5.0 CUMULATIVE IMPACTS AND REASONABLY FORESEEABLE DEVELOPMENT

5.1 INTRODUCTION

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. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time.

The Proposed Action incorporates several applicant-committed measures intended to reduce, minimize, or avoid adverse project-specific and cumulative impacts on the environment (see Section 2.3). Additional resource-specific mitigation measures that would further reduce adverse impacts have been recommended in Chapter 4. In addition, site-specific environmental considerations would likely be identified during the on-site process once locations and ROWs been staked and prior to any surface disturbance.

This chapter discusses cumulative impacts as the incremental effect to specific resources or issues that would occur from the Proposed Action or No Action Alternative in conjunction with other cumulative actions. In support of the cumulative impact discussion, this chapter provides discussion on reasonably foreseeable development (RFD) as well as past and present oil and gas field development activities in the Uinta Basin. Projected oil and gas activity is expected to be the most significant activity in the Vernal Field Office area. Other significant activities would be livestock grazing, vegetative management through prescribed burning, and recreational projects. In this section, the Cumulative Impact Analysis Area (CIAA) for most resources is the Vernal Field Office planning area. The CIAA essentially includes identified actions in Uintah County and the neighboring Duchesne County to the west. For rangeland management, the CIAA is defined as the cumulative 240,136-acre area covered by the Antelope Draw, Horned Toad, Little Emma, Olsen, Seven Sisters, and West Tabyago allotments. For air quality, the modeling domain, and thus the CIAA, extends throughout northeast Utah into north central Colorado.

5.2 HISTORY, CURRENT SITUATION, AND FUTURE SITUATION OF OIL AND GAS DEVELOPMENT IN THE UINTA BASIN

5.2.1 History Leading to Present Situation of Oil and Gas Development

The CWSA is located within the Greater Natural Buttes (GNB) Field, which is located within the east-central part of the Uinta Basin in Northeastern Utah. Oil and gas exploration and development within the Uinta Basin was initiated in the late 1920s. The first well to discover gas within the GNB Field was the Continental Oil #1, which was located within the Chapita Wells Unit and was drilled and completed in 1952. Reserves from this historical natural gas well were depleted within a few months. The Continental Oil #2 well, also located within the Chapita Wells Unit was completed in 1955 and was a productive natural gas well for several decades. Since these initial discoveries, about 15 gas fields have been discovered in the GNB Field.

In the earlier years of Uinta Basin oil and gas development, the market for oil and gas from the GNB Field fluctuated, was seasonal, and poorly priced because of the lack of a strong market. Tax incentives for “tight sands” gas development led to a spurt of drilling in the 1990s.

Pipeline Infrastructure

Historical pipeline and ROW development within the Uinta Basin was commensurate with the fluctuating market and oil and gas development. The first pipeline to take gas from the Uinta Basin was built by Northwest Pipeline in 1956. This 26-inch diameter pipeline ran from the San Juan Basin in New Mexico, through the Uinta Basin, to the Pacific Northwest. Two additional major pipelines were built in the 1960s; the Questar Mountain Fuel and Sinclair Oil Mesa pipelines. The Questar (Mountain Fuel) pipeline was constructed in order to take gas from the basin to the Wasatch front area in Salt Lake City. The Sinclair Oil (Mesa) pipeline was constructed in order to take gas from the basin to the Pacific Northwest.

By the 1980s, ROWs within the basin consisted of several hundred miles and continued to increase with increased oil and gas development. ROWs were, and continue to be, used for a variety of purposes, including oil and gas pipelines, communication lines, power lines, water pipelines, railroads, and roads.

In 1984, the two major north-south ROW corridors within the basin included the Seep Ridge Road in the central portion of the Uinta Basin and the Mapco pipeline route near the Utah-Colorado border, both of which served oil and gas pipelines. The State Highway 45 Vernal to Bonanza road running north-south shared a corridor with a water pipeline. In 1991, Colorado Interstate Gas built a 20-inch diameter pipeline to take gas from the basin to south-central Wyoming and then move gas east.

The Deseret-Western Railway is an electrical loop-to-loop railroad line that is actively used to ship coal 35 miles from the Deserado Coal Mine near Rangely, Colorado, to the Bonanza Power Plant near Bonanza, Utah, in the Uinta Basin. Although a 135-mile railroad line linking Vernal, Utah, to Rifle, Colorado, through Rangely was proposed in 2000, public opposition and lack of funding to complete feasibility studies have delayed the project indefinitely.

Designated corridors are currently BLM's preferred locations for placement of two or more linear ROWs that are similar, compatible, or identical. A major oil pipeline traverses east-west through the Uinta Basin. Major gas transmission lines travel north-south through the eastern part of Uintah County, and then east-west through the southern parts of Uinta and Duchesne counties (Chidsey 2003).

Most of the ROWs granted since 1984 have been for oil and gas gathering systems or roads, most of which were outside of designated corridors. Applications are currently being made by producing companies to construct and operate natural gas gathering systems particularly in the less-developed Uintah and Ouray Reservation. Gathering lines continue to be installed on the surface while larger pipelines (10+ inches) are buried. Existing utility windows, ROW concentration areas, and communication sites are the preferred locations for future ROW grants.

Additional natural gas transportation capacity is being planned to accommodate increasing production in the Uinta Basin. A 128-mile, 20 or 24-inch pipeline is planned to provide a direct link from the basin to trading points in the Rocky Mountain region and give customers across the country additional access to Uinta Basin gas supplies. The new pipeline would add capacity of between 250,000 to 350,000 trillion cubic feet per day (Tcf/d) (RigZone 2005).

ROWs are also being considered for projects other than the transportation of hydrocarbons. Additional early and late season irrigation water in addition to municipal and industrial water is needed to support moderately steady population growth in the basin. A pipeline to transport water from lakes in the Uinta Mountains to locations in the Uinta Basin for municipal and agricultural use is currently being evaluated.

Road Infrastructure

The major east-west corridor through the Uinta Basin was and continues to be U.S. Highway 40/191. The major north-south corridors continue to include Utah State 88 (south from U.S. 40 through Ouray), Utah State 45 (southeast from Vernal to Red Wash and Bonanza), and County Road 262 (north-south from U.S. 40 to Utah 45). Unpaved, gravel and natural material roads provide access to most of BLM-managed lands. Some historically unimproved roads have been recently surfaced to accommodate increased travel volumes by oil and gas personnel and equipment.

Compressors

Over the past several decades, installation of compressors throughout the oil and gas development areas in the Uinta Basin has increased to meet the demand of transporting the additional gas resulting from increased drilling. Emissions from compressors were not considered as significant pollutants in the early 1980s, when the primary pollutant of concern was particulates generated by the use of unimproved roads. Ambient air concentrations of criteria pollutants were, and remain today, within NAAQS standards. Currently, the main sources of emissions in the basin consist of oil and gas production facilities, compression stations, the Deseret Power Plant, and mining sites.

Summary of Present Oil and Gas Infrastructure

At present, approximately 2,800 oil and gas wells are active within the Vernal Field Office planning area. Over the span of oil and gas development in the Vernal Field Office planning area, approximately 19,783 acres and 1,724 miles have been disturbed. Existing sources of oil and gas related surface disturbance include: approximately 33 compressor sites (approximately 2 acres of surface disturbance per site), existing pipelines such as gathering/injection lines (approximately 0.47 acres disturbed per well); transportation lines (approximately 0.15 miles disturbed per well, with 0.79 acre of surface disturbance per well); and approximately 73 miles of power lines (0.25 acres of surface disturbed per mile).

5.2.2 History Leading to Present Situation of other Public Land Activities

Along with oil and gas development, the basin has a rich history of other public land uses, all of which have contributed to the present situation within the CWSA and greater Uinta Basin. Some of the more significant historical activities in the basin and their present situations are discussed in the following sections.

Livestock Grazing

Twenty years ago, the BLM managed grazing lands according to common resource characteristics. By the mid-1990s, the BLM evaluated allotments according to seral stages. In order to manage grazing lands as integrated parts of an ecosystem, the BLM in Utah developed Standards for Rangeland Health and Guidelines for Grazing Management, which described desired conditions of rangeland in consideration of watershed management.

Livestock grazing remains a permitted use of public lands. Although some minor changes may be expected over the next few years, it is reasonable to expect that livestock grazing will continue. Grazing allotments are currently evaluated as to desired conditions and whether the resource conditions should be maintained, improved, or placed in custodial management. The Vernal Field Office currently administers grazing on 153 allotments. Of these, five grazing allotments (Dry Creek, Hoy Flat, Offield Mountain, South Pot Creek, and Wild Mountain–Colorado) are located entirely outside the Vernal Field Office boundary and two allotments (Max Canyon and Blind Canyon) are located entirely on private land inholdings within the Vernal Field Office boundary. The 143 allotments within the Vernal Field Office boundary designated for livestock grazing encompass approximately 2,216,764 acres (1,670,877 acres of BLM land; 545,887 acres of private, state, and Tribal/allotted lands).

Within the grazing allotments managed by the Vernal Field Office, 146,220 animal unit months (AUMs) are allocated for livestock, but active permitted use for the 146 allotments is currently 137,897 AUMs. However, the demand for forage resources by livestock (the total average actual use) for the past 10 years was only 78,500 AUMs. Suspended use for the 160 allotments is currently 26,364 AUMs.

Weed Management

Noxious and undesirable weeds have recently been recognized as threats to native vegetation in many areas of the Uinta Basin. Collaborative weed management agencies have been formed during the last 20 years to pool resources for weed control and public education. These agencies include the National Park Service (NPS), BLM, U.S. Forest Service (USFS), UDWR, the Ute Indian Tribe, and SITLA. Weed infestation in the Uinta Basin has been exacerbated by increasing human activities such as OHV use, construction resulting in soil disturbance, and wildlife and domestic livestock grazing activities.

Fire Management and Prescribed Burning

From 1973 to 1984, an average of 7.6 wildfires occurred annually in the basin, burning an average of 137.4 acres each year. Prescribed burning was limited to sagebrush canyon bottoms to increase access and forage for deer and elk during summer months. Fire suppression was limited by a lack of funds. Since that time, fire management policy on BLM-administered lands has evolved and included the development of a State-wide Fire Management Plan, which included fire prevention, preparedness, suppression, and use as well as subsequent restoration and rehabilitation. The plan is currently implemented on an interagency basis. More than 1,000,000 acres have been identified in the Uinta Basin as currently needing fire treatments to reduce fuel loads (including some oil and gas fields and popular hunting and fishing areas) and increase forage for livestock and wildlife.

Prescribed burning continues to be BLM's primary method of vegetative treatment in the Vernal Field Office planning area. This treatment method results from BLM's acknowledgement of, and directives to use, fire as an integral tool to maintain and/or improve native rangelands. To meet management objectives, current BLM projects prescribed fires on 155,425 acres per decade, or an average of 15,542 acres per year. Target vegetation communities include pinyon-juniper, oak, aspen, and conifer. Although fire initially destroys plant material, the vegetation eventually recovers and returns to a more native plant community except where invasive annuals such as cheatgrass have invaded.

Recreation

BLM-managed lands in the Uinta Basin have provided opportunities for dispersed recreation over the last 20 years. Dispersed recreation opportunities historically have consisted primarily of hunting, OHV use, sight-seeing, fishing, and river floating. Musket Shot Springs and PR Spring contained limited developed facilities on BLM lands. Other recreation areas in the Uinta Basin include Steinaker Red Fleet Reservoir, Dinosaur National Monument, and the Ashley National Forest. Recreational use of lands in the basin has been rising in popularity with users originating from throughout the intermountain west. Dispersed activities remain similar to those in the past. Casual use of the White and Green Rivers has been increasing recently. Tourism in the Uinta Basin in general has been increasing.

Current recreation proposals potentially affecting cumulative impacts include proposed designations of Backcountry Byways and Special Recreation Management Areas (SRMAs), trail and cabin development, and mitigation of noise and light. These designations and developments would have beneficial impacts on recreation and would also affect the management of other resources in the CIAA.

Socioeconomics

During the latter decades of the 20th century, minerals development has replaced agriculture as the basin's most important private industry. As energy-related development grew and traditional farming and ranching lost its importance, the standard of living increased. Availability of housing, capacity of schools, and availability of medical care have been driven by cycles in the petroleum industry activity. As the national demand for energy grew, counties in the basin have grown in population and economic vitality. As the oil and gas and public land industries grew, retail trade, private services and government services also grew.

5.2.3 Current Situation

The Energy Crisis

The U.S. currently faces an energy challenge. As recently as April 5, 2005, Federal Reserve Chairman Alan Greenspan commented extensively on this challenge. He stated, "Markets for oil and natural gas have been subject to a degree of strain over the past year not experienced for a generation. Increased demand and lagging additions to productive capacity have combined to absorb a significant amount of the slack in energy markets that was essential in containing energy prices between 1985 and 2000 (Greenspan 2005)."

Despite diminishing available supplies and rising costs, the U.S. currently consumes over seven billion barrels (bbl) of oil a year. U.S. crude oil production, which declined following the oil price declines in 1986, leveled off in the mid-1990s, and began falling again following the sharp decline in oil prices of late 1990s. During 2003, the U.S. produced around 7.8 million bbl per day (bbl/d) of oil, of which 5.7 million bbl/d was crude oil, and the rest natural gas liquids and other liquids. U.S. total oil production in 2003 declined sharply (around 2.8 million bbl/d, or 26 percent) from the 10.6 million bbl/d averaged in 1985. U.S. crude production, which averaged 5.4 million bbl/d during the first ten months of 2004, is now at

50-year lows (EIA 2005).

From 1990 through 2003, natural gas consumption in the U.S. increased by about 15 percent. In 2002, the U.S. used about 22.8 Tcf of natural gas, making it one of the worldwide leaders in natural gas consumption. Factors determining the short-term demand for natural gas include weather, fuel switching, and the national economy. Factors determining more recent shortfalls in available energy supplies include, but are not limited to, loss of production due to Hurricane Katrina, increased transport of Rocky Mountain-produced oil and gas to eastern states, and rising import costs. For example, since 1978, the largest oil disruption occurred at the time of the 1978-1979 Iranian revolution, followed by the Gulf War in 1991, and the Iran-Iraq War in 1981. Hurricane Katrina shut down oil and gas production from the Outer Continental Shelf in the Gulf of Mexico, the source for 25 percent of U.S. crude oil production. Several oil refineries that provide a significant share of the nation's refined petroleum products were still shut down as recently as September 2005 along the Gulf Coast in Louisiana and Mississippi (EIA 2005). In addition to these factors, the following five observed gas industry features and trends support the argument that there exists a serious and persistent gas supply and demand crisis:

- Prevailing future prices and forward price curves of natural gas;
- Gas demand growth expectations;
- The near exhaustion of storage inventories over past winter seasons;
- Rapid deliverability decline rates from recently drilled gas wells; and
- The inability to muster a timely industry response for faster natural gas production.

Today, hydrocarbon extraction is increasingly influenced by worldwide energy prices. The immediate demand for and solutions for adequate supply of crude oil and natural gas is uncertain. However, home to vast reserves of traditional fossil fuels, the Rocky Mountain region, including the Uinta Basin, is emerging as a strategic place in the evolving national energy picture. Forecasts by the USGS predict that known reserves from the region could keep the U.S. at current levels of demand, supplied with natural gas for eight years.

Global Response to the Energy Crisis

Individually and collectively, nations have responded to energy supply disruption by increasing the available market supply of oil and gas. The International Energy Agency (IEA), an intergovernmental body committed to advancing the security of energy supply, has led efforts to formulate international agreements defining contingency plans that provide for the immediate availability of reserved hydrocarbons. During periods when global oil markets were tight and affected by low inventories and high uncertainty, reserved hydrocarbons were released from stockpiles. Crude oil and products were made available in response to supply disruptions caused by Hurricane Katrina. IEA response preparations include the reinforcement of the efforts of oil-producing countries by committing to increased indigenous production. Increasing indigenous production within the U.S., including production in the Uinta Basin, is a direct response to shortfalls in the national supply.

Nationally, government directives were issued to address procedural mechanisms that facilitate the exploration and production of hydrocarbons within the U.S. The National Energy Policy Development (NEPD) Group recommended in 2001 that the President issue an Executive Order to direct all Federal agencies to include in any regulatory action that could significantly and adversely affect energy supplies, distribution, or use, a detailed statement on: (1) the energy impact of the Proposed Action, (2) any adverse energy effects that cannot be avoided should the proposal be implemented, and (3) alternatives to the Proposed Action. The NEPD Group also recommended that the President direct the executive agencies to work closely with Congress to implement the legislative components of a national energy policy.

The Bush administration on August 7, 2003, announced new policies to streamline the oil and natural gas permitting process on Federal lands overseen by the BLM. The BLM was instructed not to unduly restrict access to oil and natural gas on Federal lands. The new policies explicitly directed the BLM to act most expeditiously on permit applications where unnecessary delays could result in the suspension or abandonment of a proposed energy recovery project. The Bush administration singled out seven geographic areas as a primary focus for the new instructions, one of which was the Uinta Basin. The mean estimate for energy reserves in all seven focus areas is 5.5 billion bbl of oil and 184 Tcf of natural gas. The natural gas reserves represent more than 800 percent of the nation's annual natural gas consumption (The White House 2005).

The Energy Policy Act of 2005 is a statute which was passed by the U.S. Congress on July 29, 2005 and signed into law on August 8, 2005. The Act is intended to combat growing energy problems. The President's National Energy Policy outlined a number of recommendations to diversify and increase energy supplies, encourage conservation, and ensure environmentally responsible production and distribution of energy. As a result, the BLM developed a plan containing 54 tasks designed to implement the President's directives. The Director of the BLM sent out the new guidance September 30, 2005. In 2004, the BLM approved 6,052 drilling permits from about 7,000 applications submitted, a 60 percent jump in new permits over those issued in 2003. This year, BLM expects it will approve 7,000 of the 8,000 new applications (NewsMax 2005).

BLM and Industry's Response to the Energy Crisis

With higher prices now prevailing, secondary and tertiary recovery techniques are anticipated to boost future production rates and ultimate recovery from known gas fields. Higher gas price expectations have prioritized many marginal high risk/high reward projects as exploration and production companies review and pursue their prospect inventories. Favorable economics have allowed and encouraged Uinta Basin operators to utilize technologies to maximize production and drill to deeper natural gas targets that may previously have been unfeasible. Structural controls are a major factor in exploration of the deep over-pressured plays in the Uinta Basin. The best practices for current recovery often include waterflood, CO_2 injection, and horizontal drilling. Recent successes of new technology in the Uinta Basin have included gas production from the deep Triassic Wingate and the Jurassic Entrada formations.

Proven reserves for Utah are relatively high; at 283 million bbl. Utah oil fields have produced a total of 1.2 billion bbl of oil. However, the 13.7 million bbl of oil production in 2002 was the lowest level in over 40 years and continued the steady decline that began in the mid-1980s. In 2003, 138 billion cubic feet (Bcf) of natural gas were produced on public lands in Utah, providing enough energy to heat more than 1.6 million homes, twice as many homes as there are in Utah. Four million bbl of oil were also produced on Utah public lands in 2003, enough to produce 79.6 million gallons of gasoline and 38 million gallons of diesel/heating fuel as well as other products.

The Role of the Uinta Basin in the Current Energy Crisis

The Uinta Basin is a significant source of natural gas and oil, and it is currently one of the most active oil and gas producing areas in the onshore U.S.

In September 2004, the Utah BLM's quarterly oil and gas lease sale broke the record of most acreage, revenues, and bidders for any lease sale. The focus of the bidding seemed to be both on known producing areas in the Uinta Basin and in frontier areas in the central portion of the state. In the case of the Uinta Basin, past exploration has been in shallow areas up to 8,000 feet. Companies are just now beginning to tap gas reserves that are 10,000-20,000 feet deep due to new technology and economics (BLM 2004f).

Oil and gas development is at an all-time high in the basin, with more rigs operating, and more APDs being processed than ever before. For example, over half (i.e., 8,737 wells) of the total oil and gas wells drilled in Utah between 1911 and November of 2000 were drilled within the Uinta Basin. APDs and ROWs processed by the BLM Vernal Field Office have illustrated a significant upward trend, estimated to be approximately 15 percent annually.

Because horizontal and vertical hydrocarbon occurrence in the Uinta Basin is well understood, exploration and development within the Uinta Basin allows for lower risk projects than exploration in other unproven areas. Three fields in this Uinta Basin (i.e., Altamont, Bluebell and Cedar Rim) have produced about 31 percent of Utah's oil. Wells in the Altamont-Bluebell Field, which historically has produced over 350 million bbl of oil equivalent, are currently being recompleted in additional zones in the Green River Formation to further increase daily production potential. Due to the over-pressured, fractured nature of the reservoir in the field, as well as the large vertical extent of potential pay zones, many of the wells have formation damage resulting from past high drilling mud weights and cementing operations. These conditions have left many zones unable to produce to their potential. However, a variety of conventional and innovative proprietary techniques are expected to reduce the effects of formation damage and increase oil and gas recovery.

Many of the wells in the Uinta Basin are drilled in and around producing gas fields with an established midstream infrastructure. These types of prospects were first brought on-stream as a result of a multi-month price spike, such as the 2000-2001 gas price excursions during the California power crisis. These gas wells are predominantly field extensions or infills and are low-risk targets designed to capture a short-term opportunity. Increased demand, however, has highlighted constraints in the existing gas transmission infrastructure of the Uinta Basin, attracting capital to capture the large price differentials that develop when gas volumes are too high for available pipeline capacity, such as in the Rocky Mountain states. Areas of infill drilling in the Uinta Basin are located primarily in its eastern portion.

Exploratory drilling is currently proposed in the western and southwestern portions of the Uinta Basin, including BLM, Tribal and National Forest lands. Exploration projects consist of larger and more expensive prospects. Production of exploratory wells typically lags discovery by many years. These exploratory wells are typically characterized by larger, deeper, more remote locations requiring greater per-well expenditures, potential delays in infrastructure access and, therefore, greater financial risk.

