. Under Alternatives C and D, no new surface disturbance would occur with USFWS proposed Level 1 or 2 core conservation areas for Uinta Basin hookless cactus; thus, the incremental contribution of impacts to Level 1 or 2 core conservation areas would not be cumulatively considerable.

Clay-reed Mustard

Within the CISA, potential habitat of 322 acres for clay-reed mustard is found in only one location and has minimal potential for overlap with most, if not all past, present, and reasonably foreseeable development activities. Due to the extremely limited distribution of this species, direct impacts from the Proposed Action and interrelated projects would be minimal. Indirect impacts, including effects from fugitive dust, increased spread and establishment of noxious and invasive species in suitable habitat, and road construction leading to increased access to isolated populations could increase slightly as a result of the Proposed Action and other past, present, and reasonably foreseeable development activities.

To prevent or reduce the negative impacts of habitat encroachment on special status plant species, the BLM in cooperation with the USFWS drafted a list of species-specific conservation measures that would moderate development in these areas and afford protective distances from proposed development to plants and/or their occupied habitats. As these measures (see **Appendix B**) would be implemented under the Proposed Action, impacts to special status plant species would be minimized and monitored. Under the No Action Alternative, site-specific mitigation measures for special status plant species would be implemented on a well-by-well basis as part of the APD approval process.

5.2.8 Fish and Wildlife including Special Status Species

The CIAA for fish and wildlife, including special status species, is defined as the spatial boundary of Uintah and Duchesne counties. This cumulative impact analysis focuses on regional wildlife resources and how species in these two counties may be susceptible to cumulative impacts. This analysis assumes that: 1) human use of the CIAA would increase with implementation of the proposed project; and 2) the overall region has been previously affected by past and present (existing and ongoing) oil and gas activities. It is also assumed that cumulative impacts to special status wildlife species would be similar in nature to those for general wildlife. However, given their ongoing habitat losses, sensitivity to disturbance and declining population numbers, special status wildlife species would be expected to be more sensitive than other, more common wildlife species to impacts related to development and land uses in the CIAA.

Past, present and reasonably foreseeable surface disturbance from oil and gas activities in the CIAA has and will continue to reduce wildlife habitat, contribute to habitat fragmentation, disrupt seasonal patterns or migration routes, displace individual wildlife species, result in collisions between wildlife and vehicles, and potentially contribute to poaching and harassment of animals. Other permitted activities, such as recreational activities, livestock grazing, mining activities, and prescribed burns have and will also continue to contribute to cumulative impacts to wildlife, but the incremental contribution of these activities is difficult to quantify. As such, this analysis assumes future disturbance in the CIAA would primarily result from surface disturbance from oil and gas development, but it is understood that livestock grazing, recreation and development of dedicated recreational facilities, and growth of Uinta Basin communities may also remove habitat from use by or otherwise disturb wildlife.

As shown in **Table 5.2-5**, approximately 79,143 acres have been or will be disturbed in the past, present, and reasonably foreseeable future from oil and gas activities. Depending on the alternative selected, XTO's proposed infill project would incrementally increase the cumulative disturbance in the CIAA to 80,218 acres (Alternative A - Proposed Action), 79,156 acres (Alternative B - No Action Alternative), 80,066 acres (Alternative C – Agency Preferred Alternative), or 79,735 acres (Alternative D – Resource Protection Alternative).

Table 5.2-5. Surface Disturbance Estimates for Existing, Ongoing, and Pending Oil and Gas Projects in the CIAA for Uintah and Duchesne Counties

Project Name	Totals per Project				Totals in CIAA	
	Project Area (acres)[1]	Wells (#)[2]	Well Pads (#)[3]	Surface Disturbance (acres)	Portion of Project Area in CIAA (acres)	Estimated Surface Disturbance in CIAA (acres)
Newfield Gusher EA	34,952	75	75	375	34,952	375
Newfield Castle Peak and Eightmile Flat EIS	65,381	973	973	3,701	65,381	3,701
Enduring Resources Rock House EA	4,859	60	24	106	4,859	106
Gasco Riverbend EA	13,323	49	49	245	13,323	245
RDG Uinta Basin EIS	79,807	420	420	2,100	79,807	2,100
KMG Love Unit EA	12,229	125	125	706	12,229	706
KMG Bonanza EA	12,149	95	95	877	12,149	877
Enduring Resources West Bonanza EA	27,993	133	133	665	27,993	665
QEP Greater Deadman Bench EIS	98,538	1,239	1,239	4,561	98,538	4,561
EOG Chapita Wells Stagecoach EIS	31,861	627	627	1,735	31,861	1,735
Elk Production Roosevelt Unit EA	3,306	53	53	210	3,306	210
WRR North Hill Creek EA	24,893	150	150	560	24,893	560
Berry Petroleum and BBC Lake Canyon EA	63,667	200	150	991	63,667	991
Gasco Wilkin Ridge EA	12,085	54	54	270	12,085	270
Berry Petroleum Brundage Canyon Infill EA	7,507	300	195	765	7,507	765
BRC Brundage Canyon	38,774	120	120	370	38,774	370