5.2.4 Future Situation

As previously stated, the immediate demand for and solutions for adequate supply of crude oil and natural gas is uncertain. The longer-term outlook for oil and gas is even more speculative and will largely depend on the response of demand to price. The resolution of current major geopolitical uncertainties will materially affect oil prices in the years ahead and will significantly influence the levels of investments over the next decade in raising crude oil productive capacity and investment in refining facilities (Greenspan 2005b). In the future, domestic supplies of oil and gas are expected to remain inadequate to meet national demand. Over the past few years, notwithstanding markedly higher drilling activity, the U.S. natural gas industry has been unable to noticeably expand production. The reality is that our domestic production is declining. “We now produce nearly 40 percent less oil than we did in 1970. The projection is just over five million bbl per day by 2020, down from a high of 9.4 million bbl per day 30 years ago. Failure to meet this challenge may harm our prosperity, damage our national security, and may affect the way we live our daily lives (Norton 2001)." North America, however, still has numerous unexploited sources of gas production. The North American resource base, variously estimated at 1,500 to 2,000 Tcf, indicates a domestic industry entering the decline mode some 20-30 years in the future. Incremental, market-based capital investment accelerating exploration and development of available North American gas resources would help to alleviate future shortfalls.

Future oil and gas production estimates fall into three categories: proven reserves, inferred reserves, and undiscovered resources. Utah's inferred or grown reserves are not publicly available since these data are proprietary. However, using publicly available production records, field age records, and proven reserve estimates, an estimate for inferred oil and gas projects that an additional 641 million barrels of oil (MMBO) and 6.08 TCF of gas will be extracted from within or immediately adjacent to existing fields in addition to the proven reserves. Thus, the total amount of oil and gas in or near the existing areas of large-scale production is estimated at 912 MMBO and 10.68 TCF respectively. Undiscovered resources reflect estimates of oil and gas in areas distinct from existing oil and gas fields. The estimated amount of technically recoverable undiscovered resources in the entire state of Utah is 436 MMBO and 15,668 BCF of natural gas. These estimates represent technically recoverable resources (i.e. resources producible using existing technology without regard to the economic viability of recovering the resource).

Factors determining the long-term demand for natural gas include residential and commercial demand, industrial demand, electric generation demand, and transportation sector demand. U.S. natural gas consumption and imports are expected to expand substantially in coming decades, with the fastest volumetric growth resulting from additional natural gas-fired electric power plants. Increased U.S. natural gas consumption will require significant investments in new pipelines and other natural gas infrastructure. The Energy Information Administration (EIA), in its Annual Energy Outlook 2004, estimates that natural gas demand in the U.S. could be 31.41 Tcf by the year 2025. That is an increase of 38 percent over 2002 demand levels of 22.8 Tcf. That is compared to an expected total energy consumption increase (from all sources) of 40 percent (from 97.7 quadrillion British thermal units (Btu) to 136.5 by 2020). The EIA predicts a 1.4 percent annual increase in demand over the next 21 years. While forecasts made by different Federal agencies may differ in their exact expectations for the increased demand for natural gas, one thing is common across studies: demand for natural gas will continue to increase steadily for the foreseeable future (Natural Gas Supply Administration 2004).

Future oil and gas development in the Uinta Basin will depend upon the feasibility of exploration as determined by the underlying geology and further infill development projects within the basin. Future development will be dependent upon the geologic feasibility of each prospect, the cost to develop the resources, and engineering technological advancements.

Development of Tribal/allotted lands will continue and perhaps increase as exploratory wells are drilled in the Hill Creek Extension. The Uinta Basin includes the Uintah and Ouray Indian Reservation, which has been drilled for hydrocarbons from the 1940s to the present. However, little oil and gas development occurred after the 1970s, and large areas of the 1.2 million-acre Indian reservation remain unexplored. Even after a large natural gas pipeline was constructed nearby, oil and gas development was slow until recently because of weak gas markets. Today, there are several ongoing or recently approved oil and gas exploration and development projects on Tribal/allotted lands, including the Brundage Canyon, West Brundage Canyon, Tabby Canyon, and Antelope Creek projects (see **Table 5-1**). Oil and gas development on Tribal/allotted lands is expected to grow over the next several years. Three-dimensional (3D) seismic surveying techniques are now being used extensively on the Uintah and Ouray Indian Reservation to identify future drilling targets (NETL 2004), the results of which are expected to increase development in such areas as the Tumbleweed Field and the former Naval Oil Shale Reserve #2.

The Uinta Basin also includes public lands managed by the USFS, where oil and gas leasing, seismic exploration, exploratory drilling, and gas field development are also expected to increase over the next several years. For example, on the USFS' Schedule of Proposed Actions (SOPA) for the Ashley National Forest, two exploratory gas well projects and one two-dimensional (2D) seismic exploration project were proposed between April 2005 and November 2005. In the Uinta National Forest, one exploratory gas well and one leasing proposal were listed on the SOPA between April 2005 and November 2005 (http://www.fs.fed.us/sopa.shtml).

5.3 REASONABLY FORESEEABLE DEVELOPMENT (RFD) AND CUMULATIVE IMPACTS

As part of the finalized Mineral Potential Report for the Vernal Planning Area (BLM 2004e), the Vernal BLM Geologic and Engineering Team developed a RFD scenario for oil and gas development. The RFD projects that 6,530 oil and gas wells (2,055 oil wells, 4,345 gas wells, and 130 CBM wells) will likely be drilled applying the management directives under the Preferred Alternative.

Using the disturbance calculations from Appendix A-4 of the Mineral Potential Report for the Vernal Planning Area (BLM 2004e), reasonably foreseeable surface disturbance from oil and gas development in the Vernal Field Office area is 28,848 acres. Some of the currently proposed projects comprising this reasonably foreseeable disturbance are included in the list of NEPA projects outlined in **Table 5-1**. This analysis also incorporates by reference the cumulative impact analyses within BLM's Resource Development Group Uinta Basin Natural Gas Development Project EIS ROD and the Castle Peak and Eight Mile Flat Oil and Gas Expansion Project EIS and ROD.

The majority (4,800 wells) of the reasonably foreseeable oil and gas development activity is expected to occur in the Monument Butte-Red Wash exploration and development area, which contains the CWSA project in the eastern part of this region. Thus, the CWSA would constitute 13.1 percent of the level of RFD expected in the Monument Butte-Red Wash exploration area, and 9.6 percent of overall development in the Vernal Field Office planning area.

Table A-2 of the Mineral Potential Report for the Vernal Planning Area (BLM 2004e) asserts that there are approximately 21,462 acres of existing and historic surface disturbance associated with past and present oil and gas activities in the Vernal Field Office area. Some of the currently existing projects comprising this existing and historic surface disturbance are included in the list of NEPA projects outlined in **Table 5-1**.

Recent BLM monitoring has documented that interim reclamation efforts in oil and gas development areas have largely been unsuccessful at reestablishing soil stability and vegetation. Accordingly, BLM field inspections are indicating that initial disturbance should be more accurately portrayed as long-term impacts for the life of the project. Therefore, the acreage initially disturbed for construction, drilling, and completion could potentially remain void of desired vegetation for the long-term length of oil and gas development in the Vernal Field Office planning area. Thus, based on the estimates of past, present, and reasonably foreseeable development projects outlined in Tables A-2 and A-4 of the Mineral Potential Report for the Vernal Planning Area (and summarized in the previous paragraphs), cumulative surface disturbance (regardless of reclamation efforts) from oil and gas activity in the Vernal Field Office area is approximately 50,310 acres. Disturbance associated with the CWSA Proposed Action is estimated to be 1,735 acres (3.4 percent of the cumulative total).

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Table 5-1. Existing and Ongoing Oil and Gas Field Development NEPA Projects in the CIAA

NEPA Project	Lead Agency	Number of Approved / Proposed Wells*
EA (No. 3) of Oil and Gas Development in the Duchesne River Area	BLM	41
Antelope Creek Oil and Gas and Secondary Recovery Applications from Water Flooding EA	BIA	193
Monument Butte / Myton Bench EA (EA No. UT-080-1994-77)	BLM	296
Brundage Canyon Oil and Gas Field Development	BLM/BIA	120
Chapita Wells EA	BLM	99
Wexpro Company EA Island Unit (EA No. UT-080-1997-51)	BLM	97
Final EA of Coastal's Proposed Development of the Ouray Field	BIA	232
Chapita Wells Unit Infill Development EA (EA No. UT-080-1999-32)	BLM	161
North Hill Creek Field Development EA	BIA	150
Antelope Creek Field Expansion EA	BIA	478
EA for the Antelope Creek Field Expansion	BIA	288
Supplemental EA for Modifications to the Antelope Creek Oil and Gas Field Expansion / Infill and Thermal Recovery Projects	BIA	445
Tabby Canyon Oil and Gas Field Development EA	BIA	24
Castle Peak and Eight Mile Flat Oil and Gas Expansion Project EIS	BLM	973
West Brundage Canyon Oil and Gas Field Development EA	BIA	72
North Chapita Natural Gas Field Development EA	BLM	264
West Bonanza EA	BLM	133
Bonanza Area EA	BLM	94
Chapita Wells-Stagecoach Area EIS	BLM	627
Greater Deadman Bench EIS	BLM	1,239
Resource Development Group Uinta Basin Natural Gas Development Project EIS	BLM	420
Sowers Canyon Oil and Natural Gas EA	USFS	14
Love Unit EA	BLM	130
Riverbend Natural Gas Drilling Project EA	BLM	49
LCU/HCU/BPU EA	BLM	513
Gasco Development EIS	BLM	1,500

* Number of proposed wells is a best estimate at the time of publication of this EIS.

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5.3.1 Geology & Minerals

Cumulative impacts on geology and mineral resources in the CIAA would primarily occur as a result of oil and gas development, which would deplete recoverable oil and gas from the formations underlying the CIAA and alter local topography due to surface disturbance. Extraction of mineral resources from formations underlying the CIAA would be irreversible and would cumulatively add to depletions of oil and natural gas resources across the CIAA. Cumulative impacts to surficial geology would result from the approximately 50,310 acres of past, present and reasonably foreseeable surface disturbance in the CIAA associated with oil and gas development, its associated road development, and other mining and industrial activities (including for example, potential gilsonite leasing of up to 520 acres). Many of the NEPA projects listed in **Table 5-1** discuss direct, indirect, and cumulative impacts to geology and minerals in qualitative terms, and the reader is referred to those individual documents for project-specific discussions on these resources.

Minerals development in the CIAA has been, and is expected to continue to be, extensive. Exploration for oil and gas reserves has diminished as infill projects are developed in known fields. Infill drilling continues to be proposed on decreased spacing, resulting in increasingly greater density of surface disturbance and installation of facilities.

No geologic hazards were identified in the CIAA by the Mineral Potential Report for the Vernal Planning Area (BLM 2004e) that would be exacerbated by oil and gas development.

5.3.2 Water Resources

Cumulative impacts to water resources in the CIAA would result from agriculture, livestock grazing, vehicular traffic, oil and gas development, and other mining and industrial activities. As discussed in Section 5.3, approximately 50,310 acres surface disturbance is likely to occur as a result of past, present and reasonably foreseeable oil and gas development in the CIAA. Surface disturbance resulting in effects to water resources in the CWSA would contribute incrementally to those cumulative impacts analyzed for the CIAA by increasing erosion into the White River and its tributaries, increasing potential for water quality degradation, and contributing to depletions of the Upper Colorado River Basin.

Many of the more recent NEPA documents outlined in **Table 5-1** (i.e., Tabby Canyon Oil and Gas Field Development EA, Castle Peak and Eight Mile Flat Oil and Gas Expansion Project EIS, West Brundage Canyon Oil and Gas Field Development EA, Greater Deadman Bench EIS, West Bonanza EA, Bonanza Area EA, Resource Development Group EIS, Sowers Canyon Oil and Natural Gas EA, Love Unit EA, Riverbend Natural Gas Drilling Project EA, LCU/HCU/BPU EA, and Gasco Development EIS) include project-specific discussions on soil loss, and sediment yield. However, cumulative soil loss and sediment yield resulting from these and other oil and gas activities in the CIAA can be estimated using the SSURGO database soil erosion potential information outlined in Sections 3.4 and 4.4 of this EIS. Based on SSURGO values and reasonably foreseeable surface disturbance, soil loss resulting from the 6,530 wells projected in the CIAA was estimated to be approximately 78,700 tons/year. Soil erosion resulting from the proposed 627 well locations would constitute 6.0 percent of the total soil loss across the CIAA, or approximately 4,682.8 tons/year or 7.47 tons per well per year. Sediment yield is expected to be greatest where new construction is located near flowing water. As soil erosion occurs in the CWSA, sediments could be carried to the White River via its tributaries. These sediments could eventually flow from the White River into the Green River and would incrementally add to sediment delivery resulting from oil and gas activities throughout the CIAA. Sediment loading in the Green River at Jensen, Utah, 20 miles upstream from the CWSA, averages around 807,000 tons per month (ranging between 52,651 and 3,231,564 tons/month) or 9,684,000 tons per year. If all of the sedimentation from RFD activities eventually reached the Green River, sediment loading from oil and gas development would increase sediment load by 0.08 percent. No matter how small the impact, in the context of cumulative impact analyses, all sedimentation incrementally adds to cumulative soil resource impacts created in the CIAA.

Consumptive water use reduces flows throughout the Upper Colorado River Basin, resulting in habitat losses for aquatic species, including threatened and endangered fish. Surface water for many of the reasonably foreseeable oil and gas projects would likely be taken from the White and Green Rivers through permitted sources for drilling and completion operations for well development in the CIAA. The USFWS has determined that individual (project-specific) annual average depletions of 100 acre-feet or less would not jeopardize the aquatic habitat; however, cumulative impacts to surface water volumes resulting from depletion for use in developing wells in CIAA could result in a deterioration in aquatic habitat resulting from decreased stream flow and habitat losses for aquatic species. Many of the more recent NEPA documents outlined in **Table 5-1** (i.e., Tabby Canyon Oil and Gas Field Development EA, Castle Peak and Eight Mile Flat Oil and Gas Expansion Project EIS, Castle Peak and 8-Mile Flat EIS, West Brundage Canyon Oil and Gas Field Development EA, Greater Deadman Bench EIS, Bonanza EA Development EA, Bonanza Area Preliminary EA, Resource Development Group EIS, Sowers Canyon Oil and Natural Gas EA, Love Unit Preliminary EA, Riverbend Natural Gas Drilling Project EA, LCU/HCU/BPU Preliminary EA, Gasco Development EIS) include project-specific quantitative discussions on depletion from the Colorado River Basin. However, depletion of the Colorado River Basin is not discussed in most of the older NEPA documents listed in **Table 5-1**.

5.3.3 Air Quality

Cumulative impacts to air quality from proposed oil and gas development plus other past, current, and foreseeable projects in the CIAA, both direct/indirect impacts and cumulative, are addressed in the Air Quality Technical Report for the Draft Vernal RMP EIS (BLM 2005b). The Air Quality Technical Report for the Draft Vernal RMP EIS (BLM 2005b) cumulative impacts analysis for air quality includes those impacts anticipated to result from implementation of the Proposed Action within the CIAA. Surface disturbance, drilling, completion, and operational activities resulting in effects to air quality in the CWSA would contribute incrementally to those cumulative impacts analyzed for the CIAA.

Sources within 50 kilometers of the CWSA were included with the CWSA emissions for the near-field air quality cumulative analysis. These sources were a subset of those being evaluated for the Air Quality Technical Report for the Draft Vernal RMP EIS (BLM 2005b). Two source groups were considered. The first group contained sources that had been identified or permitted, but were not yet in operation during the year that the background data was collected. The second source consisted of compressor stations and dust-producing activities that would be operated as part of the Vernal Field Office oil and gas Reasonably Foreseeable Development (RFD) scenario (BLM 2004c). The total of these sources within 50 kilometers of CWSA would be 365.5 tons per year of NO_x, 1046.5 tons per year PM_{10}, and 901.3 tons per year CO. The RFD sources were placed at representative locations to allocate the potential emissions throughout the Vernal Resource Management Area. These sources are described in the CWSA Air Quality Technical Report, which is available in the Vernal Field Office.

The cumulative emissions were added to the CWSA Proposed Action emissions. With the exception of PM_{10}, the incremental cumulative effect of the other sources in addition to CWSA sources is very small. The reason that PM_{10} impacts are artificially high is due to the placement of the idealized area sources in relation to the CWSA. In reality, the idealized sources would not exist in such close proximity to the CWSA project sources as illustrated. All cumulative impacts, however, are below State and NAAQS thresholds as illustrated in **Table 5-2**.

Table 5-2. CWSA Proposed Action vs. Cumulative Impact Comparison

Pollutant	Averaging Time	Proposed Action Maximum Predicted Impact ($\mu g/m^3$)	Proposed Action plus Cumulative Sources Maximum Predicted Impact ($\mu g/m^3$)	Proposed Action plus Cumulative Sources Maximum Predicted Impact plus Background [a] ($\mu g/m^3$)	% of NAAQS
NO_2	Annual	3.3	3.7	13.7	13.7%
CO	1-hour	459.3	461.6	7445.6	18.6%
	8-hour	174.3	177.9	4413.9	44.1%
PM_{10}	Annual	2.2	21.8	31.8	63.6%
	24-hour	9.4	91.5	119.5	79.7%

[a] with NO_2 annual background 10 $\mu g/m^3$
[a] with PM_{10} 24-hour background 28 $\mu g/m^3$
[a] with PM_{10} annual background 10 $\mu g/m^3$
[a] with CO 1-hour background 6,984 $\mu g/m^3$
[a] with CO 8-hour background 4,236 $\mu g/m^3$

The Vernal RMP air quality analysis identified cumulative sources based on the RFD and new sources that were permitted to operate or had actually begun operations after the 2001 baseline year. Additionally, RFD sources were identified in the Glenwood Springs Resource Area as well as other areas in Colorado. The method of developing the emission inventories and the CALPUFF modeling methodologies are presented in the Vernal RMP Air Quality Technical Report (BLM 2005b). The results presented in **Tables 5-3** through **5-5** summarize the magnitude of cumulative impacts identified by the Vernal RMP and the relatively insignificant incremental impact of the Proposed Action. In most cases, the impacts from the CWSA project would be 2 to 3 orders of magnitude less than the overall cumulative impacts.

Other cumulative air quality impacts may include impacts from prescribed burns for fuels management by both the BLM and other Federal agencies. In addition, the human population is expected to grow in and around the CIAA, with attendant increases in pollutants from vehicle emissions (BLM 2005).

Table 5-3. Comparison of Pollutant Concentrations at Class I/II Areas

Class I/II Area	NO_2 Annual Average		PM_{10} Annual Average		PM_{10} 24-Hour Maximum	
	All (µg/m^3)	CWSA (µg/m^3)	All (µg/m^3)	CWSA (µg/m^3)	All (µg/m^3)	CWSA (µg/m^3)
Class I Areas						
Arches NP	1.79E-02	1.04E-04	2.25E-02	1.39E-04	2.60E-01	2.16E-03
Black Canyon of the Gunnison NP	4.30E-03	8.58E-06	3.95E-02	7.24E-05	9.19E-01	9.50E-04
Canyonlands NP	2.10E-02	5.08E-05	1.89E-02	7.87E-05	2.89E-01	1.50E-03
Capitol Reef NP	5.00E-04	1.65E-05	3.60E-03	2.69E-05	1.47E-01	9.9E-04
Eagle's Nest WA	1.00E-02	6.01E-06	4.54E-02	5.12E-05	4.45E-01	8.39E-04
Flat Tops WA	1.81E-02	1.67E-05	1.03E-01	1.14E-04	6.00E-01	2.76E-04
Maroon Bells-Snowmass WA	1.89E-01	4.77E-06	5.62E-02	6.65E-05	4.72E-01	9.81E-04
Mt Zirkel WA	9.63E-02	3.05E-05	9.25E-02	9.05E-05	7.35E-01	1.39E-03
Rawah WA	2.00E-03	1.61E-05	3.3E-03	5.84E-05	1.07E-01	1.09E-03
Class II Areas						
Brown Park NWR	8.70E-03	5.79E-04	2.34E-02	5.87E-04	2.16E-01	5.50E-03
Colorado NM	4.03E-02	5.51E-05	6.61E-02	1.89E-04	5.95E-01	2.53E-03
Dinosaur NM	3.09E-02	4.28E-03	7.42E-02	3.69E-03	8.66E-01	4.46E-02
Flaming Gorge NRA	5.80E-03	3.43E-04	1.71E-02	3.34E-04	1.55E-01	5.02E-03
High Uintas WA	1.16E-02	2.26E-04	1.03E-02	2.03E-04	2.03E-01	1.18E-02
Holy Cross WA	8.50E-03	4.97E-06	4.71E-02	5.36E-05	3.95E-01	1.03E-03
Hunter-Frying WA	3.90E-03	3.23E-06	3.51E-02	4.80E-05	3.13E-01	9.67E-04
La Garita WA	4.00E-04	1.70E-06	1.04E-02	3.48E-05	1.98E-01	5.35E-04
Ouray NWR	9.63E-02	5.41E-02	9.25E-02	1.67E-02	7.35E-01	1.08E-01
Ragged WA	4.40E-03	4.40E-06	3.88E-02	6.18E-05	4.03E-01	9.27E-04
Weminuche WA	5.00E-04	1.51E-06	8.20E-03	3.35E-05	1.69E-01	7.47E-04
West Elk WA	2.60E-03	3.55E-06	2.78E-02	5.94E-05	5.0E-01	9.59E-04

Table 5-4. Comparison of Nitrogen Deposition at Class I/II Areas

Class I/II Area	CWSA		All Sources	
	Nitrogen Deposition (kg/ha/yr)	Percent of Significance Threshold	Nitrogen Deposition (kg/ha/yr)	Percent of Significance Threshold
Class I Areas				
Arches	5.10E-05	<0.1%	3.83E-03	0.128%
Black Canyon	3.79E-05	<0.1%	3.34E-03	0.111%
Canyonlands	2.02E-05	<0.1%	3.73E-03	0.124%
Capitol Reef	7.88E-06	<0.1%	2.85E-04	0.010%
Eagle's Nest	3.94E-05	<0.1%	7.90E-03	0.263%
Flat Tops	6.80E-05	<0.1%	1.15E-02	0.383%
Maroon Bells-Snowmass	3.71E-05	<0.1%	4.95E-03	0.165%
Mt Zirkel	8.04E-05	<0.1%	6.00E-02	2.000%
Rawah	6.36E-05	<0.1%	1.19E-02	0.397%
Class II Areas				
Brown Park NWR	4.50E-04	<0.1%	5.68E-03	0.189%
Colorado NM	5.75E-05	<0.1%	8.74E-03	0.291%
Dinosaur	1.23E-03	<0.1%	1.30E-02	0.433%
Flaming Gorge NRA	2.56E-04	<0.1%	7.90E-03	0.263%
High Uintas	8.98E-05	<0.1%	4.34E-03	0.145%
Holy Cross	3.56E-05	<0.1%	5.84E-03	0.195%
Hunter-Frying	3.62E-05	<0.1%	4.53E-03	0.151%
La Garita	3.65E-05	<0.1%	2.21E-03	0.074%
Ouray NWR	6.29E-03	0.2%	1.70E-02	0.567%
Ragged	2.89E-05	<0.1%	3.72E-03	0.124%
USFS Request	1.79E-05	<0.1%	1.74E-03	0.058%
Weminuche	4.71E-05	<0.1%	2.93E-03	0.098%
West Elk	4.15E-05	<0.1%	5.68E-03	0.189%

Table 5-5. Comparison of Visibility Impairment

Class I/II Area	CWSA		All Sources	
	Highest Δdv	Number of Days with Δdv > 1.0	Highest Δdv	Number of Days with Δdv > 1.0
Class I Areas				
Arches	0.03	0	1.17	1
Black Canyon	0.01	0	2.87	2
Canyonlands	0.03	0	0.75	0
Capitol Reef	0.01	0	0.25	0
Eagle's Nest	0.01	0	0.62	0
Flat Tops	0.02	0	1.17	1
Maroon Bells-Snowmass	0.01	0	0.72	0
Mt Zirkel	0.02	0	1.35	1
Rawah	0.01	0	0.33	0
Class II Areas				
Brown Park NWR	0.04	0	0.39	0
Colorado NM	0.02	0	2.39	3
Dinosaur	0.13	0	1.44	3
Flaming Gorge NRA	0.04	0	0.52	0
High Uintas	0.24	0	0.05	0
Holy Cross	0.02	0	0.05	0
Hunter-Frying	0.01	0	0.04	0
La Garita	0.01	0	0.04	0
Ouray NWR	0.76	0	1.30	3
Ragged	0.01	0	0.05	0
USFS Request	0.02	0	0.03	0
Weminuche	0.01	0	0.05	0
West Elk	0.01	0	1.39	1

5.3.4 Soils

Cumulative impacts to soils would result from surface disturbance associated with oil and gas development, road and other construction activities in and around CIAA communities, construction of recreation facilities in more rural areas, such as campgrounds and trails, off-road vehicle travel, and livestock grazing.