Project Name	Totals per Project				Totals in CIAA	
	Project Area (acres)[1]	Wells (#)[2]	Well Pads (#)[3]	Surface Disturbance (acres)	Portion of Project Area in CIAA (acres)	Estimated Surface Disturbance in CIAA (acres)
EA						
Existing Development within the RBU Project Area	16,719	**805**	**306**	**861**	16,719	861
El Paso Altamont Bluebell EA	487,988	112	112	817	487,988	817
Enduring Resources Big Pack EA	34,437	664	292	1,620	34,437	1,620
XTO Kings Canyon EA	25,027	297	166	1,131	25,027	1,131
XTO Little Canyon Unit EA	32,367	510	326	1,882	32,367	1,882
EOG North Alger II EA	2,390	2	22	110	2,390	110
BBC West Tavaputs Plateau EIS	137,937	807	538	3,656	137,937	3,656
KMG Greater Natural Buttes EIS	162,855	3,675	3,675	12,658	162,855	12,658
Gasco Uinta Basin EIS	206,829	1,538	1,538	10,302	206,829	10,302
EOG Greater Chapita Wells Natural Gas Infill Project EIS	42,019	7,028	1,679	5,688	42,019	5,688
Enduring Resources Southam Canyon EA	10,575	249	152	858	10,575	858
XTO Hill Creek Unit EA	5,418	144	108	287	5,418	287
Newfield Monument Butte EIS	119,805	5,750	3,250	15,612	119,805	15,612
Newfield EDA #1 EA	77,661	500	500	3,424	77,661	3,424
Berry Petroleum ANF South Unit EIS	25,608	400	400	2,000	25,608	2,000
Total Existing, Operational, and Proposed Projects	**-**	**27,154**	**17,546**	**79,143**	**-**	**79,143**
XTO River Bend Unit Infill EA (If Proposed Action is Selected)	16,719	484	106	1,075	16,719	1,075
Grand Total (If Proposed Action is Selected)	**-**	**27,638**	**17,652**	**80,218**	**-**	**80,218**
XTO River Bend Unit Infill EA (If No Action is Selected)	16,719	16	1	13	16,719	13
Grand Total (If No Action is Selected)	**-**	**22,517**	**17,547**	**79,156**	**-**	**79,156**
XTO River Bend Unit Infill EA (If Alternative C Selected)	16,719	250	70	924	16,719	924
Grand Total (If Alternative C Selected)	**-**	**27,404**	**17,616**	**80,066**	**-**	**80,066**

Project Name	Totals per Project				Totals in CIAA	
	Project Area (acres)[1]	Wells (#)[2]	Well Pads (#)[3]	Surface Disturbance (acres)	Portion of Project Area in CIAA (acres)	Estimated Surface Disturbance in CIAA (acres)
XTO River Bend Unit Infill EA (If Alternative D Selected)	16,719	150	42	592	16,719	592
Grand Total (If Alternative D Selected)	**-**	**27,304**	**17,588**	**79,735**		**79,735**

[1] Acreage for each project area was compiled from various notices and NEPA documents;
[2] Number of proposed wells for each project was compiled from various notices and NEPA documents; and
[3] Number of well pads includes development of new pad locations and expansion of existing pads. If the number of pads was not stated, all wells were assumed to be drilled vertically (i.e., one well per pad).

While surface disturbance does correspond to associated wildlife impacts, accurate calculations of cumulative wildlife habitat loss are not determinable because the direct impacts are species-specific and depend on the following: status and condition of the population(s) or individual animals being affected; seasonal timing of the disturbances; value or quality of the project area habitats as well as adjacent habitats; physical parameters of the affected and nearby habitats (e.g., extent of topographical relief and vegetative cover); and type of surface disturbance. On Federal lands, surveys are required in potential or known habitats of threatened, endangered or otherwise special status species prior to project implementation. These surveys help determine the presence of any special status wildlife species or extent of habitat, and protective measures would generally be taken to avoid or minimize direct disturbance in these areas.

As shown in **Table 5.2-5**, surface disturbance associated with the Proposed Action or No Action Alternative, when added to past, present, and reasonably foreseeable actions, would have minimal impacts on wildlife habitats across the CIAA (1.6%). Yet in the context of cumulative impact analyses each acre of vegetation disturbance increases erosion, which incrementally adds to overall native vegetation loss, and potentially increases invasion of noxious weeds. Ongoing and future oil and gas activities and other land uses within the CIAA would further reduce the amount of available cover, foraging opportunities, and breeding areas for a wide variety of wildlife species levels. Additional development could displace wildlife or preclude wildlife from using areas of more intensive human activity.

Under the No Action Alternative, wildlife and their habitats would be protected because site-specific mitigation measures would be implemented on a well-by-well basis as part of the APD approval process. The remaining alternatives would also protect wildlife and their habitats, as these alternatives each incorporate several ACEPMs (**Section 2.1.12.3**) that are intended to reduce, minimize, or avoid project-specific and cumulative impacts to wildlife.

Water depletions associated with the Proposed Action or alternatives, in combination with depletions from other activities in the CIAA, would reduce the ability of the Upper Colorado River Basin to create and maintain the physical habitat (areas inhabited or potentially habitable to special status fish for use of spawning, development of fish larvae, feeding, or serving as corridors between these areas) and the biological environment for the Colorado River Endangered Fish Species. In addition, the Colorado River Endangered Fish Species could also be directly affected by project activities if fish become impinged on intakes for water pumping systems. Furthermore, implementation of the Proposed Action or alternatives, in combination with other activities in the CIAA, could also degrade USFWS-designated critical habitat for the Colorado River Endangered Fish Species utilizing the Green River by increasing erosion and

sediment yield, and the potential for leaks for spills. Under the No Action Alternative, the Colorado River Endangered Fish Species would be protected because site-specific mitigation measures would be implemented on a well-by-well basis as part of the APD approval process. The remaining alternatives would also protect fish and their habitats, as these alternatives each incorporate several ACEPMs (**Section 2.1.12.3**) that are intended to reduce, minimize, or avoid project-specific and cumulative impacts to the Colorado River Endangered Fish Species. These measures include provisions to implement appropriate erosion control measures, prevent intake on water pumping systems, and use of closed-loop drilling techniques for all proposed wells located in the 100-year floodplain of Willow Creek and in all named drainages within 5 miles of the Green River. As these measures would be implemented under the Proposed Action and No Action Alternative, many of the aforementioned impacts to special status fish species would be minimized and monitored.

5.2.9 Visual Resources

The CIAA for visual resources is defined as the existing RBU Project Area and the Willow Creek area (i.e., from the creek bottoms to adjacent ridgetops). This CIAA accounts for impacts to visual resources that are collectively affected by ongoing resource management and energy extraction in this area, and are generally managed under a common land use plan. Development of oil and gas typically includes construction of roads, well pads, pipelines, power lines, compressors, and other facilities. Development to this degree has transformed the land to a more roaded, developed, and somewhat industrial landscape. Depending on the landform, vegetation type, and well spacing, the surface disturbance and production facilities are evident to varying degrees. In most of the CIAA, development dominates the landscape. Development associated with oil and gas activities, or other similar surface disturbing activities, are consistent with VRM Class III and IV management objectives. Surface disturbing activities on lands with VRM Class II objectives may not be consistent with those objectives. Disturbances would have to be mitigated to a level where they would not attract the attention of a casual observer, unless they are associated with pre-RMP leases, in which case the lease would be a valid pre-existing contractual right that would not be subject to visual objectives.

Past, present, and reasonably foreseeable future oil and gas activities has disturbed approximately 1,541 acres of land in the CIAA (**see Table 5.2-2)**. Other public land uses have resulted in an unknown acreage of surface-disturbing activities, such as livestock grazing, OHV driving, and vegetation treatments, and have also affected the character of the landscape. Construction of livestock facilities (e.g., fences and waters) and wildlife waters, cross-country OHV driving, and vegetation treatments (e.g., chainings), have also altered the existing character of the landscape with changes in vegetation pattern and the introduction of human-made features on the land.

Under the Proposed Action, development of 484 oil and gas wells would cumulatively contribute 1,075 additional acres of surface disturbance to future changes in the landscape. The RBU Project would incrementally increase the cumulative disturbance in the CIAA to 2,616 acres. Under Alternative B, 16 new wells would result in approximately 13 additional acres of surface disturbance to the characteristic landscape. Under Alternative C, 250 new wells result in approximately 924 additional acres of surface disturbance to the characteristic landscape. Under Alternative D, 150 new wells would result in approximately 592 additional acres of surface disturbance to the characteristic landscape. The impacts to the landscape, and visual resources, under Alternatives C and D would be the same as for the Proposed Action described above. Variations in the amount of surface disturbance, road construction, and placement of facilities under the alternatives would create differences between the alternatives, but the cumulative effects would be similar under all alternatives.

5.2.10 Socioeconomics and Environmental Justice

The CIAA for socioeconomics and environmental justice is defined as the spatial boundary of Uintah and Duchesne counties. This spatial boundary was selected because oil and gas development within the Uinta Basin has had a substantial impact on taxes and royalties collected by the State of Utah, many of which are reallocated back to Uintah and Duchesne counties. These counties also house minority, low-income, and Tribal communities, which are all considered when evaluating environmental justice concerns for oil and gas projects. Furthermore, oil and gas development is the largest variable component of reasonably foreseeable actions in the CIAA. As an industry, it supports large segments of the local economy (e.g., funding for local public facilities and services) and is also a key driver affecting local population, demographic, and migration trends. Other historically and economically important segments of the region's economic base are grazing and recreation; however, information regarding trends in those segments is lacking and can only be considered on a qualitative basis.

As a result of the ongoing oil and gas growth in the Uinta Basin, the rural communities in the CIAA have experienced considerable population growth. Research suggests that dramatic increases in population can have a disruptive effect on the social well-being of some segments of the local population within a rural community. Negative social consequences could include: a collapse of informal social structures; conflict and tension between advocates and opponents of growth; the absence of social integration; changes in neighboring ties; decreases in community satisfaction, and deteriorating quality of life. Rural communities impacted by boom periods can experience increases in school drop-out rates, juvenile delinquency, criminal activity, domestic/family violence, and drug and alcohol problems, which can in turn affect police and social services (Smith et al. 2001).

Because energy-related population growth and decline can be sudden and/or unexpected, it is difficult for rural communities with limited resources to prepare for these cycles (GOED 2006). Increased population growth can increase the demand for government services. Even if revenues from oil and gas development within the CIAA would eventually exceed the costs of providing these services, impacts associated with the immediacy of these issues would not be resolved.

The Natural Resource Extraction Impact Working Group (Working Group) was organized by the Utah Governor's Office of Economic Development to discuss the impacts of natural resource extraction on rural counties in Utah including the CIAA. The Working Group concluded that the primary impact of resource extraction activity is the need for construction, upgrading, and maintenance of roads. According to this working group, a mechanism for addressing transportation needs currently does not exist (GOED 2006).

Literature suggests that social disruptive effects in rural communities that have experienced extremely rapid growth due to energy-related development in the past, may not be permanent. Rather, the disruptive effects associated with boom growth dissipate in the years after the boom phase has ended, with no evidence of lasting disruption (Smith et al. 2001). Vernal, and other communities within the Uinta Basin that have experienced rapid population change from energy development in the past may also respond to these changes more favorably than a communities that have not experienced boom and bust cycles (Smith et al. 2001).