Based on the projected development in the Mineral Potential Report for the Vernal Planning Area (BLM 2004e), past, present, and reasonably foreseeable surface disturbance and removal of topsoil from oil and gas activities would consist of approximately 50,310 acres. Gas development in the CWSA would account for a disturbance of approximately 1,735 acres or 3.4 percent of the cumulative soil disturbance in the CIAA.

Many of the more recent NEPA documents outlined in **Table 5-1** (i.e., Tabby Canyon Oil and Gas Field Development EA, Castle Peak and Eight Mile Flat Oil and Gas Expansion Project EIS, West Brundage Canyon Oil and Gas Field Development EA, Greater Deadman Bench EIS, West Bonanza EA, Bonanza Area EA, Resource Development Group EIS, Sowers Canyon Oil and Natural Gas EA, Love Unit EA, Riverbend Natural Gas Drilling Project EA, LCU/HCU/BPU EA, and Gasco Development EIS) include project-specific and cumulative impacts discussions on soil loss, and sediment yield. However, cumulative soil loss and sediment yield resulting from these and other oil and gas activities in the CIAA can be estimated using the SSURGO database soil erosion potential information outlined in Sections 3.4 and 4.4 of this EIS. Based on SSURGO values and reasonably foreseeable surface disturbance, soil loss resulting from the 6,530 wells projected in the CIAA was estimated to be approximately 48,779 tons/year. Soil erosion resulting from the proposed 627 well locations would constitute 9.6 percent of the total soil loss across the CIAA, or approximately 4,682.8 tons/year or 7.47 tons per well per year. Sediment yield is expected to be greatest where new construction is located near flowing water. As soil erosion occurs in the CWSA, sediments could be carried to the White River via its tributaries. These sediments could eventually flow from the White River into the Green River and would incrementally add to sediment delivery resulting from oil and gas activities throughout the CIAA. Sediment loading in the Green River at Jensen, Utah, 20 miles upstream from the CWSA, averages around 807,000 tons per month (ranging between 52,651 and 3,231,564 tons/month) or 9,684,000 tons per year. If all of the sedimentation from RFD activities eventually reached the Green River, sediment loading from oil and gas development would increase sediment load by 0.05 percent. No matter how small the impact, in the context of cumulative impact analyses, all sedimentation incrementally adds to cumulative soil resource impacts created in the CIAA.

Many of the Uinta Basin soils have limitations on rehabilitation after disturbance, which is one of the primary factors in evaluating the effects of resource management decisions on soil function. Soil function can be defined as its ability to:

- **Regulate water:** Soil helps control where rain, snowmelt, and irrigation water go. Water and dissolved solutes flow over the land or into and through the soil.
- **Sustain plant and animal life:** The diversity and productivity of living things depends on soil.
- **Filter potential pollutants:** The minerals and microbes in soil are responsible for filtering, buffering, degrading, immobilizing, and detoxifying organic and inorganic materials, including industrial and municipal by-products and atmospheric deposits.

- **Cycle nutrients:** Carbon, nitrogen, phosphorus, and many other nutrients are stored, transformed, and cycled through soil.

- **Support structures:** Buildings need stable soil for support, and archeological treasures associated with human habitation are protected in soils.

Much of the CIAA exhibits low to moderate slopes, minimizing the need for extensive cut-and-fill; however, changes in topography resulting from slope alteration from either oil and gas development activities or mining may exacerbate slope stability in areas of steep slopes and unstable soils.

Vegetation disturbance, erosion, and sediment yield within the CIAA are likely to increase due to surface disturbance associated with oil and gas activities, livestock grazing/management, recreational activities, and naturally occurring erosion that are reasonably certain to occur. Many of the soils in the CIAA are derived from shale formations and are, therefore, highly erodible. Erosion results in direct soil loss where it occurs.

Grazing and other agricultural activities would also contribute to the loss of vegetation that would consequently impair soil function through diminished ability to cycle nutrients and regulate water. Increased competition for available forage may result if allocated AUMs are not decreased according to loss of forage from increased construction activities. Consequent impacts to soils could consist of increased sediment yield and loss of productivity.

As the demand for recreational opportunities increases within the CIAA, facilities such as campgrounds or other recreational development may be constructed near the White or Green rivers to facilitate convenient fishing opportunities or support White or Green River floating trips. The use of existing and newly constructed roads would increase access throughout the CIAA, possibly providing new access opportunities for recreationists. Although road densities contribute to the magnitude of erosion, construction of all-weather roads would reduce sediment loss. Off-highway vehicle use may also contribute to erosion and sediment yield into drainages that feed into water bodies in the CIAA.

5.3.5 Vegetation

Direct effects to vegetation would result from surface disturbance associated with oil and gas development, the construction of recreation facilities, such as campgrounds and trails, from off-road vehicle travel, forage utilization, and weed management. Direct, indirect, and cumulative impacts to vegetation are addressed quantitatively in most of the oil and gas NEPA projects listed in Table 5-1. Some of the more recent NEPA documents included in Table 5-1 (i.e., Tabby Canyon Oil and Gas Field Development EA, Castle Peak and Eight Mile Flat Oil and Gas Expansion Project EIS, West Brundage Canyon Oil and Gas Field Development EA, Greater Deadman Bench EIS, West Bonanza EA, Bonanza Area EA, Resource Development Group EIS, Sowers Canyon Oil and Natural Gas EA, Love Unit EA, Riverbend Natural Gas Drilling Project EA, LCU/HCU/BPU EA, and Gasco Development EIS) include detailed discussions on direct, indirect and cumulative impacts on vegetation resources. However, based on the estimates of historic, existing and reasonably foreseeable development projects in Section 5.3 (which includes most of the projects listed in Table 5-1), cumulative surface disturbance, and thus, vegetation loss, from oil and gas activity in the Vernal Field Office area is approximately 50,310 acres. Gas development in the CWSA would account for a disturbance of approximately 1,735 acres or 3.4 percent of the cumulative impacts on vegetation in the CIAA.

In addition to cumulative vegetation loss, other direct impacts on vegetation will likely occur as a result of past, present, and reasonably foreseeable forage use by livestock, wildlife, and wild horses, which affect plant productivity and plant community structure and composition. Vegetative recovery via reclamation may become increasingly difficult as wildlife and grazing animals compete for resources that are becoming less available due to ongoing drought conditions. Vegetation manipulation treatments and range improvement projects may result in beneficial effects in the long-term and adverse effects in the short-term due to surface disturbance.

Indirect impacts to vegetation associated with surface disturbing activities would also occur through processes such as soil loss and compaction, and noxious or invasive weed invasions. Noxious or invasive non-native plant species would likely continue to expand their distribution within the CIAA from surface disturbance and mechanical transport of seeds from outside the area. Plant communities could be altered, possibly changing the community's successional trajectory.

The incremental loss of potential habitat for rare and special status plants may decrease recovery potential for rare plant populations. The reduction in habitat resulting from the Proposed Action would be compounded by losses resulting from the ongoing drought and significant oil and gas developments elsewhere in the CIAA.

5.3.6 Wildlife

Direct cumulative impacts to wildlife would result from direct loss of habitat due to surface-disturbing activities. Historic, current, and future developments in the vicinity of the CWSA, have reduced, and will likely continue to reduce, carrying capacities as characterized by the amount of available cover, forage, and breeding areas for wildlife species. Surface disturbance in the CIAA would primarily result from oil and gas development, although livestock grazing, development of dedicated recreational facilities, and growth of Uinta Basin communities may also remove habitat from use by wildlife. Surface disturbance for livestock grazing and recreational activities have not been quantified by recent analyses and are therefore not estimated in this EIS. However, direct, indirect, and cumulative surface disturbance impacts are addressed quantitatively in most of the oil and gas NEPA projects listed in Table 5-1. Some of the more recent NEPA documents included in Table 5-1 (i.e., Tabby Canyon Oil and Gas Field Development EA, Castle Peak and Eight Mile Flat Oil and Gas Expansion Project EIS, West Brundage Canyon Oil and Gas Field Development EA, Greater Deadman Bench EIS, West Bonanza EA, Bonanza Area EA, Resource Development Group EIS, Sowers Canyon Oil and Natural Gas EA, Love Unit EA, Riverbend Natural Gas Drilling Project EA, LCU/HCU/BPU EA, and Gasco Development EIS) include detailed discussions on direct, indirect and cumulative impacts to wildlife. And based on the estimates of past, present, and reasonably foreseeable development projects in Section 5.3 (which includes most of the projects listed in Table 5-1), cumulative surface disturbance, and thus, wildlife habitat loss, from oil and gas activity in the Vernal Field Office area is approximately 50,310 acres. Gas development in the CWSA would account for a disturbance of approximately 1,735 acres or 3.4 percent of the cumulative impacts on wildlife habitat in the CIAA.

While surface disturbance does somewhat correspond to associated wildlife habitat loss, accurate calculations of cumulative wildlife habitat loss are not determinable because the direct impacts of habitat disturbance are species-specific and dependent upon (1) the status and condition of the population(s) or individual animals being affected; (2) seasonal timing of the disturbances; (3) value or quality of the disturbed sites; (4) physical parameters of the affected and nearby habitats (e.g., extent of topographical relief and vegetative cover); (5) value or quality of adjacent habitats; (6) the type of surface disturbance; and (7) other variables that are difficult to quantify. However, surface disturbance calculations are still a useful indicator of habitat loss because as forage, foraging and/or hunting habitats, and breeding, nesting and rearing habitats are removed to support oil and gas, mining, and other development activities, available wildlife AUMs shrink.

Special status wildlife species would also be cumulatively affected by reasonably foreseeable oil and gas development and the resulting direct impacts discussed above; however, on Federal lands, surveys are required in potential or known habitats of threatened, endangered or otherwise special status species. These surveys would 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 critical areas.

Indirect cumulative impacts from ongoing activities and oil and gas development could include:

- Long-term surface disturbance would incrementally add to wildlife habitat losses and overall habitat fragmentation. Where oil and gas development and its associated infrastructure have occurred, habitat fragmentation might lead to disruption of seasonal migration routes.

- Displaced individuals of any wildlife species, including avian species, could be forced into less suitable habitats, possibly resulting in subsequent effects of deteriorated physical condition, reproductive failure, mortality, and general distress as critical habitat is reduced and animals are displaced. Loss of habitat/forage could consequently result in increased competition between species and within individuals of a species for available resources.

- A decrease in reproductive success and nutritional condition from increased energy expenditure due to physical responses to disturbance;

- An increase in the potential for collisions between raptors, big game, or slow-moving wildlife and motor vehicles because of increased traffic associated with RFD development outlined in the Mineral Potential Report for the Vernal Planning Area (BLM 2004e); and

- Easier access to some areas of the CIAA, resulting from the construction of additional roads, may promote illegal poaching and/or result in loss of individuals from collisions. Loss of wildlife from these actions cannot be estimated

Based on these direct and indirect cumulative impacts, ongoing and future well development (including the CWSA project) in the CIAA would cumulatively and incrementally reduce the ability of wildlife habitats in the CIAA to support wildlife species at their current levels for the lifetime of oil and gas development and production (potentially 50 years or more).

5.3.7 Rangeland Management

For rangeland management, the CIAA is defined as the cumulative 240,136-acre area covered by the Antelope Draw, Horned Toad, Little Emma, Olsen, Seven Sisters, and West Tabyago allotments. Cumulative impacts to livestock and grazing resources in the CIAA would primarily be caused by road and trail construction and maintenance, well pad and access road construction, vehicle traffic, accidental spills of potentially hazardous material, and noxious weed infestations primarily resulting from oil and gas development. Forage for livestock would continue to be removed from available use as oil and gas development continues to expand. AUMs directly relate to forage amounts needed to support one animal, either grazing animal or wildlife individual, for one month. A reduction in the amount of available forage, therefore, results in a reduction of the number of AUMs supportable by a particular allotment.

Of the 2,390 AUMs available in the CWSA, 154 AUMs would be disturbed under the Proposed Action. AUMs disturbed by allotment, and the associated percentage of AUMs disturbed within each allotment is provided in Table 5-6. Applying the AUM loss percentages under the Proposed Action to the total AUMs found within the six affected allotments, and assuming that the same percentages would be affected by other oil and gas projects within these allotments, it is projected that cumulatively, 4,507 AUMs could be disturbed as a result of oil and gas activities within the CIAA in the reasonably foreseeable future.

The development of roads has had, and will continue to have, both adverse and beneficial impacts on the livestock grazing activities and resources. Roads would beneficially provide additional access to portions of the allotments that currently do not have access. Roads also have the ability to increase livestock distribution in some areas, but can also disrupt distribution patterns. Increased livestock distribution could occur in some areas that have previously been inaccessible due to terrain limitations, distance from water, or a combination of both. Livestock distribution would be adversely disrupted in some areas because livestock would move along the road network, thereby missing available forage, or livestock could gain access to areas that are not desirable or are too fragile for grazing. Roads would also allow increased vehicular traffic, contributing to potentially adverse disturbance to livestock from OHV users and those seeking dispersed recreational opportunities.

Table 5-6. Projected Cumulative AUM Disturbance

Allotment Name	Total Allotment Acres	Total Allotment AUMs	AUMs within CWSA	Acres / AUM	AUMs Disturbed within CWSA	% of AUMs Disturbed within CWSA	Projected Cumulative Impact on AUMs within Allotment from other O&G Projects
Antelope Draw	56,927	3,679	389	15	23	5.9	217
Horned Toad	19,773	2,238	12	8	1	8.3	185
Little Emma	38,472	3,626	587	10	49	8.3	301
Olsen	103,239	9,268	49	11	20	40	3,707
Seven Sisters	17,051	1,920	1,258	8	52	4.1	79

Allotment Name	Total Allotment Acres	Total Allotment AUMs	AUMs within CWSA	Acres / AUM	AUMs Disturbed within CWSA	% of AUMs Disturbed within CWSA	Projected Cumulative Impact on AUMs within Allotment from other O&G Projects
West Tabyago	4,674	187	95	24	9	9.47	18
Total		**20,918**	**2,390**	**NA**	**154**		**4,507**

Historic, current, and future developments in CIAA, have reduced, and will likely continue to reduce, carrying capacities as characterized by the amount of available cover, forage, and breeding areas for grazing livestock. Available grazing AUMs would continue to shrink as forage is removed to support oil and gas, recreation, mining, and other development activities. Long-term surface disturbance would incrementally add to AUM forage losses. Forage for livestock would be further reduced by increased competition with wildlife where development occurs. Well development (including the CWSA project) in the CIAA would cumulatively and incrementally reduce the ability of grazing allotments in the CIAA to support grazing animals at their current levels for the lifetime of oil and gas development and production (potentially 50 years or more).

5.3.8 Cultural Resources

Cumulative impacts to the cultural resources of the CIAA would primarily result from activities associated with surface and subsurface disturbance associated with oil and gas development, recreational use/OHV travel, livestock grazing, and fire management. However, because of the extent of oil and gas activity within the Uinta Basin area, oil and gas development is likely to result in the highest degree of direct, indirect, and cumulative impacts on cultural resources in comparison to other public land uses. Impacts may also result from specific cultural resource management decisions and from non-surface disturbing activities that create visual and/or auditory effects. These latter impacts would apply primarily to sites or locations deemed sacred or traditionally important by Native American tribes and used by these groups in such a manner that visual obstructions and/or noise levels impinge upon that use.

Federal law requires that the surface-disturbing development of oil and gas minerals be preceded by site-specific Class III cultural resource inventories. As cultural resources surveys occur prior to any ground disturbing activities in the CIAA, direct impacts to these resources from past, present and reasonably foreseeable oil and gas development is likely to be minimal. The more salient of cumulative impacts on cultural resources is indirect; impacts that could occur as a result of increased collection and vandalism due to increased access to/in the CIAA from oil and gas field roads. Beneficial cumulative impacts from oil and gas development could likely occur as undocumented cultural resources are often discovered and preserved during the Class III inventories conducted prior to the development phase of oil and gas field projects.

Because of the rich cultural history of the Uinta Basin, cultural resources are typically one of the key issues addressed in NEPA documents for oil and gas development. Most of the existing field development NEPA documents listed in Table 5-1 include at least some discussion on cultural resources. Many of the more recent NEPA documents outlined in

Table 5-1 (i.e., Tabby Canyon Oil and Gas Field Development EA, Castle Peak and Eight Mile Flat Oil and Gas Expansion Project EIS, West Brundage Canyon Oil and Gas Field Development EA, Greater Deadman Bench EIS, West Bonanza EA, Bonanza Area EA, Resource Development Group EIS, Sowers Canyon Oil and Natural Gas EA, Love Unit EA, Riverbend Natural Gas Drilling Project EA, LCU/HCU/BPU EA, and Gasco Development EIS) include detailed discussions on direct, indirect and cumulative impacts to cultural resources.

5.3.9 Paleontological Resources

Cumulative impacts to paleontological resources of the CIAA would primarily result from activities associated with surface and subsurface disturbance associated with oil and gas development, recreational use/OHV travel, and fire management.

Oil and gas activities, including gas development in the CWSA, could have short- and long-term adverse cumulative effects on paleontological resources in the CIAA. Surface disturbance that results from oil and natural gas development could affect paleontological resources by damaging or destroying fossils. Adverse effects include physical damage to or destruction of fossils, as well as increased vandalism and theft that result from improved access to fossil localities. However, similar to cultural resources, site-specific paleontological surveys are generally required prior to oil and gas surface disturbing activities. When these surveys follow the procedures for assessment and mitigation found in the BLM Manual H-8270-1, Chapter III (1998b), they reduce or eliminate the potential for adverse impacts to fossil resources.

Exploration for and development of mineral resources can also have a cumulative beneficial effect on paleontological resources by drawing the attention of a qualified paleontologist to areas that are not currently being researched, resulting in the collection of specimens and data that would not otherwise be recovered.

Because of the rich paleontological history of the Uinta Basin, paleontological resources are often one of the key issues addressed in NEPA documents for oil and gas development. Most of the existing field development NEPA documents listed in Table 5-1 include at least some discussion on paleontology and fossil resources. Many of the more recent NEPA documents outlined in Table 5-1 (i.e., Tabby Canyon Oil and Gas Field Development EA, Castle Peak and Eight Mile Flat Oil and Gas Expansion Project EIS, West Brundage Canyon Oil and Gas Field Development EA, Greater Deadman Bench EIS, West Bonanza EA, Bonanza Area EA, Resource Development Group EIS, Sowers Canyon Oil and Natural Gas EA, Love Unit EA, Riverbend Natural Gas Drilling Project EA, LCU/HCU/BPU EA, and Gasco Development EIS) include detailed discussions on direct, indirect and cumulative impacts to fossils and paleontological resources.

5.3.10 Land Use

The potential for increased productivity and resulting economic viability that oil and gas resources in the CIAA provide would encourage mineral lessees to effectively develop and drain their leased resources. Consequently, potential cumulative impacts of the past, present and future activities (including the Proposed Action) on land use would involve a more prominent use of the CIAA for oil and gas development. Based on past, present and reasonably foreseeable surface disturbance estimates discussed in the Mineral Potential Report for the Vernal Planning Area, approximately 50,310 acres would be used for oil and gas development over the next 15 to 20 years, approximately 1,735 acres of which, or 3.4 percent of the cumulative surface disturbance, would occur in the CWSA.

City and county land use plans are anticipated to adjust according to the level of oil and gas development in the CIAA in order to accommodate anticipated community growth. In general, an increased level of development is expected to occur in areas adjacent to communities in the CIAA, resulting in a more urbanized local appearance. An increasingly aggressive oil and gas development scenario may result in land acquisitions to create or protect recreational or other opportunities in areas of the CIAA containing unique resources. These acquisitions could involve Federal lands, Indian trust lands, state lands, or privately owned lands. The potential for consolidating land ownership patterns could result in increased development in more remote areas, including recreational development.