6.0 CONSULTATION & COORDINATION

6.1 INTRODUCTION

The issue identification section of **Chapter 1** identifies those issues analyzed in detail in **Chapter 4**. **Appendix A** provides the rationale for issues that were considered but not analyzed further. CEQ regulations under NEPA require an "early and open process for determining the scope of issue to be addressed and for identifying significant issues related to a Proposed Action" (40 CFR 1501.7). In order to satisfy this CEQ requirement, announcement of the Proposed Action was posted on the Utah BLM Environmental Notification Bulletin Board (ENBB) on July 17, 2007. BLM resource specialists in the BLM VFO reviewed XTO's plan of development and conferred with the BIA, U.S. Fish and Wildlife Service (USFWS), Utah Division of Wildlife Resources (UDWR), and Uintah County to assess the type and magnitude of potential impacts to the elements of the human environment and other resources. A draft EA was prepared, and a 30-day public comment period was held from December 8, 2008 to January 6, 2009.

The EPA submitted a comment letter encompassing the XTO Riverbend EA, the Enduring Resources Southam Canyon EA, and the XTO Big Pack EA that raised questions regarding the adequacy of the air quality analysis. In the meantime, BLM's knowledge of the air quality in the Uinta Basin was rapidly expanding with the completion of three large photochemical models (the UBAQS, the Gasco Study, and the Greater Natural Buttes Study), in addition to the installation and operation of air quality monitors in the Red Wash and Ouray areas.

Following review of the public comments, and in particular those submitted by the EPA, the BLM VFO determined that additional air quality analyses were needed in order to adequately address public concerns.

With the addition of the new air quality modeling results and Emissions Inventory comparison, a new public comment period was determined to be necessary. All comments that were received on the original EA have been treated as scoping comments, and have been taken into account during the revision of this EA. Disposition of the original comments is recorded in the administrative file for the EA. A second public comment period was held from September 11, 2012 to October 25, 2012. Six comment letters were received from the following: Ken Kreckel, Southern Utah Wilderness Alliance, Uintah County, U.S. Environmental Protection Agency, U.S. National Park Service, and XTO Energy. One letter did not contain substantive comments. Substantive comments were extracted from the five other letters, and responses were prepared. See **Appendix K** for the comment summaries and responses.

6.2 PERSONS, GROUPS, AND AGENCIES CONSULTED

Name	Purpose & Authorities for Consultation or Coordination	Findings & Conclusions
U.S. Fish & Wildlife Service (USFWS)	Information on Consultation, under Section 7 of the ESA (16 USC 1531)	Consultation with the U.S. Fish and Wildlife Service was initiated on November 8, 2012. A Biological Opinion was received on January 26, 2013 concurring with the effects determinations. See Appendix I.
Utah State Historic Preservation Office (SHPO)	Consultation for undertakings, as required by the National Historic Preservation Act (NHPA) (16 USC 470)	Consultation with Utah SHPO was initiated on October 10, 2012. Concurrence with the no adverse effect determination was received on October 22, 2012. See Appendix J.
Utah Division of Wildlife Resources	Coordinate with UDWR as the agency with expertise on impacts on game species.	Data and analysis regarding big game species incorporated into Chapters 3 and 4.
Uintah County Road Department	Coordinate with county road department as agency with expertise on roads within the RBU Project Area.	Data on county roads incorporated into Chapters 2, 3, and 4.
Native American Tribes	Consultation with Native American Tribes with cultural ties to the Uinta Basin.	Consultation with the Native American Tribes was initiated on September 2, 2010. One response was received from the Pueblo of Laguna on October 18 2010 indicating that no significant impacts would occur. See Appendix J.
Air Resource Technical Advisory Group: BLM, NPS, EPA, Utah, USFS	Coordinate the appropriate methodology for analyzing and mitigating air quality impacts.	Emissions inventory and draft EA were provided for review prior to the public comment period. Comments were addressed.
Environmental Protection Agency	Coordinate the appropriate methodology for analyzing and mitigating resource impacts, especially air quality, water quality, and floodplains.	Draft EA was provided for review prior to the public comment period. Comments were addressed.
Bureau of Indian Affairs: Uintah and Ouray Agency	Coordinate the appropriate methodology for analyzing and mitigating resource impacts on the Uintah and Ouray Reservation.	Draft EA was provided for review prior to the public comment period. No comments were received.

6.3 LIST OF PREPARERS

The following people participated in initial scoping, were members of the Interdisciplinary Team, and/or provided direction and assistance during the preparation of this EA

6.3.1 BLM

Name	Title	Responsible for the Following Section(s) of this Document
Stephanie Howard	Environmental Coordinator	Project Lead, Air Quality, Water Quality, Socioeconomics
Cameron Cox	Archaeologist	Cultural Resources, Native American Religious Concerns
Stan Olmstead	Range Conservationist	Surface Water Quality, Floodplains
Aaron Roe	Botanist	Invasive and Noxious Weeds and Vegetation including T&E Plant Species
Daniel Emmett	Wildlife Biologist	Wildlife including Special Status Wildlife Species
Elizabeth Gamber	Geologist	Ground Water Resources, Paleontology
Steve Strong	Natural Resource Specialist	Soils
Dusty Carpenter	Rangeland Management Specialist	Livestock Grazing

6.3.2 Non-BLM Preparers

Name	Affiliation	Title	Responsible for the Following Section(s) of this Document
Brad Norling	Kleinfelder	NEPA Project Manager	Project Manager, Vegetation, Noxious Weeds, Wildlife, Special Status Species
Dave Nicholson	Kleinfelder	Senior Hydro-geologist	Water Resources, Soils, Paleontology
Russ Erbes	Kleinfelder	Senior Air Quality Specialist	Air Quality
Nicole Peace	Kleinfelder	GIS Coordinator	GIS Mapping
Sue Nall	U.S. Army Corps of Engineers	Environmental Engineer	Water Resources, Wetlands
Ashley Hawes	Kleinfelder	Environmental Planner	Document Production
Aliina Fowler	Kleinfelder	Environmental Planner	Document Production

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United States Department of the Interior
Bureau of Land Management

Finding of No Significant Impact
Environmental Assessment
DOI BLM UT-080-07-772

January 2013

XTO Energy's
River Bend Unit Infill Development

Location: Sections 33 and 34
Township 9 South, Range 18 East

Sections 3, 4, 9, 10, 13-17, 20-24
Township 10 South, Range 19 East

Sections 2, 3, 10, 11, 14-23
Township 10 South, Range 20 East

Salt Lake Base and Meridian
Uintah County, Utah

Applicant/Address: XTO Energy
810 Houston Street
Fort Worth, Texas 76102

U.S. Department of the Interior
Bureau of Land Management
Vernal Field Office
170 South 500 East
Vernal, Utah 84078
Phone: (435) 781-4400
Fax: (435) 781-4410

FINDING OF NO SIGNIFICANT IMPACT

Environmental Assessment

UT-080-07-772

XTO Energy's River Bend Unit Infill Development

INTRODUCTION:

The Bureau of Land Management (BLM) has prepared Environmental Assessment UT-080-07-772 for XTO Energy's proposed River Bend Unit Infill Development proposal in Uintah County, Utah. The agency preferred alternative analyzed the drilling of and production from 250 wells, including 70 new well pads, and the construction of associated facilities including one new compressor station and the expansion of nine existing compressor stations. The agency preferred alternative would be subject to the following restrictions:

- No new surface disturbance would occur within USFWS designated Level 1 core conservation areas for Uinta Basin hookless cactus.
- No new surface disturbance would occur within mapped 100-year floodplains.
- No new surface disturbance would occur within the Lower Green River suitable WSR.
- No new surface disturbance will occur within Visual Resource Management (VRM) Class II areas.

FINDING OF NO SIGNIFICANT IMPACT:

Based upon a review of the EA and the supporting documents, I have determined that the agency preferred alternative is not a major federal action and will not significantly affect the quality of the human environment, individually or cumulatively with other actions in the general area. No environmental effects meet the definition of significance in context or intensity as defined in 40 CFR 1508.27 and do not exceed those effects described in the Vernal RMP/FEIS. Therefore, an environmental impact statement is not needed.

This finding is based on the context and intensity of the project as described:

Context: The project is a field development plan within the River Bend Unit of the BLM Vernal Field Office directly involving approximately 16,719 acres of BLM administered land that by itself does not have international, national, regional, or state-wide importance.

Intensity: The following discussion is organized around the Ten Significance Criteria described in 40 CFR 1508.27 and incorporated into resources and issues considered (includes supplemental authorities Appendix 1 H-1790-1) and supplemental Instruction Memorandum, Acts, regulations and Executive Orders. The following have been considered in evaluating intensity for this proposal:

1. **Impacts may be both beneficial and adverse**. The proposed action would impact resources as described in the EA. Measures to reduce impacts were incorporated in the design of the action alternatives. None of the environmental effects discussed in detail in the EA and associated appendices are considered significant.

2. **The degree to which the selected alternative will affect public health or safety**. The proposed action is designed to minimize impacts to health thru the application of

measures to reduce the emissions of NO_2 during drilling, and through agency preference of a reduced drilling alternative to minimize other air emissions.

3. **Unique characteristics of the geographic area such as proximity to historic or cultural resources, park lands, prime farm lands, wetlands, wilderness, wild and scenic rivers, or ecologically critical areas**. All characteristics of the geographic area have been considered during preparation of the EA as documented in Appendix A of the EA. Those resources determined to be potentially impacted were described and analyzed in detail in Chapters 3 and 4 of the EA. No significant impacts were identified.

4. **The degree to which the effects on the quality of the human environment are likely to be highly controversial**. There is no scientific controversy over the nature of the impacts.

5. **The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks**. The project is not unique or unusual. The BLM has experience implementing similar actions in this and other adjacent areas. The environmental effects to the human environment are fully analyzed in the EA. There are no predicted effects on the human environment that are considered to be highly uncertain or involve unique or unknown risks.

6. **The degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration.** The actions considered in the selected alternative were considered by the interdisciplinary team within the context of past, present, and reasonably foreseeable future actions. The agency preferred alternative is an infill project in an already developed oil and gas field that would not establish a precedent or represent a decision in principle about a future consideration.

7. **Whether the action is related to other actions with individually insignificant but cumulatively significant impacts – which include connected actions regardless of land ownership.** The interdisciplinary team evaluated the proposal and alternatives in context of past, present and reasonably foreseeable actions. All related and connected actions were analyzed in the proposal and alternatives. No cumulatively significant impacts were identified.

8. **The degree to which the action may adversely affect districts, sites, highways, structures, or other objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources.** A Class I cultural review was conducted for the proposed project which identified 31 sites eligible for listing on the NRHP. In the proposal the applicant committed to measures that would avoid or mitigate adverse effects on historic properties. Consultation with SHPO has been completed in accordance with Section 106 of the NHPA and they have concurred with BLM's determinations of eligibility and No Adverse Effect for the undertaking. Documentation of the consultation has been attached to the EA as Appendix J.