The scope and depth of discussion on land use in the NEPA documents listed in Table 5-1 is highly variable. The more detailed accounts of land use and impacts to land uses are generally included in the EISs (e.g., Castle Peak and Eight Mile Flat Oil and Gas Expansion Project EIS, Greater Deadman Bench EIS, Resource Development Group EIS) and EAs on Tribal/allotted lands (e.g., Tabby Canyon Oil and Gas Field Development EA, West Brundage Canyon Oil and Gas Field Development EA). Most of the remaining NEPA documents listed in Table 5-1 include or will likely include at least some discussion on land use, however, quantitative cumulative impacts analyses on this rather intangible issue are limited or non-existent.

5.3.11 Transportation

Cumulative impacts to transportation in the CIAA from would result from past, present, and reasonably foreseeable construction of roads to support a growing population, construction of roads to support increased mineral resource development, and designation of special resource-value roads and trails to support recreational opportunities. Adverse cumulative impacts would include increased traffic and increased potential for vehicular accidents. Beneficial impacts would include improved road surfaces which would facilitate increased vehicle use and access throughout the CIAA.

Extensive oil and gas development already exists in and near the CWSA and throughout most leased areas of the CIAA that have already seen oil and gas development. Road networks and traffic associated with developed oil and gas fields are already established. Additional oil and gas development in existing fields would primarily result in the construction of additional, short dead-end roads used to access well locations. As oil and gas development is extended into areas of the CIAA that have seen the development of only exploratory wells, arterial roads would be constructed, and the web of primarily dead-end well access roads would be constructed thereafter. Vehicle traffic to oil and gas locations would be the highest during construction, drilling, and completion operations and would substantially decrease once construction activities diminish and wells are put on production. Traffic to well locations would decrease as telemetry is installed by some operators to allow remote monitoring.

Construction of roads in rural areas would provide easier access for recreational users and OHV users. Hunters may be able to access more remote areas in the Book Cliffs to increase their opportunities for success. Hikers may be able to more easily access the canyons along the Green River. Use of roads constructed for oil and gas development by recreational users may result in conflicts or accidents as passenger vehicles are confronted with large trucks transporting water, chemicals, and/or heavy machinery.

Most roads in the CIAA are claimed by the counties as county roads. Increased use of roads by all users would result in increased maintenance obligations to ensure a safe running surface.

Discussions on transportation and transportation-related cumulative impacts are somewhat limited in the NEPA documents listed in **Table 5-1**. Similar to land use, more detailed accounts of transportation and transportation related impacts are generally included in the EISs (e.g., Castle Peak and Eight Mile Flat Oil and Gas Expansion Project EIS, Greater Deadman Bench EIS, Resource Development Group EIS). However, quantitative calculations of cumulative transportation-related impacts are not available.

5.3.12 Recreation

Cumulative impacts to recreational resources in the CIAA would be caused by oil and gas development, cultural and paleontological resource protection, fire management, construction and/or designation of roads and trails, mineral resource development, changes in recreational opportunities, designation of ACECs, and management actions taken by the Ashley National Forest and counties within the CIAA. Adverse impacts associated with these activities would mainly include short and long-term recreational closures, restrictions, and/or a diminished recreational experience due to the presence of noise and human activity. Continued promotion by the State of Utah of the Uinta Basin and vicinity as “Dinosaurland” could result in conflicts between tourism and oil and gas development in the more rural areas of the CIAA. BLM, National Forest, and county plans are anticipated to provide for the availability and quality of recreation in consideration of increasing oil and gas development in the CIAA. For people not negatively influenced by development and the presence of infrastructure, increased road surfaces in the CWSA would increase recreational access to the area.

Cumulative oil and gas activities, in general, are increasingly modifying the natural landscape through surface disturbance, construction and installation of facilities, pipelines and roads, and degradation of air quality resulting in visibility impairment, all of which could affect the quality of a recreational experience in particular areas where recreational opportunities are also available. The addition of 6,530 wells to an already highly developed oil and gas activity area would increase the existing impacts from such development. The addition of EOG’s proposed wells to existing and reasonably foreseeable oil and gas operations in the CIAA would have minimal cumulative impacts on recreational resources in the CIAA. As discussed in Section 4.12.1.1, potential impacts include temporary and long-term displacement of recreation opportunities in the CWSA. Short-term impacts would primarily occur during the initial construction and drilling phases of the project. Long-term impacts would occur as a result of people avoiding areas of human infrastructure.

The scope and depth of cumulative impact discussions for recreation in the NEPA documents listed in **Table 5-1** is dependent upon the level of recreational activity within each area-specific document. For example, where oil and gas development is proposed near the White River, the associated NEPA document tends to include rather detailed (albeit mainly qualitative) analyses of impacts to recreation (e.g., Greater Deadman Bench EIS, West Bonanza EA). Where development is proposed in areas with little recreational activity, the NEPA documents in **Table 5-1** devote little or no attention to the analysis of recreational impacts.

5.3.13 Visual Resources

The current management objective for visual resources in the CIAA is to manage the public lands in such a way as to preserve those scenic vistas that are deemed most important and to design or mitigate all visual intrusions so that the intrusions do not exceed the established VRM class objectives. Activities within the CIAA that could potentially cause visual intrusions and have an impact on scenic quality are primarily surface-disturbing activities, including minerals exploration and development, OHV use, trail and/or road development, and fire management. Generally, the greater the degree of surface disturbance, the greater the impact would be to scenic quality.

Oil and gas activities are the predominant source of modification to the landscape and visual environment of rural areas of the CIAA in the Uinta Basin. Past, present, and future oil and gas development in the CIAA would have both direct and indirect impacts on visual quality. The cumulative effects on visual quality would include strong visual contrasts from (and not limited to) the construction of well pads, access roads, drilling rigs, pipelines, and processing and support facilities. Indirect impacts to visual quality, both short-term and long-term, would occur as a result of soil erosion from disturbed areas, fugitive dust from disturbed areas, and/or regional haze from compressor and generator emissions that could obscure or degrade scenic vistas. The results previously presented in Table 5-5 summarize the magnitude of cumulative visibility impacts identified by the final Air Quality Technical report for the Vernal Draft RMP, and the relatively insignificant incremental impact of the Proposed Action. In most cases, the visibility impacts from the CWSA project on Class I and Class II areas would be 2 to 3 orders of magnitude less than the overall cumulative impacts.

Oil and gas activities, in general, are increasingly modifying the natural landscape through surface disturbance, construction and installation of facilities, and degradation of air quality resulting in visibility impairment. The reasonably foreseeable addition of 6,530 wells to an already highly developed oil and gas activity area would increase the existing impacts from such development. In the more highly developed areas, oil and gas development operations would dominate the view and be the major focus of the viewer attention.

All activities performed on Federally managed surface in the CIAA are required to conform to the VRM Class Objectives. Lands owned and/or managed by the State of Utah or the Northern Ute Tribe have no requirements relating to the protection of visual resources. Activities associated with the Proposed Action would incrementally contribute to cumulative visual impacts to the natural landscape across the CIAA. Because visual resources are carefully managed by the BLM and closely monitored by the BLM, almost all of the BLM NEPA documents listed in Table 5-1 include analyses of direct, indirect and cumulative impacts on visual resources.

5.3.14 Noise

Regulatory noise standards have not been established by the BLM, Uintah or Duchesne counties, or the State of Utah. No regulations are in place to ensure the viability and long-term survival of wildlife impacted by noise.

Cumulative impacts to noise in the CIAA would be caused increased traffic, general high activity levels in communities within the CIAA, construction, mineral resource development, and recreational activities.

As oil and gas development continues, noise from construction and drilling operations in the CWSA would incrementally add to the ambient noise level in nearby areas of the CIAA while those activities occur. Traffic noise from well field roads would be more locally noticeable as development activities increase. Perceived noise levels would relate to the proximity of a receptor to the source. Past, present, and reasonably foreseeable oil and gas development activities would have minimal to negligible impacts on cumulative noise levels throughout the CIAA because the individual locations of construction sites, operational compressor stations, and adjacent fields are typically sufficiently offset such that noise from these facilities would not be additive.

5.3.15 Socioeconomics

Because the economy of Uintah and Duchesne Counties are largely driven by the oil and gas industry, socioeconomics are typically one of the key issues addressed in NEPA documents for oil and gas development. Most of the existing field development NEPA documents listed in Table 5-1 include at least some discussion and quantitative predictions on socioeconomics. Many of the more recent NEPA documents outlined in Table 5-1 (i.e., Tabby Canyon Oil and Gas Field Development EA, Castle Peak and Eight Mile Flat Oil and Gas Expansion Project EIS, West Brundage Canyon Oil and Gas Field Development EA, Greater Deadman Bench EIS, West Bonanza EA, Bonanza Area EA, Resource Development Group EIS, Sowers Canyon Oil and Natural Gas EA, Love Unit EA, Riverbend Natural Gas Drilling Project EA, LCU/HCU/BPU EA, and Gasco Development EIS) include, or will include, detailed discussions on direct, indirect and cumulative impacts of oil and gas development on socioeconomics.

As previously discussed in Chapter 4.0, mineral lease royalties are collected by the Minerals Management Service, U.S. Department of the Interior, on fluid minerals produced on Federal leases. Half of the Federal mineral lease royalties on production are then returned to the State of Utah.

Assuming the current estimated value of a producing well of $98,000 per year and an average Federal royalty rate of 12.5 percent, the 6,530 reasonably foreseeable wells in the CIAA would generate approximately $79,992,500 in mineral lease royalties, which would then be distributed as described in the previous paragraph. These estimates do not account for inflation or potential escalation or deflation of the value of natural gas.

Overall, the addition of EOG's CWSA project would incrementally add to beneficial cumulative socioeconomic impacts to the CIAA from oil and gas development by contributing to income taxes, royalties, and other fees/revenues collected by the State of Utah, Duchesne County, Uintah County, and the Northern Ute Tribe. Among the largest natural gas and oil-producing counties in Utah, Uintah and Duchesne counties' mineral extraction industries make a major contribution to the economic well being of the State and the Tribe.

Other actions related to recreation and rangeland management may have smaller socioeconomic effects. Decisions within County plans, the Vernal Field Office's Draft RMP, and the Ashley National Forest's Forest Plan, which is also currently in revision, could result in economic benefits within the CIAA to the extent that they promote tourism. Cumulative benefits resulting from the oil and gas industry and other opportunities may include job creation and a consequent increase in population.

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6.0 PUBLIC INVOLVEMENT, CONSULTATION, AND COORDINATION

6.1 PUBLIC INVOLVEMENT

The public involvement process for this EIS was initiated with public scoping. A legal Notice of Intent (NOI) was published in the Federal Register on October 1, 2004. The BLM prepared a scoping information notice and provided copies to Federal, State, and local agencies, the Ute Tribe, and the general public. Announcements of the scoping opportunities were sent to the Vernal Express, Uintah Basin Standard, Deseret News, Denver Post, and Salt Lake Tribune for publication; local Vernal, Utah radio stations for announcement; and Channel 6 (the local Vernal television station), for announcement. These announcements included information on a public scoping and information open house, which was held at the Western Park Conference Center in Vernal, Utah on October 19, 2004. The official scoping period ended November 1, 2004. However, to ensure that the public was provided adequate scoping opportunity, a second public scoping and information open house was held at the Western Park Conference Center on November 30, 2004.

The Vernal Field Office received several scoping letters commenting on the CWSA Proposed Action. The contents of these letters may be found in the project record at the Vernal Field Office. The concerns and comments about the proposed project are summarized in Section 1.6 of this EIS.

Table 6-1 lists the persons, groups, and agencies that were sent a hard copy and/or CD of the DEIS. The Notice of Availability (NOA) of the formal CWSA DEIS was published by the BLM in the Federal Register on January 12, 2006. The EPA's Federal Register NOA publication occurred on January 20, 2006, which officially began the public comment period. Written comments on the CWSA DEIS were accepted from January 20 to March 13, 2006 on the DEIS. A public meeting for the receipt of comments on the DEIS was held in Vernal, Utah, on February 8, 2006. Hard copies of the DEIS and project maps were made available during this public meeting. Members of the BLM were available for questions and comments. Except for representatives from one consulting firm and three oil and gas companies, no other public representatives or other government agencies attended the meeting. Eight written comment letters were received by the BLM. Table 6-2 summarizes the relevant comments and the BLM's responses to these comments. Copies of the letters received are on file at the Vernal BLM Field Office in Vernal, Utah.

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Table 6-1 CWSA DEIS Recipients

UTAH WILDLIFE PO BOX 1227 FILLMORE UT 84631	THE SALT LAKE TRIBUNE 143 SOUTH MAIN SALT LAKE CITY, UT 84111	NRDC 1200 NY AVE. NW SUITE 400 WASHINGTON, DC 20005
ASHLEY NATIONAL FOREST 355 NORTH VERNAL AVE VERNAL, UT 84078	CHIEF NEPA UNIT U.S. EPA, REGION 8 999 18TH STREET, SUITE 500 DENVER, CO 80202-2405	CENTER FOR NATIVE ECOSYSTEMS P O BOX 1365 PAONIA, CO 81428
BUREAU OF INDIANS AFFAIRS UINTAH AND OURAY AGENCY FT. DUCHESNE, UT 84026	UINTAH MOUNTAIN CLUB BOX 782 VERNAL, UT 84078	CENTER FOR NATIVE ECOSYSTEMS 1536 WYNKOOP STREET, SUITE 301 DENVER CO 80202
DAGGETT COUNTY COMMISSIONERS PO BOX 219 MANILA, UT 84047	UINTAH BASIN STANDARD 268 SOUTH 200 EAST ROOSEVELT, UT 84066	NATIONAL TRUST FOR HIST. PRES. LAW DEPT. 1785 MASSACHUSETTS AVENUE, NW WASHINGTON, DC 20036
UTAH STATE DIVISION OF HISTORY ANTIQUITIES SECTION 300 RIO GRANDE AVE SALT LAKE CITY, UT 84101	UDWR PO BOX 146301 SALT LAKE CITY, UT 84111-6301	FOREST GUARDIANS HAMILTON SMITH 312 MONTEZUMA AVENUE, SUITE A SANTA FE NM 87501
DESERET NEWS 30 EAST 100 SOUTH SALT LAKE CITY, UT 84111	VERNAL AREA CHAMBER OF COMMERCE CONSERVATION ISSUES COMMITTEE 134 WEST MAIN STREET VERNAL, UT 84078	JAMES M. LEKAS LEXCO, INC. P.O. BOX 1198 VERNAL UT 84078
DINOSAUR NATIONAL MONUMENT PO BOX 210 DINOSAUR, CO 81610	VERNAL EXPRESS PO BOX 1000 VERNAL, UT 84078	WESTON W. WILSON ENVIRONMENTAL ENGINEER ENVIRONMENTAL PROTECTION AGENCY REGION 8 (8EPR-N) 999 18TH STREET, SUITE 300 DENVER CO 80202-2466
DUCHESNE COUNTY COMMISSIONERS PO BOX 270 DUCHESNE, UT 84021	UDWR 152 EAST 100 NORTH VERNAL, UT 84078	LAVONNE GARRISON SITLA 675 EAST 500 SOUTH, SUITE 500 SALT LAKE CITY UT 84102

UINTAH COUNTY LIBRARY 155 EAST MAIN STREET VERNAL, UT 84078	DEPT OF BOTANY/ RANGE SCIENCE BYU PROVO, UT 84601	CONGRESSMAN ROB BISHOP 124 CANNON HOUSE OFFICE BUILDING WASHINGTON DC 20515
KVEL RADIO PO BOX 307 VERNAL, UT 84078	DEPT OF ZOOLOGY BYU PROVO, UT 84601	CONGRESSMAN CHRIS CANNON 118 CANNON HOUSE OFFICE BUILDING WASHINGTON DC 20515
KNEU RADIO ROUTE 2 BOX 2384 ROOSEVELT UT 84078	UTAH ENVIRONMENTAL CONGRESS 1817 SOUTH MAIN STREET, SUITE 9 SALT LAKE CITY, UT 84115	CONGRESSMAN JIM MATHESON 410 CANNON HOUSE OFFICE BUILDING WASHINGTON DC 20515
HIGH COUNTRY NEWS BOX 1090 PAONIA, CO 81428	UTAH RIVERS COUNCIL 1471 SOUTH 1100 EAST SALT LAKE CITY, UT 84105	THE HONORABLE ROBERT BENNETT 431 DIRKSEN SENATE OFFICE BUILDING WASHINGTON DC 20510
SUWA 1471 SOUTH 1100 EAST SALT LAKE CITY, UT 84105	DUCHESNE COUNTY PLANNING, ZONING PUBLIC LANDS & COMMUNITY DVLPMT PO BOX 317 DUCHESNE, UT 84021	THE HONORABLE ORRIN HATCH 131 DIRKSEN SENATE OFFICE BUILDING WASHINGTON DC 20510
MR. HERB MCHARG SUWA 76 SOUTH MAIN STREET – SUITE 9 MOAB UT 84532	DINOSAUR TRAVEL BOARD 25 EAST MAIN VERNAL UT 84078	NATIONAL TRUST FOR HISTORIC PRESERVATION LAW DEPARTMENT 1785 MASSACHUSETTS AVENUE, NW WASHINGTON DC 20036
SIERRA CLUB 2120 SOUTH 1300 EAST SUITE 204 SALT LAKE CITY, UT 84106	UINTAH COUNTY PUBLIC LANDS COMMITTEE 152 EAST 100 NORTH VERNAL, UT 84078	NRDC 1200 NY AVENUE NW SUITE 400 WASHINGTON, DC 20005
THE NATURE CONSERVANCY UTAH FIELD OFFICE 559 EAST SOUTH TEMPLE SALT LAKE CITY, UT 84102	UINTAH COUNTY PLANNING OFFICE 152 EAST 100 NORTH VERNAL, UT 84078	PAW 951 WERNER COURT, SUITE 100 CASPER, WY 82601

THE WILDERNESS SOCIETY 1660 WYNKOOP STREET #850 DENVER, CO 80202-1269	OIL & GAS ACCOUNTABILITY PROJECT PO BOX 1102 DURANGO, CO 81302	PGS ONSHORE INC. P.O. BOX 549 7765 WINDWOOD WAY PARKER, CO 80134
PLA 1410 GRANT STREET, SUITE B-305 DENVER, CO 80203	BLM GRAND JUNCTION FIELD OFFICE 2815 H ROAD GRAND JUNCTION CO 81506	USFWS DON PETERSON (STEPHANIE NASH) 4401 NORTH FAIRFAX DRIVE - MS 400 ARLINGTON VA 22203
STATE OF UTAH DEPT OF COMMUNITY & ECONOMIC DEVELOPMENT DIVISION OF STATE HISTORY UTAH STATE HISTORICAL SOCIETY 300 RIO GRANDE SALT LAKE CITY, UT 84101-1182	BLM WHITE RIVER FIELD OFFICE 73544 HIGHWAY 64 MEEKER CO 81641	NATIONAL PARK SERVICE JAKE HOOGLAND (DALE MORLOCK) 1849 C STREET NW NPS-23 10 - MS 2749 WASHINGTON DC 20240
STATE OF UTAH GOVERNOR'S OFFICE OF PLANNING & BUDGET RDCC 1594 WEST NORTH TEMPLE, SUITE 3710 P.O. BOX 145610 SALT LAKE CITY, UT 84114-5610	MARK BELLES 9318 WILLARD STREET ROWLETT, TEXAS 75088	GS CELSO PUENTE 12201 SUNRISE VALLEY DRIVE MS 423 RESTON VA 20192
STATE OF UTAH SITLA 675 EAST 500 SOUTH, SUITE 500 SALT LAKE CITY, UT 84102	PAUL E FRYE FRYE LAW FIRM 10400 ACADEMY NE, SUITE 310 ALBUQUERQUE NM 87111	BLM CAROL MACDONALD 1620 L STREET NW - MS 1075 WASHINGTON DC 20036
UTAH CATTLEMEN'S ASSOCIATION 150 SOUTH 600 EAST # 10-B SALT LAKE CITY, UT 84102	GREYSTONE ENVIRONMENTAL CONSULTATNTS ATTN: DEB 5231 S QUEBEC STREET GREENWOOD VILLAGE CO 80111	BR ROY ARNOLD 1849 C STREET NW MS 7612 WASHINGTON DC 20240
UTAH ENVIRONMENTAL CONGRESS 1817 SOUTH MAIN STREET, SUITE 9 SALT LAKE CITY, UT 84115	ALAN ISAACSON BUREAU OF ECONOMIC & BUSINESS RESEARCH 1645 EAST CAMPUS CENTER DRIVE ROOM 401 SALT LAKE CITY UT 84112-9302	BIA DON SUTHERLAND 1849 C STREET, NW MS 4513 WASHINGTON DC 20240