9. **The degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of 1973, or the degree to which the action may adversely affect: 1) a**

proposed to be listed endangered or threatened species or its habitat, or 2) a species on BLM's sensitive species list. The agency preferred alternative has been designed to minimize adverse effects to listed cactus and endangered fish by precluding new surface disturbance within USFWS designated Level 1 core conservation areas for Uinta Basin hookless cactus, mapped 100-year floodplains, and the Lower Green River suitable WSR. Section 7 ESA Consultation was initiated on November 8, 2012, and the USFWS Biological Opinion was received on January 29, 2013. The identified Reasonable and Prudent Measure and Terms and Conditions for implementing that Measure have been incorporated as Conditions of Approval in the Decision Record for this project. In addition, those Conservation Measures identified in the Biological Opinion specific to this project and proponent have been incorporated into the Decision Record Conditions of Approval. However, those Conservation Measures that applied to the entire species range were not incorporated into the Decision Record because the BLM is committed to work with the USFWS to implement those measures to achieve recovery of the species regardless of the status of this or any other project.

10. **Whether the action threatens a violation of a federal, state, local, or tribal law, regulation or policy imposed for the protection of the environment, where non-federal requirements are consistent with federal requirements.** The project does not violate any known federal, state, local or tribal law or requirement imposed for the protection of the environment. Federal, state, local, and tribal interests were given the opportunity to participate in the environmental analysis process including the public comment period as documented in Chapter 5 of the EA. No concerns regarding law, regulation or policy consistency were raised.

Authorized Officer

JAN 3 1 2013

Date

United States Department of the Interior
Bureau of Land Management

Decision Record
Environmental Assessment
DOI BLM UT-080-07-772

January 2013

XTO Energy's
River Bend Unit Infill Development

Location: Sections 33 and 34
Township 9 South, Range 18 East

Sections 3, 4, 9, 10, 13-17, 20-24
Township 10 South, Range 19 East

Sections 2, 3, 10, 11, 14-23
Township 10 South, Range 20 East

Salt Lake Base and Meridian
Uintah County, Utah

Applicant/Address: XTO Energy
810 Houston Street
Fort Worth, Texas 76102

U.S. Department of the Interior
Bureau of Land Management
Vernal Field Office
170 South 500 East
Vernal, Utah 84078
Phone: (435) 781-4400
Fax: (435) 781-4410

DECISION RECORD
Environmental Assessment
UT-080-07-772
XTO Energy's River Bend Unit Infill Development

Decision:
It is my decision to authorize XTO to drill two hundred and fifty wells, construct up to 70 new well pads and associated facilities, construct one new compressor station, and expand nine existing compressor stations as described in the agency preferred alternative (Alternative C) of UT-080-07-772. A detailed description of the alternative is included in Section 2.3 of the EA.

The following surface use limitations are integral to the selected alternative:

- No new surface disturbance would occur within USFWS designated Level 1 core conservation areas for Uinta Basin hookless cactus.
- No new surface disturbance would occur within mapped 100-year floodplains.
- No new surface disturbance would occur within the Lower Green River suitable WSR.
- No new surface disturbance will occur within Visual Resource Management (VRM) Class II areas.

This decision is contingent on implementing all design features and applicant committed measures included in the selected alternative as well as meeting all conditions of approval listed in Attachment 1 of this Decision Record.

Authorities: The Project Area lands were leased for oil or gas development under authority of the Mineral Leasing Act. A lessee operator has the right to explore for oil and gas on its leases as specified in 43 CFR 3101.1-2, and if a discovery is made, to produce oil and/or natural gas for economic gain, so long as those operations are conducted in accordance with the lease terms and 43 CFR 3160. All right-of-way development would be conducted in compliance with 43 CFR 2800.

Decision Rationale:
I considered the following prior to reaching my Decision.

Alternatives Considered: The River Bend EA analyzed four alternatives in detail: the Proposed Action, the No Action, the Agency Preferred, and the Minimum Development Alternatives. For a detailed description of the alternatives, refer to sections 2.1, 2.2, 2.3, and 2.4 of the EA respectively. There were also two alternatives considered but dismissed from detailed analysis: Vertical Drilling to attain 20-acre spacing and Surface Pipelines as described in section 2.5 of the EA.

Purpose and Need: Of all alternatives, the selected alternative best addressed the BLM's purpose and need for the project by responding to XTO's proposal for development of their leases while minimizing potential environmental impacts. The Minimum Development Alternative would have resulted in fewer environmental impacts than the selected alternative; however, the selected alternative provides more flexibility for XTO to meet their pipeline contractual agreements by allowing additional development of their leases to offset current production decline. The BLM has reached a Finding of No Significant Impact determination for the selected alternative.

Plan Conformance and Consistency: The management of BLM public lands and resources within the RBU Project Area is directed and guided by the Vernal Field Office Approved Resource Management Plan (RMP) and Record of Decision (ROD) (BLM 2008a). The ROD and RMP allow for processing of Applications for Permit to Drill (APDs) and right-of-way (ROW) grant applications in support of oil and gas operations with the impacts of construction and operation activities (e.g., drilling of wells, operation of compressor stations, etc.) to be analyzed on a case-by-case basis. The management objective of the RMP for energy resources is to meet local and national non-renewable and renewable energy needs, while protecting other resource values. All the Federal leases except U-76500 were issued prior to the signing of FLPMA and the VFO RMP (BLM 2008a). As the RMP recognizes valid existing rights of previously existing oil and gas leases, and as development of lease U-76500 would meet the management objective of the RMP, the selected alternative would be in conformance with the ROD and approved RMP.

Compliance with Pertinent Laws: As required by the Endangered Species Act and the National Historic Preservation Act, Section 7 and Section 106 consultations were conducted for this project. Details of the consultations are included in Chapter 6 and Appendices I and J of the EA.

Public Involvement: Public involvement occurred as described in Section 1.1 and Chapter 6 of the EA. A 45-day public comment period was held for the EA from September 10, 2012 through October 24, 2012. Public comment letters have been reviewed, and substantive comments have been responded to in Appendix K of the EA. No substantial changes necessitating a further public review period were made as a result of the public comment period.

Authorized Officer

JAN 3 1 2013

Date

Protest/Appeal Language: This decision is effective upon the date it is signed by the Authorized Officer. The decision is subject to appeal. Under BLM regulation, this decision is subject to administrative review in accordance with 43 Code of Federal Regulations 3165. Any request for administrative review of this decision must include information required under 43 Code of Federal Regulations 3165.3(b) *State Director Review*, including all supporting documentation. Such a request must be filed in writing with the State Director, Bureau of Land Management, Utah State Office, 440 West 200 South, Suite 500, Salt Lake City, Utah 84101-1345, within 20 business days of the date this decision is received or considered to have been received.

If you wish to file a petition for stay, the petition for stay should accompany your notice of appeal and shall show sufficient justification based on the following standards:

(1) The relative harm to the parties if the stay is granted or denied;
(2) The likelihood of the appellant's success on the merits;
(3) The likelihood of irreparable harm to the appellant or resources if the stay is not granted; and
(4) Whether the public interest favors granting the stay

ATTACHMENT 1: CONDITIONS OF APPROVAL

CONDITIONS OF APPROVAL

Air Quality:

Monitored ozone exceedances in the Uinta Basin could result in a nonattainment designation for the region. In view of this, and unless otherwise specified, the applicant has committed to employ the following measures at the outset of the proposed project to mitigate possible additional adverse ozone impacts:

- Installation of low emission glycol dehydrators at all existing and new compressor stations and production wells where uncontrolled emissions are over five tons per year;
- Electric compression, if and where feasible;
- Emission controls having a control efficiency of 95 percent on existing condensate tanks with a potential to emit of greater 20 tpy, and on new condensate tanks with a potential to emit of 6 tpy VOCs;
- Low-bleed pneumatic devices would be installed at all new compressor stations and production facilities. Within 6 months after of the Record of Decision (ROD), all existing high-bleed pneumatic devices would be replaced with low bleed pneumatic devices. High-bleed devices may be allowed to remain in service for critical safety and/or process reasons;
- Green completions for all well completion activities;
- Tier 2 drill rig engines;
- Lean burn natural gas-fired stationary compressor engines or equipment with equivalent emission rates;
- Catalyst on all natural gas-fired compressor engines to reduce the emissions of CO and VOCs;
- Dry seals on new centrifugal compressors;
- An annual inspection and maintenance program to reduce VOC emissions, including:
    - Performing inspections of thief hatch seals and Enardo pressure relief valves to ensure proper operations.
    - Reviewing gathering system pressures to evaluate any areas where gathering pressure may be reduced, resulting in lower flash losses from the condensate storage tanks.
- *Adaptive Management:* Additionally, the applicant commits to developing a project-specific adaptive management strategy, to be informed by periodic emission inventory updates. Implementation of this strategy and associated application of "enhanced" ozone mitigation measures would be required once the proposed project is initiated if:
    - USEPA designates the area "nonattainment" for ozone;
    - There is a monitored exceedance of the ozone NAAQS in a single monitoring year and after BLM and UDEQ review it is determined that oil and gas development caused or meaningfully contributed to the exceedance;
    - The ARMS modeling shows that additional mitigation is needed to prevent future ozone exceedances; or
    - The ARMS group establishes industry-wide mitigation requirements through ongoing modeling.
- If implementation of this adaptive management strategy is triggered, the applicant commits to working with the BLM to analyze project-specific "enhanced" mitigation

measures and employ them within 1 year. The measures to be considered could include, but would not be limited to, the following:

- Reducing the total number of drill rigs.
- Installing Tier 4 or better drill rig engines.
- Seasonally reducing or ceasing drilling during specified periods.
- Using only lower-emitting drill and completion rig engines during specified time periods.
- Using natural gas-fired drill and completion rig engines.
- Replacing internal combustion engines with gas turbines for natural gas compression.
- Using electric drill rig or compression engines.
- Centralizing gathering facilities.
- Limiting blowdowns or restricting them during specified periods.
- Installing plunger lift systems with smart automation.
- Employing a monthly Forward Looking Infrared, or FLIR, monitoring program to reduce VOCs.
- Enhancing a direct inspection and maintenance program.
- Employing tank load out vapor recovery.
- Employing enhanced VOC emission controls with 95 percent control efficiency on additional production equipment having a potential to emit of greater than 5 tons per year.

Soils:

- Erosion and sedimentation would be reduced through the use of BMPs including, but not limited to: mulching, hydroseeding, erosion control blankets, silt fence installation, jute matting, revegetation, interim reclamation, and/or mychorrizal bacteria supplements.
- In areas with unstable soils where seeding alone may not adequately control erosion, grading would be used to minimize slopes and water bars would be installed on disturbed slopes. Erosion control efforts would be monitored by XTO and, if necessary, modifications would be made to control erosion.
- All disturbed areas of access roads, other than the driving surface, would be revegetated as directed by the AO. These include, but are not limited to, the shoulders, ditches, and cut and fill slopes of the access roads.
- Well pads would be bermed to prevent runoff from entering nearby drainages.

Cultural Resources:

- As directed by the AO, protective fencing would be placed around the boundaries of historic properties during activities that occur within 150 feet.
- If deemed appropriate by the AO, construction activities within areas having a high site potential would be monitored by a qualified archaeologist for the presence of subsurface cultural material.