WASHINGTON WILDERNESS COALITION 4649 SUNNYSIDE AVENUE N #520 SEATTLE, WA 98103	CHRISTOPHER A. BILTOFT, METEOROLOGIST 674 16TH AVENUE SALT LAKE CITY, UT 84103	MMS GEORE VALIULIS 381 ELDEN STREET MS 4042 HERNDON, VA 20070-4817
MOAB FIELD OFFICE 82 EAST DOGWOOD MOAB UT 84532	CATHY O'BRYANT 593 SOUTH 300 EAST PAYSON UT 84651	OSM SAM BAE 1951 CONSTITUTION AVENUE NW MS 10 WASHINGTON DC 20240-0001
DAVID TOBERT 3115 SOUTH 2900 EAST SALT LAKE CITY UT 84109	DANNY WIDNER RDG PO BOX 1668 VERNAL UT 84078	DOI REGIONAL ENVIRONMENTAL OFFICER ROBERT F. STEWART PO BOX 25997 (D-108) DENVER FEDERAL CENTER DENVER CO 80225-007
H. WILSON 4994 EAST MEADOWS DRIVE PARK CITY UT 84090	LOUISE SANDBERG TRACE ENERGY 187 EAST 1975 NORTH CENTERVILLE UT 84014	NATURAL RESOURCES LIBRARY DEPARTMENT OF INTERIOR 1849 C STREET NW MAIL STOP 2258 WASHINGTON DC 20240
DOUG THARP 1202 EAST FOURTH AVENUE SALT LAKE CITY UT 84103	DAVID MORRISION 1986 DOUGLAS STREET SALT LAKE CITY UT 84108	DEPARTMENT OF INTERIOR – OEPC ATTN: GWEN WILDER 1849 C STREET NW MS 2342 WASHINGTON DC 20240
BOB ARRINGTON 1216 FOURTH AVENUE SALT LAKE CITY UT 84103	TOM MORRISON 3048 SOUTH PLATEAU DRIVE SALT LAKE CITY UT 84108	U.S. EPA OFFICE OF FEDERAL ACTIVITIES EIS FILING SECTION MAIL CODE 2252-A ROOM 7241 AREA RIOS BUILDING (SOUTH OVAL LOBBY) 1200 PENNSYLVANIA AVENUE, NW WASHINGTON DC 20460
JERRY BERGOSH 1961 SCENIC DRIVE SALT LAKE CITY UT 84108	RANDY LONG 8610 KINGS HILL DRIVE SALT LAKE CITY UT 84121	BRAD BOYCE OSO ENERGY RESOURCES CORPORATION 900 MAIN AVENUE SUITE D DURANGO CO 81301
JOHN DYER MILLER, DYER & CO. LLC 475 17TH STREET SUITE 420 DENVER CO 80202	DOMINION EXPLORATION & PRODUCTIONFOUR GREENSPOINT PLAZA 16945 NORTHCHASE DRIVE SUITE 1750 HOUSTON TX 77060-2133	JOHN HUNTING 78 WEST 3325 NORTH VERNAL UT 84078

STEPHANIE TOMKINSON QEP UINTA BASIN, INC. 11002 EAST 17550 SOUTH VERNAL UT 84078	TRC MARIAH ASSOCIATION INC. ATTN: ROGER SCHOUMACHER 605 SKYLINE DRIVE LARAMIE WY 82070-8909	BJORK, LINDLEY, & LITTLE ATTN: LINDA VANDERVEER 1600 STOUT STREET, SUITE 1400 DENVER CO 80202 303/892-1400
ZIEGLER CHEMICAL & MINERAL CORPORATION 366 NORTH BROADWAY - SUITE 210 JERICHO, NY 11753 400	LARRY H. ROBINSON 7104 COUNTY ROAD 5 RIFLE, CO 81650	EOG RESOURCES, INC TONI MILLER 600 17TH STREET, SUITE 1100 N DENVER, CO 80202
JAYNE BELNAP 2290 S. RESOURCE BLVD. MOAB, UT 84532	NATIONAL PARK SERVICE 324 SOUTH STATE, SUITE 200 BOX 30 SALT LAKE CITY, UTAH 84111	EARTHJUSTICE ATT: EDWARD B. ZUKOSKI 1400 GLENARM PLAZA SUITE 300 DENVER CO 80202-5050
AMERICAN GILSONITE COMPANY ATTN: RICH LICONTI 29950 BONANZA HWY BONANZA, UTAH 84008	THURSTON ENERGY ATTN: WILL CURTON PO BOX 240 VERNAL, UT 84078	ERIC DILLE EOG RESOURCES 600 17TH STREET, SUITE 1100N DENVER, CO 80202
ED TROTTER PO BOX 1910 VERNAL UTAH 84078	BILL JOHNSON UINTAH COUNTY ECONOMIC DEVELOPMENT 147 EAST MAIN VERNAL UT 84078	DARLENE BURNS 152 E. 100 N. UINTAH COUNTY PUBLIC LANDS VERNAL, UTAH 84078
DAN SULLIVAN 8301CRAWFORD ROAD HOTCHKISS, CO 81419	USDOI FOREST & RANGELAND ECOSYSTEM SCIENCE CENTER CANYONLANDS FIELD STATION 2290 SOUTH WEST RESOURCE BLVD. MOAB, UT 84532	

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Table 6-2 CWSA DEIS Comments and Responses

Public Comment	BLM Response
SUWA Comments	
SUWA I. BLM must independently analyze the contractor's information. Specifically, BLM must explain how they reviewed the directional drilling paper, and the reviewer's qualifications to analyze geotechnical issues.	The directional drilling paper was prepared by EOG as disclosed in Section 2.4.3 of the DEIS. The directional drilling paper was independently evaluated by engineers at both the BLM Vernal Field Office and the Utah BLM State Office.
SUWA II i. White River Alternative. A reasonable range of alternatives must include an alternative that reduces or prohibits drilling in the White River corridor. BLM can and must consider an alternative that reduces the number of wells within the viewshed and soundscape of the river.	Based on public comments submitted on the DEIS, EOG committed to the following new measures within the FEIS: EOG would not drill from new or existing well pads within the 100-year floodplain of the White River Corridor. EOG would not drill new wells in the White River corridor that would result in new well pads and roads. The White River corridor is defined as the line of sight from the centerline, up to ½ mile, along both sides of the White River. The oil and gas resources beneath the White River corridor in the CWSA have been leased by the United States, and under the terms of such leases, the BLM cannot deny EOG's valid, existing rights to drill and develop this leasehold. EOG may drill new twin wells on existing well pads within the White River corridor (but outside the 100-year floodplain). These twins to existing wells would require no new roads. For surface-disturbing activities proposed within the 100-year floodplains of Coyote Wash and Red Wash, additional applicant-committed design features would be considered on a site-specific basis during the onsite inspection in order to maintain and protect wildlife habitat, water quality, quality of the recreation experience, and other land uses. Such site-specific design features could include the use of closed-loop drilling within the 100-year floodplain, directional drilling, placement of surface facilities (other than the associated wellhead and pipeline) outside of the floodplain, and/or other measures designed to eliminate potential impacts to the floodplains. The decision to implement additional, site-specific design features

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	within the 100-year floodplains of Coyote Wash and Red Wash would be determined on a well-by-well basis during the APD approval process. Twin wells in the White River corridor (but outside the 100-year floodplain) will be located, designed, or screened to be out of view of recreational boaters on the White River from the upstream boundary of the Chapita Wells Unit to the Mountain Fuel Bridge. The White River Seen Area Analysis (Chapter 4.0, Map 4-1, EOG Resources, Inc., Environmental Assessment Chapita Wells Unit Infill Development, Uintah County Utah, EA No. UT-080 1999-32) is the conceptual guideline used to define areas that are out of view of White River recreational boaters. In conjunction with the APD, EOG and the AO will jointly determine the use of topographic features and placement of facilities, such as low-profile tanks, to prevent facilities from view. EOG will use telemetry/automation to reduce vehicle trips to these locations. If drilled, twin wells within the White River corridor (but outside the 100-year floodplain) will be drilled during the months of August though April, outside of the typical boating season, to the extent possible in consideration other applicable constraints, such as seasonal restrictions associated with wildlife protection. If EOG is unable to schedule drilling operations outside of the boating season, a drilling rig, workover rig, and associated equipment may be visible to recreational boaters on the White River temporarily while a well is being drilled or re-worked. These commitments are addressed in Section 2.3.1 and 2.3.2. These measures eliminate the potential for wells within the 100-year floodplain of the White River corridor and substantially reduce the number of wells and related impacts that could potentially occur within the viewshed and soundscape of the river.

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SUWA II ii. SUWA believes that the DEIS description of cumulative impacts to the White River is woefully inadequate. Particularly, BLM has not even listed specific events, much less provided quantified and detailed information. BLM must provide a detailed analysis of the cumulative impacts of past, present, and reasonably foreseeable cumulative impacts on the White River. Specifically, BLM should evaluate the cumulative impacts on noise levels, viewsheds, water quality, and recreational opportunities.	Based on EOG's recent commitments to not drill from new or existing well pads within the 100-year floodplain of the White River Corridor, and to not drill new wells in the White River corridor that would result in new well pads and roads (see previous response), direct impacts (and therefore contributions to cumulative impacts) to the White River corridor would be minimal. However, where feasible, the cumulative impact discussions in Section 5.3 of this FEIS have been revised to include more quantitative information. The Section 5.3 discussions on water resources, soils, visual resources, noise, and recreation all include adequate discussion on the contributions of the CWSA to cumulative impacts.
SUWA II iii. Did sedimentation calculations in the DEIS include sedimentation from road development? BLM should explain over what period of time the expected sedimentation will occur.	The soil loss calculations were performed using the Revised Universal Soil Loss Equation, and include all disturbed areas proposed, including well pads, access roads, pipeline corridors, and injection well sites. The equation gives the soil loss in terms of tons per acre per year. As stated in Section 2.1, approximately 90 wells per year would be drilled for a period of about seven years. The soil loss calculated is for the entire proposed project. Therefore, during the first year, the additional soil loss would be about one-seventh of the calculated number, and would increase each year during project construction. However, it is impossible to predict erosion rates for any particular month. The increased soil loss caused by the construction of new project facilities would be partially offset by interim reclamation efforts at the completed well sites (see Appendix E), which would reduce the total soil lost from these surfaces. In addition, because of the use of efficient design features and BMPs, only a small portion of this soil loss is expected to reach the White River or other streams in the area. The worst case analysis presented in the EIS assumes that all of this soil is delivered to the White River in the first year of the project. Even under this scenario, the increased sediment loading to the river would be only 0.24%. Accordingly, the expected amount of additional sedimentation loading to the White River would be much less than 0.24% over the life of the project.
SUWA II iv. BLM does not analyze the impacts of noise from the proposed project to visitors (i.e., river runners, hikers, etc.) within the	BLM regrets the omission. The following has been added to Section 3.14.3 - Existing CWSA Noise Levels: "Noise effects to recreational

Public Comment	BLM Response
White river corridor. BLM should provide some basic assessment of the level of noise that would be audible to boaters on the White River. BLM states that the noise effects would be short-term and specific to the location of the affected well. BLM must clarify that the noise from the project will likely be audible for several months and possibly years.	users on the White River was specifically identified as an issue for the EIS. In May 2006, noise was measured 10 feet from the south bank of the White River at the mouth of Saddletree Draw. Noise was measured for 30 minutes and the average noise was 55.9 dBA with a maximum value of 58.2 dBA.” Additionally, the following has been added to Section 4.14.1.1: “As discussed in Section 2.3.1, EOG would not drill wells from new well pads or build new roads within the White River corridor, defined as the line of sight from the centerline up to ½ mile (whichever is shortest), along both sides of the White River. Furthermore, as previously demonstrated, the noise from a drilling rig would be less than 55 dBA beyond 800 feet from a drill rig. At a distance of ½ mile, the noise would decrease to 44 dBA, a level well below the background level of 56 dBA measured along the White River. If intervening topography would obscure the view of a well from the river, the well could be constructed within the corridor. Although the well would not be visible from the river, the noise of the drill rig engine may be heard although the intervening terrain and the background noise of the river measured to be 56 dBA would muffle the noise somewhat of the drill rig. Twin wells could still be drilled from existing well pads within the corridor, however, based applicant-committed measures in Section 2.3.2, twin wells within the White River corridor (but outside the 100-year floodplain) will be drilled during the months of August though April, outside of the typical boating season, to the extent possible in consideration other applicable constraints, such as seasonal restrictions associated with wildlife protection. If EOG is unable to schedule drilling operations outside of the boating season, a drilling rig, workover rig, and associated equipment may be visible to recreational boaters on the White River temporarily while a well is being drilled or re-worked. Based on this commitment, noise from a drilling rig to boaters on the White River would be avoided or limited during peak recreational use of the White River. In spite of this commitment, the distance or intervening terrain, and the background noise of the White River, the noise from a drilling rig may be audible to

Public Comment	**BLM Response**
	recreational users on the White River if drilling occurs during the boating season.
SUWA II v. The EIS incorrectly identifies *S. wetlandicus* as *S. glaucus*.	The EIS has been corrected to identify *S. wetlandicus* habitat as occurring within the CWSA. New conservation measures developed by the USFWS have also been added to the EIS as mitigation for *S. wetlandicus*.
SUWA III. The DEIS does not conform to the Book Cliffs RMP and inappropriately attempts to amend the RMP.	As discussed in Section 1.5.2, the alternatives are in conformance with the Book Cliffs RMP. All suggestions that this EIS would be used to update or amend the Book Cliffs RMP have been deleted.
Uintah County Comments	
Uintah County 1. Page 2-17, Section 2.3.7, Recreation and Visual Resources: At the beginning of the first paragraph, it provides screening of facilities from view of recreational boaters on the White River. This requirement should only be provided where it is feasible to do so. Text should be changed to add this wording.	The referenced text is part of EOG's Proposed Action as an applicant-committed measure. The text has been modified since publication of the DEIS and now includes additional commitment for recreation and visual resources, which can be found in Section 2.3.2 of this FEIS. These refined measures are cited below: Twin wells in the White River corridor (but outside the 100-year floodplain) will be located, designed, or screened to be out of view of recreational boaters on the White River from the upstream boundary of the Chapita Wells Unit to the Mountain Fuel Bridge. The White River Seen Area Analysis (Chapter 4.0, Map 4-1, EOG Resources, Inc., Environmental Assessment Chapita Wells Unit Infill Development, Uintah County Utah, EA No. UT-080 1999-32) is the conceptual guideline used to define areas that are out of view of White River recreational boaters. In conjunction with the APD, EOG and the AO will jointly determine the use of topographic features and placement of facilities, such as low-profile tanks, to prevent facilities from view. EOG will use telemetry/automation to reduce vehicle trips to these locations. If drilled, twin wells within the White River corridor (but outside the 100-year floodplain) will be drilled during the months of August though April, outside of the typical boating season, to the extent possible in consideration other applicable constraints, such as seasonal

Public Comment	BLM Response
	restrictions associated with wildlife protection. If EOG is unable to schedule drilling operations outside of the boating season, a drilling rig, workover rig, and associated equipment may be visible to recreational boaters on the White River temporarily while a well is being drilled or re-worked. EOG shall improve sight distances along routes accessing Fantasy Canyon and the White River by implementing construction measures developed in conjunction with the AO. Such measures would include taking out high points on rises and by laying back cut slopes near blind turns. EOG would post signs along routes accessing Fantasy Canyon and the White River warning motorists of heavy truck traffic. Operating equipment on all lands contained within the boundaries of the CWSA would be painted in a flat non-reflective color that is compatible with the surrounding landscape as specified by the appropriate SMA. Unpainted steel pipe would be used for surface gathering pipelines, which after rusting would blend with the existing landscape. All these requirements will be implemented as feasible.
Uintah County 2. Page 3-44, Section 3.6.3 Big Game – Pronghorn Antelope, Mule Deer. Here it provides that there are 8,375 acres of critical habitat. The text does not reveal source of this designation. If it is not provided for in the current RMP, references to critical habitat should be dropped. The same applies to similar comments under Mule Deer.	Section 3.6.3 of the EIS has been revised to reflect that big game habitat information within the CWSA comes from UDWR. This information is entirely appropriate for the EIS.
Uintah County 3. Page 3-73, Table 3.11-1 Average Daily Traffic: Uintah County Road Department provides the following AADT for the Glen Bench Road south of the intersection State Road HWY45: Fidlar and Glen Bench Intersections – 1,000 per day Mountain Fuel Bridge – 675 per day Chapita Grove/Glen Bench – 852 per day.	BLM appreciates this new information. It has been incorporated into Table 3.11-1

Public Comment	BLM Response
Uintah County 4, Page 4-14, Section 4.4 Soil Resources. A comparison of projected erosion should be compared to a background rate. In order to fully inform the reader regarding the erosion increases, it is inconsistent without material being previously displayed in other documents.	Table 3.4-1 provides background soil erosion rates, which are referenced in the analysis in Section 4.4. Cumulative impacts are disclosed in chapter 5.0.
Uintah County 5, Page 4-21, Section 4.5.2 Mitigation, Bullet #1. The requirement to power wash vehicles should be dropped. There are many unanswered questions of how and where this is to be accomplished, and it could result in the concentration of noxious weeds in the vehicle wash area, on or off site. There is nothing to substantiate the benefits of such a proposal.	Power washing of all construction and drilling equipment would occur prior to the equipment entering the CWSA from outside the Vernal Field Office area. The EIS has been revised to reflect this mitigation
Uintah County 6, Page 4-21, Section 4.5.2 Mitigation, Bullet #2. This section should be rewritten to allow for the use of non-native plant species where they could be utilized to provide green stripping, wildlife habitat, and ground cover on highly erodible soils. We previously commented on the provision that EOG should reseed any site within the CWSA determined necessary by the appropriate SMA. This should be reworded because as written, this could apply to any site in the area regardless of whether it was impacted or disturbed by this project.	The referenced mitigation measure has been revised to appropriately incorporate these recommendations.
Uintah County 7, Page 4-21, Section 4.5.2 Mitigation, Bullet #3. Such requirements as presented here should be determined on a site-by-site basis. The text should be changed accordingly.	The referenced mitigation measure was developed by the BLM based upon its experience and expertise in dealing with impacts to the Uinta Basin hookless cactus. The mitigation measure stands as is. The mitigation measure stands as is and will be implemented as needed based on site-specific application review.
Uintah County 8, Page 4-47, Section 4.6.3 Mitigation Bullet #1. The mitigation measure here is unsupported by analysis and should be struck as the CWSA does not provide critical (crucial) mule deer or pronghorn wintering habitat.	The EIS has been revised to reflect this suggestion.
Uintah County 9, Page 4-47, Section 4.6.3 Mitigation Bullet #2. Requirement for netting should be considered on a case-by-case basis because previous evaluations have revealed that bird deaths in pits is not a problem.	Netting of reserve pits would be considered on a site-specific basis. The EIS has been revised to reflect this change.
Uintah County 10, Page 4-47, Section 4.6.3 Mitigation Bullet #3. The requirement for screening raptor nests from facilities is not substantiated by need or scientific study to support such a requirement.	The referenced text notes that the mitigation measure would be applied where feasible and has been revised to specify that it would apply to new facilities. The mitigation measure stands as is.

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This measure should be struck. Additionally, it appears to be inconsistent with the current RMP.	
Uintah County 11, Page 4-47, Section 4.6.3 Mitigation Bullets #6, 7 and 8. The need for such mitigation requirements is not supported by analysis and should be removed from the FEIS. It is clear from the text that this area is not a major sage grouse breeding or rearing area.	Mitigation measures 6 and 8 (as listed in the DEIS) are reasonable and needed to protect sage grouse from potential impacts to active leks. An additional mitigation measure that would provide for surveys for active leks has been added to the referenced section of the as follows: "*If surface disturbance within sagebrush-steppe habitats is proposed between March 1 and June 15, surveys would be conducted by a qualified biologist to document the presence of active sage grouse leks. All active lek locations would be reported to the AO of the appropriate SMA*. BLM agrees that mitigation measure 7 (as written in the DEIS) is unnecessarily restrictive, particularly considering the protective measures for sage grouse leks discussed in the current version of the FEIS. The referenced mitigation measure has been deleted from the text.
Uintah County 12, Page 4-51, Section 4.7.3, Range Management Mitigation. Strike this section and re-write to provide these areas as avoidance areas.	BLM believes these mitigation measures are necessary and appropriate for protecting rangeland management resources. The mitigation measures stand as is.
Uintah County 13, Page 5-21, Section 5.3.13, Visual resources. Here it provides that all activities would be required to conform to VRM class objectives. It is not clear what objective determinations would be the basis of this requirement. This document constitutes management decision, thus the VRM classes should be adjusted to be compatible with the decisions made in this document.	No management decisions are proposed within this EIS. Management decisions are made through Resource Management Plans and their Supplements or Amendments. The activities referenced in the subject section would be required to conform to the VRM class decisions in the appropriate Resource Management Plan.
USFWS Comments	
USFWS 1. The project proposes to drill up to four new wells located within floodplains in Colorado pikeminnow critical habitat.	As a result of comments on the DEIS, EOG has committed that they will not drill from new or existing well pads within the 100-year floodplain of the White River Corridor, and that they will not drill new wells in the White River corridor that would result in new well pads and roads. Therefore, critical habitat for the Colorado pike minnow would not be disturbed.
USFWS 2. The project should consider burying and co-locating	As discussed in Section 2.4.5, burying pipelines may successfully

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pipelines where feasible within the existing ROW to avoid further fragmenting the landscape for small mammal species. Where pipelines are buried, the ROW should be reseeded with an appropriate seed mix to discourage the spread on noxious weeds.	mitigate visual impacts in other parts of the western United States; however, the CWSA is dominated by the presence of surface and near-surface bedrock. Burying pipelines in this environment would frequently result in ripping, cutting, or blasting rock along the pipeline corridor. Surface disturbance resulting from these construction methods would result in long-term visual impacts, destruction of sparse vegetation, soil erosion, possible noxious weed infestation, and reduction of livestock and wildlife forage and habitat. The semi-arid and arid climate regime characteristic of the Uinta Basin makes successful interim and final reclamation difficult to achieve in the short-term, as is evident from historical experience. Based on these and other considerations, buried pipelines were considered to be an unrealistic BMP in the CWSA.
USFWS 3. Where pipelines would cross stream channels, the pipeline entrance and exit bore holes should be out of the 100-year floodplain and automated emergency shut-off valves should be placed on both sides of the stream. An interagency field visit to ascertain the best available routing across floodplains to minimize impacts to listed fish species.	As discussed in Section 4.2.1.1.3, pipelines constructed in washes would be installed in accordance with the BLM's Hydraulic Considerations for Pipeline Crossings of Stream Channels and as directed by the AO.
USFWS 4. Channel degradation and scour can lower the river bed resulting in pipeline exposure over time. A study for a Green River pipelines crossing indicated the scour depths within the Green River of up to 3 meters are possible.	Pipeline crossings of the Green River are not proposed for this project.
USFWS 5. For pipelines crossing the White River, a geomorphic analysis should be conducted.	Pipeline crossings of the White River are not proposed for this project.
USFWS 6. The Proposed Action states that overhead electric lines may be installed to provide power to pumps (page 2-8). USFWS recommends that the project proponent take strong precautionary measures to protect raptors by raptor-proofing power lines per the requirements of the Suggested Practices for Raptor Protection on Power Lines: The State of the Art, Avian Power Line Interaction Committee.	Section 4.6.3 has been revised to include this suggestion as a mitigation measure.
USFWS 7. Although the CWSA does not have bald eagle nesting pairs, UDWR's GAP analysis shows the White River as providing primary	Direct impacts to breeding bald eagles, should they become established in the CWSA, would generally be avoided through the

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breeding habitat. The EIS should analyze and discuss the effects and what minimization measures should be employed should breeding eagles become established within the CWSA during the life of the project.	application of the applicant-committed measure in Section 2.3.6, which states: "In conjunction with the APD, EOG would coordinate with the applicable SMA to have a survey conducted (by an approved biologist) prior to surface-disturbing activities to determine whether raptor nests are present within 0.5 mile of locations proposed for surface disturbance. If nests are determined to be present, the AO from the appropriate SMA shall determine appropriate measures to avoid disturbing active nest sites and to protect the viability of all nest sites or potential future nesting. Such measures may include: timing limitations on new construction and surface-disturbing activities within 0.5 mile of known nests (1.0 mile for nesting peregrine falcons); the use of terrain features to shield the nest site from human activities; and, the construction of Artificial Nest Sites (ANS) in appropriate locations."
USFWS 8. In addition to the applicant's commitment to removing roadside carrion, additional avoidance and minimization measures are recommended for protection of the bald eagle.	Through consultation with USFWS, the following mitigation measures have been added to Section 4.6.3 of the FEIS: In order to protect bald eagles and their habitat, the following would be implemented: • Temporary activities within 1.0 mile of nest sites will not occur during the breeding season of January 1 to August 31, unless the area has been surveyed and determined to be unoccupied. • Temporary activities within 0.5 mile of winter roost areas, e.g., cottonwood galleries, will not occur during the winter roost season of November 1 to March 31, unless the area has been surveyed and determined to be unoccupied. • No permanent infrastructure will be placed within 1.0 mile of nest sites. • No permanent infrastructure will be placed within 0.5 mile of winter roost areas. • Contact UDWR for removal of carrion from roadways within bald eagle foraging range. • Avoid loss or disturbance to large cottonwood gallery riparian

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	habitats • Utilize directional drilling to avoid direct impacts to large cottonwood gallery riparian habitats: o When employing directional drilling techniques, ensure that drilling does not intercept or degrade alluvial aquifers • Re-vegetate with native species indigenous to the area and non-native species that are not likely to invade other areas, all areas of surface disturbance within riparian areas and/or adjacent uplands.
EPA Comments	
EPA 1. The DEIS fails to compare the Proposed Action to any alternative that meets the purpose of EOG utilizing its valid existing rights. EPA suggests that the following alternatives should be analyzed in a Supplemental Draft EIS or the FEIS:	See responses 1a through 1d for each suggested alternative. The following responses, along with the detailed descriptions of Alternatives Considered but Eliminated from Analysis in Section 2.4, present the rationale for the need to fully analyze only the Proposed Action and the No Action Alternatives.
EPA 1a. A Phased Development Alternative could decrease the distances between each new rig setup, address issues of unitization and gas capture, and reduce field-related vehicular traffic. Phased development would also allow time for additional technical advances, such as improving directional drilling techniques, which could result in increased oil and gas production with fewer environmental impacts.	Based on comments received from the EPA on the DEIS, a phased development alternative that requires drilling and production occur sequentially across the CWSA was considered for analysis in this EIS. Under this alternative, natural gas development on Federal leases would be implemented in a manner that may be spatially or temporally constrained. Phased development for this project is not feasible for the following reasons: • It would not meet the stated purpose and need for the project to increase the available supply of natural gas by a daily delivery of up to 175 million cubic feet, with an ultimate production volume of between 650 billion cubic feet and 850 billion cubic feet during defined life of the project.

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	• Temporal, spatial, seasonal restrictions associated with wildlife and/or other resource values may preclude drilling in some areas or otherwise further restrict development in a manner that would conflict with the stated purpose and need for the project. The Proposed Action as presented by EOG contains a temporal scenario that results in an inherently phased approach to development. The expected construction, drilling, and completion phase of the project would extend over seven years, with an approximate average annual number of wells anticipated to be drilled each year. The Proposed Action is structured so that orderly development would occur during the 7-year construction, drilling, and completion phase. The EPA-recommended phased development would restrict exploration and development in some areas until all development within a specified area would be complete. The Proposed Action contains elements of exploration as well as infill development. EOG has included outlying areas within the CWSA that have yet to demonstrate production that warrants the development and infill wells proposed for the known productive areas of the CWSA. Exploration in outlying areas of the CWSA is necessary to confirm or contraindicate future development drilling. Spatial limitations to project development may disproportionately emphasize or de-emphasize these outlying areas to an extent that the purpose and need for the project is not met. A more detailed discussion of this alternative considered but eliminated from detailed analysis has been added to Section 2.4.6.
EPA 1b. A White River Protection Alternative should be considered that provides for no development within the White River floodplain and riparian corridor.	In response to public comments on the DEIS, EOG voluntarily committed to the following measures (see Section 2.3.1): EOG would not drill from new or existing well pads within the 100-year floodplain of the White River Corridor.

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	EOG would not drill new wells in the White River corridor that would result in new well pads and roads. The White River corridor is defined as the line of sight from the centerline, up to ½ mile, along both sides of the White River. The oil and gas resources beneath the White River corridor in the CWSA have been leased by the United States, and under the terms of such leases, the BLM cannot deny EOG's valid, existing rights to drill and develop this leasehold. EOG may drill new twin wells on existing well pads within the White River corridor (but outside the 100-year floodplain). These twins to existing wells would require no new roads. For surface-disturbing activities proposed within the 100-year floodplains of Coyote Wash and Red Wash, additional applicant-committed design features would be considered on a site-specific basis during the onsite inspection in order to maintain and protect wildlife habitat, water quality, quality of the recreation experience, and other land uses. Such site-specific design features could include the use of closed-loop drilling within the 100-year floodplain, directional drilling, placement of surface facilities (other than the associated wellhead and pipeline) outside of the floodplain, and/or other measures designed to eliminate potential impacts to the floodplains. The decision to implement additional, site-specific design features within the 100-year floodplains of Coyote Wash and Red Wash would be determined on a well-by-well basis during the APD approval process. EOG's modification to the Proposed Action and removal of all proposed well development from the 100-year floodplain of the White River effectively addresses the specific concerns of the EPA and USFWS. Potential impacts that could have occurred from drilling on existing well pads or constructing new well pads were eliminated by the EOG commitments. The primary need for a minimum setback distance, as described in EPA's comment letter, has been resolved by the Proposed Action and subsequent commitments by the operator.

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	For these reasons, a White River Protection Alternative (which was originally included in the DEIS) is no longer needed in this FEIS.
EPA 1c. A Minimum Setback Distances Alternative should be considered that assures adherence to all minimum setback distances from riparian zones, floodplains, springs, or sensitive wildlife, geologic, and cultural resource areas that could be used to highlight where such conflicts may occur. EPA recommends this alternative to analyze the difference in environmental effects compared to the Proposed Action and other alternatives.	This alternative is not reasonable or necessary for the following reasons: After publication of the DEIS, EOG voluntarily committed that they would not drill from new or existing well pads within the 100-year floodplain of the White River Corridor, and that they would not drill new wells in the White River corridor that would result in new well pads and roads. Potential impacts that could have occurred from drilling on existing well pads or constructing new well pads were eliminated by these EOG commitments. Therefore, analysis of a required minimum setback to the White River was not needed and eliminated from further analysis. Possible impacts to riparian zones, floodplains other than that of the White River, springs, or sensitive wildlife, geologic, and cultural resources areas would be avoided by the application of standard lease terms and conditions contained in 43 CFR 3101.1-2. The regulation states that facilities can be moved 200 meters to avoid any conflicts. The implementation of the offset distance allowed by standard terms and conditions, the application of conditions of approval to specific APDs resulting from onsite inspections, and compliance with applicable laws and regulations, such as the National Historic Preservation Act and Threatened and Endangered Species Act, would prevent impacts to the identified resources. Therefore, a minimum setback analysis throughout the project area was considered but not fully analyzed because the regulatory mechanisms are in place that would allow adverse impacts to be avoided. Furthermore, well sites shown in Figure 2-1 are not intended to accurately depict actual well locations. The well pad, access road, and pipeline ROW locations illustrated for the Proposed Action are conceptual in nature. Actual proposed well locations would be determined during project implementation by EOG and the appropriate

Public Comment	BLM Response
	SMA. Well locations would be finalized during the onsite inspection/evaluation process based on site-specific resource conditions. EOG's commitments to not drill within the 100-year floodplain overrides the conceptual depiction of possible future well locations in Figure 2-1. Well sites that appear to be located in proximity to riparian zones, floodplains, springs, or sensitive wildlife, geologic, and cultural resources areas do not represent actual physical well locations on the ground. A more detailed discussion of this alternative considered but eliminated from detailed analysis has been added to Section 2.4.7.
EPA 1d. A Directional Drilling Alternative should be considered in areas where there are low risks such as infill locations and within the "exceptional recovery areas".	The drilling of multiple wells from single pads is already incorporated into the Proposed Action in the discussion of twinned wells. Section 2.4.3 of this FEIS provides a detailed discussion on why a directional drilling alternative is not reasonable for this project.
EPA 2. The CWSA and Greater Deadman Bench Region air quality analysis for the cumulative effects and the reasonably foreseeable developments are identical. Therefore, EPA provided a single analysis as part of EPA's upcoming review of the Greater Deadman Bench Region air quality analysis, which should be applied to the CWSA DEIS.	Comments 2a through 2c were received on the Greater Deadman Bench Region DEIS air quality analysis. Only one comment is applicable to the CWSA project.
EPA 2a. Table 3.3-2. The source of background data, as well as the statistics selected, need to be included as footnotes to this table as well as Tables 4.3-4 and 4.3-5.	The tables have been updated to include source information. The background values reflect the most current data for the Uintah Basin obtained from the Utah Department of Environmental Quality, Utah Division of Air Quality.
EPA 2b. The percentage of air quality standards in the text are not consistent with the results shown in Table 4.3-5.	Not applicable to CWSA EIS.
EPA 2c. The results indicate that the maximum visibility impact at the Ouray National Wildlife Refuge would be 4 days having a visibility reduction of over 1.0 deciviews with a maximum impact being 1.5 deciviews. Please clarify whether this would be a direct impact from project emissions and not a cumulative effect.	Not applicable to CWSA EIS.
EPA 3. Under Section 365 of the Energy Policy Act, the Vernal Field Office has been designated as a pilot project office. It may be possible to improve the efficiency of field inspections regarding environmental compliance based on the additional staffing provided to pilot offices.	This comment is beyond the scope of this document.

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EPA requests that the FEIS specify the number of staff and percentage of time allocated to enforcement inspection.	
EPA 4. EPA requests that the FEIS should specify the number and percentage of time allocated to enforcement actions. It would be appropriate for the public and Tribal members to receive quarterly or semi-annual reports of field compliance with all environmental stipulations or any waivers to such stipulations.	This comment is beyond the scope of this document.
EPA 5. Since the project area is [partially] located on Indian lands within the exterior boundary of the Uintah and Ouray Indian Reservations, EPA directly implements Federal environmental protection programs with regard to activities associated with the proposed project. This includes permitting authority for the proposed water injection wells for enhanced recovery and any produced water disposal wells pursuant to the Underground Injection Control (UIC) program.	BLM recognizes that the EPA has permitting authority for Indian Country.
BIA Comments	
BIA 1. BIA requests to be a cooperating agency for the project.	BIA officially became a Cooperating Agency status on the CWSA EIS on May 17, 2006.
BIA 2. There is no difference between the number of wells on tribal and Allotted lands between the Proposed Action and the No Action Alternative. The additional wells on Tribal and Allotted lands should be included as part of the proposed Action.	The effects of all wells (Federal, State, Tribal/Allotted, and private) are included in the Proposed Action. The document states on page 1-3 that the BLM Record of Decision will only apply to Federal lands. However, the impacts are identified for all the activities within the CWSA. Therefore, the appropriate agency (State or BIA) can use the EIS analysis as a basis for permitting wells under their jurisdiction if they so choose. The No Action Alternative specifically evaluates the impacts of the non-Federal lands and identifies the impacts on non-Federal lands.
BIA 3. Include formal comments/letters used to identify issues (page S-3 and 1-14 that were received during public scoping so that these records are disclosed as part of the EIS record.	Publication of the public scoping letters within the FEIS is not necessary and would result in undue paper use. The letters are on file at the BLM Office in Vernal, UT and available for public review.
BIA 4. Table S-3 and Table 2.5-1 should be clarified. Cultural surveys identify sites and potential impacts. Mitigation is achieved by avoidance and/or other activities. Cultural sites on Tribal or Allotted lands will be	Table S-3 and Table 4.16-1 (formerly Table 2.5-1) have been revised to reflect this correction.

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avoided.	
BIA 5. Effects to transportation in Tables S-3 and 2.5-1 (now Table 4.16-1) are same for Proposed Action as No Action.	The Proposed Action and No Action summaries are for different time periods. The Proposed Action indicates the level of traffic for each year of the seven-year construction period. The No Action summary indicates the same annual traffic levels, but for only a two-year period.
BIA 6, page 1-1. Current conditions as of March 1, 2004 are addressed. This should be updated in the FEIS to reflect current conditions.	The analysis for an EIS must have a starting point. Since EISs can take from 2 to 4 years to complete, a change in the starting point would create the need for a complete new analysis (number of wells, miles of roads, pipelines, etc.). This would be a time consuming and expensive process that would not be justified since the ultimate analysis includes the full field development scenario regardless of the starting point.
BIA 7, page 1-2. The background on the energy situation in Chapter 5.0 may be more appropriately addressed in the affected environment section.	Comment noted. Section 3.1.4 has been modified to include some of the historical information presented in Chapter 5.0
BIA 8, page 1-3. Please include a paragraph with the same language regarding decisions to be made by the BIA Regional Director for all Tribal and Allotted lands.	The following has been added to the text on page 1-3: "*As discussed further in Section 1.5.3, the BIA will, under its authority, issue its own decision for the portion of the CWSA natural gas development project on Tribal land*."
BIA 9. In the final document, provide surface and mineral ownership maps to better describe the split estate issue.	Table 1-2 and Figure 1-2 have been added to illustrate mineral ownership.
BIA 10, pages 1-3 and 1-4. In Section 1.4, please indicate that Rights-of-way on Tribal and Allotted lands will be approved by the Uintah and Ouray Superintendent.	Section 1.4.2 has been revised to reflect this correction.
BIA 11, page 1-5. If there was a Stagecoach Unit EA, please list with other NEPA documents.	To date, a separate NEPA document for the Stagecoach Unit has not been prepared.
BIA 12, Table 1-2. Permits, Approvals and Authorizing Actions should include the actions required by the BIA, Uintah and Ouray Agency.	Table 1-3 (formerly Table 1-2) has been updated to include this revision.
BIA 13, pages 1-14 to 1-16. Include a list or table of issues to be addressed in addition to BLM's critical elements.	The issues derived from the comments received on the Scoping Notice are listed on Section 1.6.1 of the DEIS.
BIA 14, page 1-13. List the designated operator for the SESE Section 32. Clarify if additional wells and effects will be added due to this second operator.	There is no designated operator for the SESE Section 32. The SESE Section 32 involves Tribal surface and Federal minerals and is not leased because the Book Cliffs RMP did not analyze spilt estate lands. Section 1.5.5 of the FEIS has been revised to reflect this point.
BIA 15, page 2-2. Include UDOGM in the acronym list.	The FEIS has been revised to include this suggestion.

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BIA 16, page 2-2. Reserve pit reclamation should be in compliance with Onshore Order requirements.	The text has been revised to reflect that compliance with Onshore Order #1 is needed when reclaiming reserve pits.
BIA 17, page 2-3. Update "Gold Book" reference from 1989 to 2005.	Gold Book references have been update to 2007.
BIA 18, Section 2.1.5. As this is full-field development, include existing disturbance in tables as a separate column so the true impact can be determined. Disclose reasons that surface disturbance could be greater than proposed cultural site relocations, special status species, etc.). All tables with disturbance figures should be revised to reflect values are "approximate".	The existing level of development as of March 1, 2004, is described on page 1-1 and is also discussed under Cumulative Impacts in Chapter 5.0. As noted, the surface disturbance is basically a best estimate and may change as a result of the APD and ROW processes. It is not necessary to label such estimates as approximate.
BIA 19, Section 2.1.5. Define "long-term" and short-term".	Short term impacts are basically impacts that occur during initial construction, but are reclaimed soon after. Long term impacts are impacts that will remain in place for the life of the project.
BIA 20, Section 2.1.6. Address water depletion issues in one place, which will tie together drilling and completion uses of water.	Drilling and completion water use needs are addressed in Section 2.1.2, 2.1.3, and 2.1.6, as well as in Chapter 4.0 under analyses of the Colorado River Endangered Fish.
BIA 21, Section 2.3.3. Please amend the last sentence of this section to read "*If any historic or archaeological resources are found during operations, all operations will be suspended until the appropriate authorities are contacted, and a formal determination is made by the authorized official that work may resume*".	BLM has reviewed this section and finds the existing wording sufficient.
BIA 22, Section 2.3.9. May desire to reference USFWS Biological Opinions regarding the 100-year floodplain, as certain restrictions have been implemented to date.	This mitigation measure is no longer needed. The Proposed Action has been changed such that EOG would drill from new or existing well pads within the 100-year floodplain of the White River Corridor, and they would not construct new well pads or access roads within the White River corridor (see Section 2.3.1).
BIA 23, Section 2.4.7. Best Management Practices (BMPs) should be included not as an alternative, but as part of the Proposed Action. This will make implementation easier and more easily incorporated into the ROD.	Comment Noted. Numerous BMPs have been included in the Proposed Action, as well as the acknowledgement that additional BMPs would be implemented on a site-specific basis.
BIA 24, Section 3.2.2. Hydrographs should include more recent data if available.	The hydrograph data illustrate general flow characteristics and include the most recent data when the DEIS analyses were written. New hydrograph data, if available, would not contribute any important information to the EIS.
BIA 25, Section 3.4. Do not discuss >60% clay content soils if not present.	The knowledge of clay content in soils is an indicator for reclamation potential. The fact that clay content does not meet the poor

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	reclamation potential criterion is good information about the Affected Environment.
BIA 26, Section 3.11. There may be several Tribal roads within the project area that are not claimed by Uintah County.	BLM has not been provided any information by the BIA or Ute Tribe on roads that would allow us to update this discussion.
BIA 27, Section 3.15.1. Population centers are also present in Duchesne County that should be included.	The CWSA is located entirely within Uintah County.
BIA 28, section 3.15.2. Verify statistics directly with the Ute Indian Tribe's Vital Statistics, not through the State of Utah's records.	No new information has been presented by the Tribe.
BIA 29, page 3-85. It is stated that approximately 1/3 of the CWSA occurs on lands owned by the Ute Indian Tribe or Tribal allottees.	The correct value is 21 percent. The FEIS has been revised to reflect this correction.
BIA 31, Section 3.15.2. Verify whether or not there are Ute Tribe members living within the CWSA.	The FEIS has been modified to reflect that there are no known Tribal members living within the CWSA.
BIA 32. "Native American Religious Concerns" and "Native American Trust Resources" should be analyzed in Chapters 3 and 4 as identified as Critical Elements.	Native American Religious Concerns and Native American Trust Resources were identified as Critical Elements of the Human Environment in Section 1.6.2. Potential impacts and mitigation measures for Native American Religious Concerns are discussed in Section 4.8 of the EIS. Native American Trust Resources were not identified by the Tribe or BIA during the public scoping process. No information has been provided by the BIA or Northern Ute Tribe to indicate how or where trust resources would be affected by the proposed gas development.
BIA 33. Chapter 4 Socioeconomics: The FEIS should be modified to distinguish between Tribal land and Allotted land.	As feasible, the socioeconomic discussions have been revised to distinguish between the types of payments received by the Ute Tribe on Tribal surface and minerals, versus Tribal surface and Federal minerals. However, the BLM has not received any specific guidance from or information that specifies acreage and location of Tribal versus allotted minerals in the CWSA.
BIA 34, Tables 4.3-1 and 4.3-2 should be combined if possible to show true emissions for the first 7 years. Then a table showing emissions for years 8-40 should be made.	The following has been added to the paragraph preceding Table 4.3-1 for clarification: "*The development emissions are based on an average annual development of 90 wells per year. This rate may vary for any number of factors. The annual operational emissions are based on the ultimate, full-field development of 637 wells*."
BIA 35, Section 4.3. Tables need to include existing developments to adequately reflect emissions of the field.	The referenced table evaluates the development under the Proposed Action and No Action Alternative. Existing development is taken into

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	account in the cumulative impacts chapter (chapter 5.0). The assumed background levels of pollutants from existing facilities were provided by the Utah Division of Air Quality. These are the same background levels that are used for evaluation of air quality impacts for air permitting purposes.
BIA 36, page 5-8. The role of the Uintah Basin in the Current Energy Crisis needs to cover the years 2000 - 2005 to reflect cumulative impacts.	The referenced time frames under Role of the Uinta Basin in the Current Energy Crisis include citable statistics. However, the overall discussion includes qualitative information on the role of the Uinta Basin up to the time of publication of the DEIS.
BIA 37, Section 5.3.15. Royalty rates need to be re-evaluated, while we would like to see these values, they are off by several orders of magnitude.	Section 5.3.15 has been revised appropriately.
EOG Comments	
EOG 1, Page 1-10, Table 1-2, UDEQ UPDES General Permit for Storm Water Discharges: Storm water discharge permits are not usually required for oil and gas operations in the State of Utah. The State of Utah is exempting oil and gas activities from storm water permitting, in accordance with the Energy Policy Act, unless they take place near a “sensitive” area.	This reference has been removed from Table 1-2.
EOG 2, On Page 4-4, EOG has not committed to developing Storm Water Pollution Prevention Plans (SWPPPs). To contend that SWPPPs would be developed in compliance with a particular regulation, a regulatory authority needs to be cited. If the plans would not be developed, reference to developing SWPPPs should be omitted.	References to EOG voluntarily committing to SWPPPs have been removed from the EIS.
EOG 3, Water use volumes for drilling and completion are incorrect throughout the DEIS. The FEIS should include correct water use information as provided by EOG.	All references to water use volumes for drilling and completion in Chapters 2 and 4 have been replaced with corrected information provided by EOG.
EOG 4, Page 3-21, 6th full paragraph: The Birds Nest is present beneath the CWSA.	The EIS has been revised to reflect this correction.
EOG 5, Page 4-3, Section 4.1.2 Geology and Minerals Mitigation: The text states the “on slopes greater than 35%, Controlled Surface Use Stipulation CSU-1 would apply;” however, the authority for this	The reference to CSU-1 has been deleted. Section 4.1.2 now states that slope stability issues and multiple mineral development conflicts

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stipulation is not identified in the text.	would be addressed on a case-by-case basis.
EOG 6, Page 4-7, surface water mitigation measures: The text states “BMPs that would be employed for road construction could include…” followed by a list of measures that “will” be performed by EOG. The text is confusing in that it presents a variety of BMPs meant to be conditional (on a site-specific basis) in a way that sounds mandatory. This text should be re-written to be consistent with the presentation of mitigation measures for other resources by replacing “will” in each bullet with “may.” In addition, the text should describe that the choice of BMPs depends upon site-specific conditions made at the onsite evaluation as part of the APD approval process.	Per guidance from the BLM Washington Office, the introductory paragraphs in Section 4.2.1.1.3 have been revised to include the statement that “*Typical BMPs that would be implemented for road construction on a site-specific, case-by-case basis include …*”
EOG 7, Page 4-7, surface water mitigation measures, Bullet #4: The text states that “Ditches will (may) be allowed to revegetate and/or will (may) include large rocks or stones to slow the velocity of drainage and allow sediments to settle out.” In reality, this proposed mitigation measure is impractical and never implemented because near-surface bedrock precludes construction of ditches. EOG requests that this proposed mitigation measure be removed from the FEIS.	This mitigation measure is appropriate for the EIS, but has been revised to read “*Ditches could be allowed to vegetate and/or could include large rocks or stones (if available) to slow the velocity of drainage and allow sediment to settle out*.”
EOG 8, Page 4-7, surface water mitigation measures, Bullet #7: EOG requests that the text be changed to read, “Roads crossing floodplains may be constructed at the narrowest part of the floodplain and perpendicular to the floodplain, *where feasible*.” All attempts would be made to follow this guidance; however, site-specific conditions would dictate the road construction location.	The EIS has been revised to reflect this suggestion.
EOG 9, Page 4-7, surface water mitigation measures, Bullet # 8: Bedrock is often too close to the surface to bury pipelines five feet below the surface. EOG requests that this text be removed and replaced with “Pipelines constructed in washes would be installed in consideration of the BLM’s HYDRAULIC CONSIDERATIONS FOR PIPELINE CROSSINGS OF STREAM CHANNELS and as directed by the Authorized Officer.”	The EIS has been revised to reflect this suggestion.