Colorado River Fish:

- XTO will make a one-time payment which has been calculated by multiplying the Project's peak annual depletion (175 acre-feet) by the depletion charge in effect at the time payment is made. For Fiscal Year 2013 (October 1, 2012, to September 30, 2013),

the depletion charge is $19.82 per acre-foot for the average annual depletion which equals a total payment of $3,468.50 for this Project. The total payment will be due upon completion of a BLM Decision Record for the EA. Fifty percent of the funds will be used for acquisition of water rights to meet the in-stream flow needs of the endangered fishes (unless otherwise recommended by the Implementation Committee); the balance will be used to support other recovery activities for the Colorado River endangered fishes. All payments should be made to the Service's designated agent, the National Fish and Wildlife Foundation (Foundation), at the time of issuance of the federal approvals from the BLM.

National Fish and Wildlife Foundation
1133 15th Street, NW
Suite 1100
Washington, DC 20005

The payment is to be accompanied by a cover letter that identifies the Project and biological opinion that requires the payment, the amount of payment enclosed, check number, and any special conditions identified in the biological opinion relative to disbursement or use of the funds (there are none in this instance). A copy of the cover letter and of the check is to be sent directly to:

Fish and Wildlife Service
Utah Field Office
2369 West Orton Circle, Suite 50
West Valley City, Utah 84119.

The cover letter shall identify the name and address of the payer, the name and address of the federal agency responsible for authorizing the project, and the address of the Service office issuing the biological opinion. This information will be used by the Foundation to notify the payer, the lead federal agency, and the Service that payment has been received. The Foundation is to send notices of receipt to these entities within 5 working days of its receipt of payment.

- We (USFWS) believe that the following reasonable and prudent measures are necessary and appropriate to minimize impacts of incidental take of the Colorado pikeminnow, humpback chub, razorback sucker, and bonytail:
    - Conduct all proposed actions in a manner that will minimize all impacts to listed endangered fish species and their designated critical habitat
- In order to be exempt from the prohibitions of section 9 of the Act, the BLM and XTO must comply with the following terms and conditions, which implement the reasonable and prudent measure, described above, and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary. The following terms and conditions are assumed to include all previously listed applicant committed environmental protection measures, but in some cases include more restrictive or more detailed measures. Conservation measures include implementing the Recovery Program (and relevant RIPRAP measures). For Reasonable and Prudent Measure # 1 :

1. To ensure proper tracking of water depletions from the Upper Colorado River System, XTO will notify the BLM and/or our office as to what water resources will be used for the project as they are designated and the amounts that will be withdrawn from each one.
2. Coordinate with our office regarding design and placement of any structures that may need to be placed in washes or tributaries of the Green River.
3. Coordinate with our office regarding any in-stream pumping structures that deviate from the approved pumping guidelines described above in the applicant committed conservation measures section.
4. Appropriate erosion control and revegetation measures will be employed. In areas with unstable soils where seeding alone may not adequately control erosion, grading will be used to minimize slopes and water bars will be installed on disturbed slopes. Erosion control efforts will be monitored by the operator and necessary modifications will be made to control erosion.

- Machinery should be fueled outside of all stream channels to prevent spillage into waterways.

***Sclerocactus wetlandicus*:**

- Any annual cactus monitoring reports associated with the proposed actions must be submitted to the USFWS and BLM by January 31 each year following monitoring.
- Mineral extraction activities should avoid occupied sites and other important habitat when possible.
- Implement standard conservation measures (EA Appendix B) to minimize future project and use impacts. For example, proposed projects should use existing surface disturbance and rights-of-way to minimize additional surface disturbance and habitat fragmentation.
- Prevent the collection of *Sclerocactus wetlandicus* plants from natural populations. With respect to this project, XTO employees should notify the USFWS or BLM immediately if they observe suspicious behavior-such as non-federal or non-project-related personnel looking for plants-in areas with known cactus locations.
- For infrastructure (typically, a pipeline) that crosses through occupied cactus habitat, applicants should ensure that future maintenance activities will not impact cacti. This can be accomplished by some or all of the following:
    - Notify maintenance crews when they will be working in a sensitive cactus area and provide them with GPS information or maps of areas to avoid,
    - Have a botanist on-site prior to and during maintenance activities to flag cacti or avoidance areas and remove the flags immediately after work has completed, and
    - Install protective fencing (e.g., silt fencing) around cacti that are downslope or downwind of surface-disturbing maintenance activities during maintenance, and remove the fencing immediately when work is completed.

***Schoenocrambe argillacea*:**

- No development will occur within 300 feet of *Schoenocrambe argillacea* occupied habitat or avoidance areas[1].

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[1] Avoidance areas are defined in the EA's Appendix B as being areas of suitable habitat "where standard surveys are technically infeasible and otherwise hazardous due to topography, slope, etc.,".

Threatened or Endangered Species:

- Upon locating dead, injured, or sick listed species, immediate notification must be made to the U.S. Fish and Wildlife Service Salt Lake City Field Office at (801) 975-3330 and the U.S. Fish and Wildlife Service Division of Law Enforcement, Ogden, Utah, at (801) 625-5570. Pertinent information including the date, time, location, and possible cause of injury or mortality of each species shall be recorded and provided to the U.S. Fish and Wildlife Service. Instructions for proper care, handling, transport, and disposition of such specimens will be issued by the U.S. Fish and Wildlife Service Division of Law Enforcement. Care must be taken in handling sick or injured animals to ensure effective treatment and in handling dead specimens to preserve biological material in the best possible state.

Suitable habitat is identified in the EA's Appendix B as being areas "that contain or exhibit the specific components or constituents necessary for plant persistence; determined by field inspection and/or surveys; may or may not contain clay reed-mustard; habitat descriptions can be found in Federal Register Notice and species recovery plan links at http://www.fws.gov/endangered/wildlife.html"