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EOG 10, Page 4-7, surface water mitigation measures, Bullet # 10: Road construction is addressed in an APD's Surface Use Plan. The intent of the text, as stated, probably refers to engineered roads plans. EOG requests that the text be changed to "Road design plans may identify …."	The EIS has been revised to reflect this suggestion.
EOG 11, Page 4-8, Groundwater Mitigation: The statement in the first paragraph may not be accurate in all cases. Not all wells are logged by wireline tools. EOG requests that the text be replaced with the following paragraph: "Any shallow groundwater zones encountered during drilling of the proposed wells would be properly protected and the presence of these zones reported to the appropriate agencies. The casing and cementing program would be designed to isolate and protect the shallower formations encountered in the wellbore and to prohibit pressure communication or fluid migration between zones."	The EIS has been revised to reflect this suggestion.
EOG 12, Page 4.3.2, Air Quality Mitigation: The text does not recognize that emissions sources on Ute Tribal lands are not permitted by the UDEQ. EOG requests the following change to the text: "Mitigation of air quality impacts would be accomplished through permitting by the UDEQ, Air Quality Division, and also through the Ute Tribe, if constructed on Tribal surface or within the Ute airshed, as applicable."	The EIS has been revised to reflect this suggestion.
EOG 13, Page 4-21, Vegetation Mitigation, Bullet #1: EOG requests that this mitigation measure be removed from the FEIS. Power-washing all construction equipment prior to the start of construction or operational vehicles on a weekly basis is impractical and not economic. EOG works cooperatively with the BLM and Uinta County to recognize weed infestations on its leases and actively engages in a weed control program.	Power washing of all construction and drilling equipment would occur prior to the equipment entering the CWSA from outside the Vernal Field Office area. The EIS has been revised to reflect this mitigation.
EOG 14, Page 4-21, Vegetation Mitigation, Bullet #2: First sentence: Lack of definition of the word "intensive" and lack of recognition that successful growth of seeds depends on favorable weather conditions renders this sentence unclear and not practical as a mitigation	The EIS has been revised to reflect this suggestion.

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measure. EOG requests that this first sentence be replaced with: "*EOG would control noxious weeds along ROWs, well sites, or other facilities. EOG would obtain a list of noxious weeds from the BLM or the County Extension Office. On BLM-administered land, EOG would submit a Pesticide/Herbicide Use proposal prior to their application*."	
EOG 15, Page 4-21, Vegetation Mitigation: The text states that "*reseeding would be accomplished using native plant species*…" The invasion of nonnative species has led the VFO to reconsider the exclusive use of seeds from native plants for reclamation. Native species are not used exclusively for reseeding by the BLM in the CWSA. The sentence should be revised to reflect that *reseeding is accomplished at the direction of the BLM*.	The EIS has been revised to reflect this suggestion, with the exception that "BLM" has been replaced with "SMA".
EOG 16, Page 4-21, Vegetation Mitigation: Post-construction seeding applications would continue at the direction of the BLM, not "*until determined successful by the BLM*."	The EIS has been revised to reflect this suggestion.
EOG 17, Page 4-21, Vegetation Mitigation, last sentence: EOG requests that the phrase "*on an annual basis*" be removed from the text, such that it reads "*Weed monitoring and reclamation measures would be continued throughout the 30-year life of the project*." Inclusion of a specified time frame implies that documentation must be made.	Documentation of annual weed monitoring and reclamation is a key component of ensuring the success of such programs. The referenced text has been slightly revised to read "*Weed monitoring and reclamation measures would be continued on an annual basis (or as frequently as the SMA determines) throughout the 30-year life of the project*". A reclamation plan has been added to the FEIS as Appendix E.
EOG 18, Page 4-21, Vegetation Mitigation, Bullet #3: A mandatory requirement for siting a well location, access road or pipeline upslope of an identified population of any endangered plant species unreasonably assumes that BMPs would not be implemented to protect these species. T&E and other protected species are, by virtue of their status, not subject to indiscriminate actions that would result in a loss of viability. Site-specific assessments can and should be made to ensure that these species, as well as any other protected species, are not put into jeopardy; however, the compulsory implementation of a particular mitigation measure without consideration of particular site-specific BMPs is unwarranted and unnecessarily broad.	The referenced mitigation measure was developed by the BLM based upon its experience and expertise in dealing with impacts to the Uinta Basin hookless cactus. The mitigation measure stands as is.
EOG 19, Page 4-47, Wildlife Mitigation: The listed mitigation measures are presented as if they are mandatory across the CWSA rather than	The referenced text has been revised to read "Implementation of the following mitigation measures for wildlife resources would be

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possible measures that could be implemented on a site-specific basis as determined at the onsite evaluation.	considered by the appropriate SMA on a site-specific basis during the on-site process".
EOG 20, Page 4-47, Wildlife Mitigation, 1st bullet: "Blanket" seasonal restrictions upon oil and gas activities preclude such mitigating factors as mild winters and non-use of the area by wildlife. Mule deer typically inhabit areas displaying abundant browse and cover, neither of which are characteristic of most of the CWSA. Vegetation in the CWSA constitutes marginal habitat, contains sparse vegetation, and does not constitute good browse or cover for mule deer. The presence of antelope could be evaluated on a site-specific basis. EOG requests that this mitigation be removed from the FEIS.	The EIS has been revised to reflect this suggestion as the CWSA does not provide critical (crucial) winter habitat for mule deer or pronghorn.
EOG 21, Page 4-47, Wildlife Mitigation, 2nd bullet (also on Page 4-26, Section 4.5.1.1.5 Migratory Birds): EOG requests that this mitigation be rephrased "All reserve pits would be netted or flagged in order to prevent access by migratory birds and other wildlife species, as determined by the Authorized Officer."	Netting of reserve pits would be considered on a site-specific basis. The EIS has been revised to reflect this change.
EOG 22, Page 4-47, Wildlife Mitigation, 3rd bullet: Concealing all facilities and infrastructure, including roads, from active or inactive raptor nests is excessively restrictive in the CWSA, which often exhibits unimpeded lines of sight. Existing regulatory offsets to nests are sufficient to ensure protection of raptors. EOG requests that this mitigation be removed from the FEIS.	The referenced text notes that the mitigation measure would be applied where feasible and has been revised to specify that it would apply to new facilities. The mitigation measure stands as is.
EOG 23, Page 4-47, Wildlife Mitigation, 4th bullet: EOG requests that this mitigation be removed from the FEIS. Moving roadside carrion off of CWSA roads may result in safety and health concerns to EOG personnel, could violate state game laws, and could result in conflicts with provisions of the Endangered Species Act. EOG is not responsible for the removal of carrion from roads.	The referenced mitigation measure was designed in coordination with the USFWS to reduce potential impacts to carrion-feeding bald eagles. The referenced text stands but has been modified slightly as follows: "Where to do so would not endanger project personnel, <u>or violate provisions of the ESA or State laws regarding big game,</u> roadside carrion would be moved off of CWSA roads in order to minimize the potential for collisions between vehicles and carrion-feeding raptor species."
EOG 24, Page 4-47, Wildlife Mitigation, 5th bullet: EOG requests that the first sentence in the bullet be rephrased as such: Surface-disturbing activities would be avoided within riparian habitats *where feasible*, in	The referenced text has been revised slightly as follows "*Surface-disturbing activities would be avoided <u>within habitats supporting riparian vegetation</u> in order to minimize loss or degradation of habitats*

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order to minimize degradation of habitats for the special status fishes, the Western yellow-billed cuckoo, and the common yellowthroat. Riparian areas exhibit vegetation growing close to a watercourse. Riparian vegetation consists of plants that grow rooted in the water table, requiring free or unbound water, or conditions that are noticeably moist along the margins of streams or drainage lines. These conditions are not present in the dry drainages characteristic of the CWSA although they may be present along the White River.	*for the special status fishes, the Western yellow-billed cuckoo, and the common yellowthroat*."
EOG 25, Page 4-47, Wildlife Mitigation, 6th bullet: EOG requests that this mitigation be removed from the FEIS. Assuming that the auditory range of greater sage grouse is roughly equivalent to that of a human being, compressors would need to be offset over two miles from a lek, and drilling activities would need to be offset roughly one mile away. Some areas in the CWSA exhibit unimpeded lines of sight. To mandate that surface disturbance be prohibited within audio or visual range of active greater sage grouse leks between March 1 and June 15 is unduly restrictive. EOG would comply with all applicable regulations in order to protect greater sage grouse.	BLM agrees that this measure is unnecessarily restrictive, particularly considering the other protective measures for sage grouse leks discussed in Section 4.6.3. The referenced mitigation measure has been deleted from the text.
EOG 26, Page 4-47, Wildlife Mitigation, 7th bullet: EOG requests that this mitigation be removed from the FEIS. Sagebrush-steppe habitat comprises approximately 60% of the CWSA. To restrict oil and gas activities almost four months of the year in this habitat is unreasonable and unduly restrictive. EOG would comply with all applicable regulations in order to protect greater sage grouse.	BLM agrees that this measure is unnecessarily restrictive, particularly considering the other protective measures for sage grouse leks discussed in Section 4.6.3. The referenced mitigation measure has been deleted from the text.
EOG 27, Page 4-51, Section 4.7.3, Range Management Mitigation, 1st bullet: EOG requests that this mitigation measure be removed from the FEIS or, at a minimum, be amended to read "*Roads, pipelines, well pads or other facilities would avoid livestock reservoirs, rain gauges, corrals, springs, guzzlers, or vegetation trend plots currently in place*." Imposition of a mandatory offset is simply not needed to protect structures of the sorts listed. Avoidance would provide sufficient protection and would ensure their continued usability. The FEIS should also note that the construction of catchment basins is often performed	The EIS has been revised to reflect this suggestion.

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as a mitigation measure.	
EOG 28, Page 4-53, Section 4.9.2, Paleontology Mitigation: EOG requests that this mitigation measure be removed from the FEIS. EOG has committed to performing paleontological surveys where Type I conditions (as defined by the BLM) exist (where the chances of finding a significant fossil are greater). Sufficient data exist that provide reliable information locating those areas in the CWSA where paleontological surveys are necessary in order to avoid potential damage to fossil resources. The BLM acknowledges that these data are available by instituting its classification system, rendering the imposition of mandatory surveys unnecessary.	The referenced mitigation has been revised to specify that paleontologic resource surveys would be conducted in Condition 1 and Condition 2 areas.
EOG 29, Page 4-57, Section 4.11.2 Transportation Mitigation: EOG requests that this mitigation measure be removed from the FEIS. EOG does not have the authority or responsibility to implement and enforce speed limits. Vehicle and driving safety is addressed in EOG's regularly scheduled safety meetings.	The BLM agrees with this assessment and the referenced mitigation measure has been deleted from the EIS.
EOG 30, Page 4-58, Section 4.12.1.1 Recreation, last paragraph: The statement that "*… noise levels would be in compliance with applicable Federal, state, and county standards…*" is inaccurate. Further, this statement is contradicted by the text on page 4-62. Although Federal (EPA) guidance exists, there are no promulgated standards with the exception of OSHA regulations applicable to workers. The reference to Federal, state, and county standards should be removed from the FEIS.	The EIS has been revised to reflect this correction.
EOG 40, Page 4-65, Section 4.14.2 Noise Mitigation: Although no Noise Sensitive Receptors were identified within the CWSA, two mitigation measures are presented in the text to prevent adverse impacts to nonexistent receptors. EOG requests that these mitigation measures be removed from the FEIS because there are no currently existing sensitive noise receptors. As the mitigation measures read in the DEIS, facilities such as residences, schools, etc. (sensitive noise receptors) could be constructed in the future, and EOG would be responsible for relocation of its already installed facilities to increase separation distance. In addition, the requirement to construct or use naturally-occurring obstacles in the direct path from the noise source to a	The designation of Noise Sensitive Receptors (NSRs) is done on a case-by-case, project-specific basis. There are no formal guidelines as to what is or is not an NSR as inferred by EOG's comments. In the case of the CWSA, active raptor nests and recreationists along the White River and in Fantasy Canyon certainly qualify as NSRs. However, to avoid any confusion with public interpretation of what is or is not an NSR, the EIS has been revised to use the term Noise Sensitive <u>Resources</u>, rather than Noise Sensitive <u>Receptors</u>. The referenced mitigation measures are necessary as they provide methods for reducing potential noise related impacts to noise sensitive resources.

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receiver….” is unreasonably broad such that “receiver” could mean anything capable of detecting an audible transmission.	
EOG 41, Page 5-21, Section 5.3.13 Visual Resources, 2nd full paragraph: The statement that “*all activities performed in the CWSA would be required to conform to VRM class objectives*” does not hold true on fee, State, and Tribal lands. The text needs to be corrected to address non-Federal lands. Also, project activities would add incrementally to cumulative visual impacts despite application of VRM objectives, which allow for alteration.	This section of the EIS has been revised appropriately.
U.S. Geological Survey Comments	
USGS 1, Section 3.2.2.1, page 3-17: The correct site number for the Green River gaging station near Jensen, Utah is USGS Site No. 09261000. The correct site number for the Green River gaging station near Ouray, Utah is USGS Site No. 09307000.	The EIS has been revised to reflect this correction.
USGS 2, Section 3.2.2.1, page 3-17, second paragraph: The text refers to the information from the gaging station at Ouray, but incorrectly refers to Figure 3.2-2, which illustrates gaging station information from Jensen.	The EIS has been revised to reflect this correction.
National Park Service Comments	
NPS 1, The proposed gas development could affect the parks of Vernal City-Uintah Co., Vernal City Park, City of Naples, and Uintah County. The BLM should consult directly with Seth McArthur, who administers the Land and Water Conservation Fund (L&WCF) program in Utah to determine and potential conflicts of the L&WCF.	The BLM is not aware of any conflicts between the proposed alternatives and the parks of Vernal City-Uintah Co., Vernal City Park, City of Naples, and Uintah County. However, the BLM will deal with all appropriate Federal and State authorities regarding implementation of this project.

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6.2 CONSULTATION AND COORDINATION

The following Tribes, agencies and organizations were contacted or consulted with during the scoping process and the preparation of the DEIS:

Tribes

Hopi Tribal Council, White Mesa Ute, Zia Pueblo, Eastern Shoshone, Santa Clara Pueblo, Southern Ute, Ute Mountain Ute, Confederated Tribes of the Goshute Reservation, Laguna Pueblo, Navajo Nation, Ute Indian Tribe, Northwestern Shoshone

Federal Offices

National Park Service

U.S. Forest Service

U.S. Fish and Wildlife Service

U.S. Environmental Protection Agency

U.S. Bureau of Indian Affairs

State Offices

Utah Division of Wildlife Resources

Utah Department of Environmental Quality

Utah Division of Oil, Gas and Mining

Utah School and Institutional Trust Lands Administration

State Historic Preservation Office

6.2 CONSULTATION RESULTS

A summary of the consultation process is included in the table below. Important correspondence regarding consultation with the USFWS, SHPO, and Native American Tribes is included in Appendix D.

Name	Findings and Conclusions
Utah State Historic Preservation Office (SHPO)	Consultation was initiated on January 13, 2004 with a recommendation of "no historic properties affected" based on the applicant committed measures. No response was received. Consultation is therefore considered to be closed. However, consultation may be reinitiated as necessary upon site-specific review of individual applications.
United States Fish and Wildlife Service	Preliminary comments from the USFWS were received on November 4, 2004. They were taken into account in the drafting of the EIS. A consultation initiation and request for a list of species letter was sent on December 29, 2004. An additional consultation letter was sent on January 17, 2006. A Biological Opinion was received from the USFWS on July 10, 2007. Conservation measures identified through the Biological Opinion will be carried forward in the Record of Decision for the FEIS.
Native American Tribes	Consultation was initiated on January 11, 2006. A letter from the Pueblo of Laguna was received on January 27, 2006 stating that the project would not have an affect, but requesting Reinitiation of consultation should cultural resources be found during the site-specific review of individual applications. A letter from the Confederated Tribes of the Goshute Reservation was received on February 27, 2006. No concerns were identified. Consultation is therefore considered to be closed. It may be reinitiated as necessary upon site-specific review of individual applications.

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7.0 LIST OF REVIEWERS AND PREPARERS

BLM and Uintah County List of Reviewers		
Name		**EIS Responsibilities**
William Stringer, BLM		Decision Maker
Stephanie Howard, BLM		Project Management
Robert Specht, BLM		Vegetation, T&E Species
Kyle Smith, BLM		GIS, Maps
Tim Faircloth, BLM		Wildlife, T&E Species
John Mayers, BLM		Geology, Paleontology
Marc Stavropoulos, BLM		Rangeland Management
Kim Bartel, BLM		Recreation
Blaine Phillips, BLM		Cultural Resources
Karl Wright, BLM		Water Resources
Darlene Burns, Uintah County		County Comments
Buys & Associates List of Preparers		
Name	**Education and Experience**	**EIS Responsibilities**
Marty Buys	M.S. Environmental Science 27 Years Experience	Program Manager
Dawn Martin	M.S. Wildlife Biology 11 Years Experience	Project Manager, Wildlife, Vegetation, Editing
Don Douglas	M.S. Atmospheric Science 34 Years Experience	Air Quality, Noise, Visual Resources, Transportation
Jon Torizzo	M.S. Environmental Science 6 Years Experience	Air Quality and Noise
Chris Freeman	B.S. Environmental 15 Years Experience	Socioeconomics, Recreation, Land Use & Status
Andy Dworak	B.S. Natural Resource Management 4 Years Experience	Vegetation
Kirby Carroll	M.S Zoology 6 Years Experience	Wildlife, Vegetation, Soils, Rangeland Management.
Scott Sprague	Computer Science & Info. Tech. 5 Years Experience	GIS, Cartography
Dave Nicholson	M.S. Environmental Engineering 16 Years Experience	Geology & Minerals, Water Resources
Kendell Johnson (sub-contractor)		Formatting
Tyler Ashcroft, Mark Weitz, Kim Kurczewski		Technical Editing
Carl Conner (sub-contractor)		Cultural Resources
Rod Sheetz (sub-contractor)		Paleontology

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8.0 ACRONYMS AND GLOSSARY

8.1 ACRONYMS

- A -

AADT	Annual Average Daily Traffic
ACEC	Areas of Critical Environmental Concern
ACGIH	American Conference of Governmental Industrial Hygienists
ACHP	Advisory Council on Historic Preservation
amsl	above-mean-sea-level
ANC	Acid Neutralization Capacity
ANS	Artificial Nest Sites
AO	Authorized Officer
APD	Applications for Permit to Drill
APE	Area of Potential Effects
AQRV	Air Quality Related Value
ARPA	Archaeological Resources Protection Act
AUM	Animal Unit Month

- B -

bbl/d	bbl per day
bbls	Barrels
Bcf	Billion Cubic Feet
b_{ext}	light-extinction coefficient
BHL	Bottom Hole Location
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BMP	Best Management Practices
BTEX	Benzene, Toluene, Ethylbenzene, Xylene
Btu	British Thermal Unit

- C -

CAA	Clean Air Act
$CaCO_3$	Calcium Carbonate
CEQ	Council of Environmental Quality
CFR	Code of Federal Regulations
cfs	Cubic Feet per Second
CIAA	Cumulative Impact Analysis Area

CO	Carbon Monoxide
COA	Conditions of Approval
CRM	Cultural Resource Management
CWA	Clean Water Act
CWSA	Chapita Wells – Stagecoach Area
CWU	Chapita Wells Unit

- D -

dB	Decibel
dBA	A-weighted Decibel
DOE	U.S. Department of Energy
DOI	U.S. Department of the Interior
DOT	Department of Transportation
dv	Deciview

- E -

EA	Environmental Assessments
EIA	Energy Information Administration
EDA	Economic Development Agency
EIS	Environmental Impact Statement
EO	Executive Order
EOG	EOG Resources, Inc.
EPA	Environmental Protection Agency
ESA	Endangered Species Act

- F -

FEMA	Federal Emergency Management Agency
FLAG	Federal Land Managers' Air Quality Related Values Workgroup
FLPMA	Federal Land Policy and Management Act
FONSI	Finding of No Significant Impact
FWS	Fish and Wildlife Service

- G -

GIS	Geographic Information System
GNB	Greater Natural Buttes
gpm	Gallons per Minute
GPS	Global Positioning System

- H -

HAP	Hazardous Air Pollutant
hp	Horsepower
HUD	Housing and Urban Development

- I -

IDLH	Immediately Dangerous to Life or Health
IEA	International Energy Agency
IF	Isolated Find
ISC	Industrial Source Complex

- K -

kg/ha/yr	kilograms per hectare per year

- M -

MBTA	Migratory Bird Treaty Act
MEI	Maximally Exposed Individual
MLE	Most Likely Exposure
mmhos/cm	Millimhos per centimeter
Mscf	Thousand Standard Cubic Feet
MMscf	Million Standard Cubic Feet
mg/L	Milligrams per Liter
µeq/l	Microequivalents per liter
µg/l	Micrograms per liter
$\mu g/m^3$	Micrograms of pollutant per cubic meter air
MMBO	Million Barrels of Oil

- N -

n-hexane	Normal hexane
N/A	Not Applicable or Not Available
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves Protection and Repatriation Act
NEPA	National Environmental Policy Act
NEPD	National Energy Policy Development
NHPA	National Historic Preservation Act
NO_2	Nitrogen dioxide
NOA	Notice of Availability
NOI	Notice of Intent
NOS	Notice of Staking

NO_x	Nitrogen Oxides
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NSO	No Surface Occupancy

- O -

OD	Outside Diameter
OHV	Off Highway Vehicle
ORV	Off-road Vehicle
OSHA	Occupational Safety and Health Administration

- P -

PCIF	Permanent Community Impact Fund
PILT	Payments-In-Lieu of Taxes
POD	Plan of Development
PMZ	Primary Management Zone
$PM_{2.5}$	Particulate Matter less than 2.5 Microns Diameter
PM_{10}	Particulate Matter less than 10 Microns Diameter
PPM	Parts Per Million
PPP	Pollution Prevention Plan
PSD	Prevention of Significant Deterioration

- R -

RCRA	Resource Conservation and Recovery Act
RDCC	Resource Development Coordinating Committee
REL	Reference Exposure Levels
RfC	Reference concentrations
RFD	Reasonably Foreseeable Development
RIPRAP	Recovery Implementation Program Recovery Action Plan
RMP	Resource Management Plan
RPA	Reasonable and Prudent Alternative
ROD	Record of Decision
ROW	Right-of-Way

- S -

SARA	Superfund Amendments and Reauthorization Act
SITLA	School and Institutional Trust Lands Administration

SHPO	State Historic Preservation Office
SMA	Surface Management Agency
SOPA	Schedule of Proposed Actions
SPCC	Spill Prevention, Control and Countermeasure Plan
SRMA	Special Recreation Management Areas
SSURGO	Soil Survey Geographic Database
STSA	Special Tar Sand Areas
SO_2	Sulfur dioxide
SUP	Surface Use Plans
SVR	Standard Visual Range

- T -

Tcf	Trillion Standard Cubic Foot
TDS	Total Dissolved Solids
TLV	Threshold Limit Values
TSL	Toxic Screening Levels
T&E	Threatened and Endangered

- U -

UIC	Underground Injection Control
UDAQ	Utah Division of Air Quality
UDEQ	Utah Department of Environmental Quality
UDOGM	Utah Division of Oil, Gas, and Mining
UDOT	Utah Department of Transportation
UDWR	Utah Division of Wildlife Resources
UPDES	Utah Pollutant Discharge Elimination System
USC	United States Code
USDA	United States Department of Agriculture
USDOI	United States Department of the Interior
USDOE	United States Department of Energy
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey

- V -

VOC	Volatile Organic Compound
VR	Visual Range
VRM	Visual Resource Management

- W -

WTPD	White-tailed Prairie Dog

8.2 GLOSSARY

ADAPTATION. Adjustment to environmental conditions.

AERIAL COVERAGE. The ground area circumscribed by the perimeter of the branches and leaves of a given plant or group of plants.

ASTHETICS. Relates to the pleasurable characteristics of a physical environment as perceived through the five senses of sight, sound, smell, taste, and touch.

ALLUVIUM. An unconsolidated terrestrial sediment composed of sorted or unsorted sand, gravel, and clay that had been deposited by water.

AMBIENT. The environment as it exists at the point of measurement and used as a basis to measure changes or impacts. Synonymous with background.

AMBIENT NOISE LEVEL. Cumulative effect from all noise generating sources in the area.

ARTHROPODS. Insects, mites, scuds and crayfish.

ANTICLINAL. Pertaining to anticline which is a convex upward rock fold in which strata have been bent into an arch; the strata on each side of the core of the arch are inclined in opposite directions away from the axis or crest; the core contains older rocks than does the perimeter of the structure.

AQUIFER. A body of rock or unconsolidated sediments that contains sufficient saturated permeable material to yield significant quantities of water to wells and springs.

AREA OF CRITICAL ENVIRONMENTAL CONCERN (ACEC). Areas within the public lands where special management attention is required to protect or prevent irreparable damage to important resources.

ARROYO. A watercourse (as a creek) in an arid region, or a water-carved gully or channel.

ARTESIAN AQUIFER. Synonymous with confined aquifer.

ARTESIAN WELL. A well deriving its water from an artesian or confined aquifer, in which the water level stands above the top of the aquifer.

ASSOCIATION. Organisms living together in any given combination of environmental conditions.

ATMOSPHERIC DEPOSITION. Atmospheric deposition refers to the processes by which air pollutants are removed from the atmosphere and deposited on terrestrial and aquatic ecosystems, and is reported as the mass of material deposited on an area (kilograms per hectare or kg ha^{-1}). Air pollutants are deposited by wet deposition (precipitation) and by dry deposition (gravitational settling of particles and adherence of gaseous pollutants).

ATMOSPHERIC DISPERSION. The process by which pollutants are transported and vertically mixed in the atmosphere.

ATMOSPHERIC STABILITY. A measure of turbulence in the atmosphere. Three general classes of stability include neutral, unstable, and stable. Influenced by vertical temperature gradients and wind profiles.

BACKGROUND. The environment as it exists at the point of measurement and used as a basis to measure changes or impacts.

BENTONITE. An absorbent aluminum silicate clay formed from volcanic ash.

BERM. A barrier constructed to confine water or other substances.

BEST MANAGEMENT PRACTICES (BMP). BLM actions developed to produce improved results. BMPs include construction techniques designed to reduce the "footprint" of oil and gas activities or reduce negative effects of construction and operation.

BIOTA. The plant and animal life in an area.

BROOD. Hatchlings in a given nest or being raised by a given female bird.

BROWSER. An animal, which feeds on leaves, wigs, and young shoots of trees or shrubs; i.e., deer.

CARNIVORE. An organism, which acquires life-sustaining nutrients by using animals as food.

CATION. An ion that has a positive electrical charge. That is, an atom that has lost one or more electrons.

CHARACTERISTIC LANDSCAPE. The established landscape within an area being viewed. This does not necessarily mean a naturalistic character. It could refer to an agricultural setting, an urban landscape, a primarily natural environment, or a combination of these types.

CHERT. A sedimentary form of amorphous or extremely fine-grained siliceous, partially hydrous, found in concretions and beds.

CLAYSTONE. A consolidated rock that consists of any mineral fragments smaller than 1/255 mm in diameter.

CLEAN AIR ACT (CAA). Public Law 84-159, established July 14, 1955, and amended numerous times since. The Clean Air Act establishes Federal standards for air pollutants emitted from stationary and mobile sources; authorizes states, tribes, and local agencies to regulate polluting emissions; requires the agencies to improve air quality in areas of the country which do not meet Federal standards; and to prevent significant deterioration in areas where air quality is cleaner than the standards.

CLIMATOLOGY. Science of climate and its causes.

CLUTCH. The eggs of birds, reptiles, or amphibians of a given nest.

COLLUVIUM. An unconsolidated terrestrial sediment composed of sorted or unsorted sand, gravel, and clay that had been deposited due to the action of gravity.

COMMERCIAL WATER USE. Water for motels, hotels, restaurants, office buildings, other commercial facilities, and institutions. The water may be obtained from a public supply or may be self-supplied.

COMMUNITY. A group of plants and animals, which occupy a given locale.

COMPRESSOR BUILDING. A building or cluster of buildings, that house the required equipment to pressurize underground gas lines for the purposes of gas transport.

COMPRESSOR PLANT (STATION). A facility consisting of one or more compressors, auxiliary treatment equipment, and pipeline installations to pump natural gas under pressure over long distances.

CONDENSATE. A low-density liquid hydrocarbon phase that generally occurs in association with natural gas. Its presence as a liquid phase depends on temperature and pressure conditions in the reservoir allowing condensation of liquid from vapor.

CONFINED AQUIFER. An aquifer bounded above and below by impermeable beds or by beds of distinctly lower permeability than that of the aquifer itself; an aquifer containing confined groundwater.

CONFINING BED. A body of impermeable or distinctly less permeable material stratigraphically adjacent to one or more aquifers.

CONGLOMERATE. A clastic sedimentary rock composed of lithified beds of rounded gravel mixed with sand.

CONSUMPTIVE USE. Recreational activities, such as hunting, fishing and trapping, that involves the taking of wild animals.

CONTRAST. Opposition or unlikeness of different forms, lines, colors, or textures in a landscape.

CONTRAST RATING. A method of analyzing the potential visual impacts of proposed management activities.

COVER. That part of the environment, living or dead, utilized by animals for resting, feeding, nesting, and protection.

COVER-TYPE. The part of the environment or landscape characterized by a predominant plant community.

CRITERIA POLLUTANTS. Six common air pollutants for which the Environmental Protection Agency (EPA) has established national air quality standards, including (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), ozone (O_3), and particulate matter less than 10 microns in diameter (PM_{10}) and less than 2.5 microns in diameter ($PM_{2.5}$), and lead.

CROSS-BEDDED. A arrangement of laminations of strata transverse to the main planes of stratification.

CRUCIAL RANGE. Any particular seasonal range or habitat component that is documented as the determining factor in a big games species' ability to sustain a viable population. A viable population is defined as the species' capability to maintain and reproduce itself at a certain population level specific to that species.

CULTURAL MODIFICATION. Any man-caused change in the landform, water form, vegetation, or the addition of a structure, which creates a visual contrast in the basic elements (form, line, color, texture) of the naturalistic character of a landscape.

CUMULATIVE IMPACT. The impact on the environment, which results from the incremental impact of the action when added to other past, present, and reasonable foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor, but collectively significant actions taken place over a period of time (40 CFR 1508.7).

DECIBEL (dB). The measurement unit commonly used to describe sound levels. The A-weighted decibel (dBA) scale is a logarithmic function that emphasizes the audio frequency response curve audible to the human ear and thus more closely describes how one perceives sound.

DECIVIEW (dv). A unit of measure for visibility. The deciview index was developed as a linear perceived visual change.

DIRECT IMPACTS. Effects that are caused by the action and occur at the same time and place (40 CFR 1508.8).

DIRECTIONAL DRILLING. The intentional deviation of a wellbore from vertical to reach subsurface areas some distance from the well pad.

DISSOLVED SOLIDS. The portion of solids in water that can pass through a 0.45-micron filter.

DOLOMITE. A mineral, calcium-magnesium carbonate ($CaMg[CO_3]_2$); also the name applied to sedimentary rocks composed largely of the mineral. It is white, colorless, or tinged yellow, brown, pink or gray; has perfect rhombohedral cleavage; appears pearly to vitreous; effervesces feebly in cold dilute hydrochloric acid.

DOMESTIC WATER USE. Water for household purposes, such as drinking, food preparation, bathing, washing clothes and dishes, flushing toilets, and watering lawns and gardens. Also called residential water use. The water may be obtained from a public supply or may be self-supplied.

DRAIN. A ditch that removes surplus water from irrigated land and returns it to the surface watershed.

EASEMENT. An interest in land owned by another that entitles its holder to a specific limited use or enjoyment.

ECOSYSTEM. A system of biological communities interacting with each other and with their nonliving surroundings.

ECOSYSTEM INTEGRITY. A measure of the health of an entire area or community based on how much of the original physical, biological and chemical components of the area remain intact.

EPHEMERAL. A stream that flows only in direct response to a runoff event.

EPIFAUNA. Part of the benthos living on the sediment surface.

FAUNA. All animal life associated with a given habitat.

FLORISTIC. All plant life associated with a given habitat.

FORAGE. Vegetation utilized by animals as food.

FORB. Flowering herbaceous plants.

FUGITIVE DUST. Dust that escapes the general vicinity of an area where activity is occurring. Dust can be generated by construction traffic, surface clearing operations etc., and can then by carried by wind into the air, creating a plume that may be visible from greater distances than the activity directly causing the dust.

GEOMORPHOLOGY. The study of landforms.

GROUNDWATER, CONFINED. Confined groundwater is under pressure substantially greater than atmospheric throughout, and its upper limit is the bottom of a bed of distinctly lower permeability than that of the material in which the confined water occurs.

GROUNDWATER, UNCONFINED. Unconfined groundwater is water in an aquifer that is under atmospheric pressure and is considered under water table conditions.

HABITAT. A place where a plant or an animal lives.

HAZARDOUS AIR POLLUTANTS (HAPs). Pollutants that are known or suspected to cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental impacts. The Environmental Protection Agency (EPA) has classified 189 air pollutants as HAPs.

HERBACEOUS. Having little or no woody tissue and persisting usually for a single growing season.

HERBIVORE. An organism, which acquires life-sustaining nutrients by feeding on vegetation.

HYDROCARBONS. An organic compound containing only carbon and hydrogen and often occurring in petroleum, natural gas, and coal.

HYDROGRAPH. A graph showing fluctuations in stream flow, stream level, or water levels in wells over time.

INDIRECT IMPACTS. Effects, which are caused by the action bit occur later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include reduced reproduction, population density or growth rate in wildlife. Other effects may be related to induced changes in the patterns of land use and effects on air, water, and other natural systems, including ecosystems (40 CFR 1508.8).

INDUSTRIAL WATER USE. Water used for industrial purposes such as fabrication, processing, washing, and cooling, and includes such industries as steel, chemical and allied products, paper and allied products, mining, and petroleum refining. The water may be obtained from a public supply or may be self-supplied.

INSTREAM WATER USE. Water that is used, but not withdrawn from a groundwater or surface water source for such purposes as hydroelectric power-generation, navigations, water-quality improvement, fish propagations, and recreation. Sometimes called non-withdrawal use or in-channel use.

INTERBEDDED. Rock beds that lie within rock beds of different material.

INTERDISCIPLINARY TEAM. A group of individuals with different training, representing the physical sciences, social sciences, and environmental design arts, assembled to solve a problem or perform a task. The members of the team proceed to a solution with frequent interaction so that each discipline may provide insights to any stage of the problem and disciplines may combine to provide new solutions.

INTERMITTENT. A stream that flows only part of a year along which the bed intercepts the groundwater table.

INVERTEBRATES. All animals without vertebrae.

LANDSCAPE CHARACTER. The arrangement of a particular landscape as formed by the variety and intensity of the landscape features and the four basic elements of form, line, color, and texture. These factors give the area a distinctive quality, which distinguishes it from its immediate surroundings.

LANDSCAPE FEATURES. The land and water form, vegetation, and structures which compose the characteristic landscape.

LEKS. A place where males of some species of birds, such as grouse gather and perform courtship displays in a group.

LINE. The path, real or imagined, that the eye follows when perceived abrupt differences in form, color, or texture. Within landscapes, line may be found as ridges, skylines, structures, changes in vegetative types, or individual trees and branches.

LITHOLOGY. The systematic description of rocks, in terms of mineral composition and texture.

LIMESTONE. A sedimentary rock composed principally of calcium carbonate (CaCO3), usually as the mineral calcite.

LONG TERM IMPACTS. Effects that persist beyond the construction, drilling and reclamation phases, or continue for the life of the project.

MANAGEMENT ACTIVITY. A surface disturbing activity undertaken on the landscape for the purpose of harvesting, traversing, transporting, protecting, changing, replenishing, or otherwise using resources.

MASSIVE. Sandstone rock without any distinctive bedding planes.

MITIGATION. Avoiding, minimizing, reducing, rectifying, or compensating for impacts to resources from an action. The complete definition is provided in 40 CFR 1508.8.

MITIGATION MEASURES. Methods or procedures designed to reduce or lessen the adverse impacts caused by management activities.

NATIONAL AND COLORADO AMBIENT AIR QUALITY STANDARDS (NAAQS and CAAQS). The allowable concentrations of air pollutants in the air specified by the Federal government (and the State of Wyoming). The air quality standards are divided into primary standards (based on the air quality criteria and allowing an adequate margin of safety and requisite to protect the public health) and secondary standards (based on the air quality criteria and allowing an adequate margin of safety and requisite to protect the public welfare from any unknown or expected adverse effects of air pollutants).

NIGHT-LIGHTING. Lights used to illuminate facilities for work or safety. These lights can be mounted on poles, buildings, other equipment and fences. The lighting can consist of two types: area and accent. Area lighting provides general illumination over a broad zone for safety, while accent lighting provides concentrated illumination for work areas, doorways, pathways, stairs and other areas that require distinction.

NON-CONSUMPTIVE USES. Recreational activities, such as wildlife observation and wildlife photography, where wild animals are not taken.

OUTCROP. Rock strata exposed at the surface.

PARTURITION AREAS. Documented birthing areas commonly used by females. These areas may be used as nursery areas by some big game species.

PERENNIAL. A stream or river that flows all year.

PERMEABILITY. The capacity of material to transmit water or other fluids. Primary permeability is the capacity of interconnected pores to transmit fluids and Secondary permeability is the capacity of interconnected fractures, bedding planes, solution voids, etc. to transmit fluids.

pH. A measure of the acidity or alkalinity of water. It is defined as the negative logarithm of the hydrogen-ion concentration. This parameter is dimensionless and generally has a range from 0 to 14, with a pH of 7 representing neutral water. A pH of greater than 7 indicates the water is alkaline, whereas a pH value of less than 7 indicates an acidic water.

PHYSIOGRAPHIC PROVINCE. An extensive portion of the landscape normally encompassing many hundreds of square miles, which portrays similar qualities of soil, rock, slope, and vegetation of the same geomorphic origin (Fenneman 1946, Sahrhaftig 1975).

PHYSIOGRAPHY. The study and classification of the surface features of the Earth.

PLANT ASSOCIATION. The basic unit of vegetation classification representing a plant community containing a defined flora, composition, and uniform habitat conditions (Reid et al. 2002).

PLANT COMMUNITY. A group of plants that occupy a given locale.

POTENTIOMETRIC SURFACE. A groundwater surface that describes the static head, as related to an aquifer, it is defined by the levels to which water will rise in tightly cased wells. A water table is a particular potentiometric surface.

PREVENTION OF SIGNIFICANT DETERIORATION (PSD). A regulatory program under the Clean Air Act (Public Law 84-159, as amended) to limit degradation of air quality in areas that currently achieve the National Ambient Air Quality Standards. The PSD program established air quality classes that allow differing amounts of additional air pollution above a legally defined baseline level. Almost any additional air pollution would be considered significant in PSD Class I areas (certain large national parks and wilderness areas in existence on August 7, 1977, and specific Tribal/allotted lands redesignated since then.) PSD Class II areas allow deterioration associated with moderate, well-controlled growth (most of the country).

RANGELANDS. Typically non-irrigated lands managed primarily for grazing cattle, sheep, goats, horses etc.

REHABILITATION. A management alternative and/or practice, which restores landscapes to a desired scenic quality.

RELIEF. The vertical difference in elevation between the highest and lowest points of a land surface within a specified horizontal distance or in a limited area.

RESERVE PIT. A pit dug to contain drilling fluids, drill cuttings, and other wastes from drilling operations that disposes of the liquids by evaporation.

SANDSTONE. A sedimentary rock composed of mineral grains from 1/16 to 2 millimeters in diameter, bound together by a cement of silica, carbonate, or other minerals or a matrix of clay minerals.

SECONDARY COVER-TYPE. Land cover type occupying the second largest area within the polygon (WYNDD 2003).

SEDIMENTARY ROCK. A rock formed by the accumulation and cementation of mineral grains transported by wind, water, or ice to the site of deposition or chemically precipitated at the depositional site.

SHALE. A fine-grained sedimentary rock formed by the consolidation (esp. by compression) of clay, silt, or mud. It is characterized by finely laminated structure, approximately parallel to the bedding, along which the rock breaks readily into thin layers.

SHORT-TERM IMPACT. Effects of short duration that occur during construction, drilling, completion and reclamation of a well.

SIDE-SLOPES. The rising area of land that forms the transition between a relatively flat condition and a hilltop, mesa top or ridgeline.

SILTSTONE. A rock composed of silt having the texture and composition of shale but lacking its fine lamination or fissility.

SPECIES. The basic category of biological classification intended to designate a single kind of animal or plant.

SPECIFIC CAPACITY. The rate of discharge of water form a well divided by the drawdown of the water level within the well.

SPECIFIC CONDUCTANCE. A measure of the water's ability to conduct an electrical current. Specific conductance is expressed in microsiemens per centimeter (µS/cm) at 25 degrees Centigrade (25^{o} C). For water containing between 100 and 5,000 mg/L of dissolved solids, specific conductance in µS/cm at 25^{o} C multiplied by a factor between 0.55 and 0.71 will approximate the dissolved solids concentration in mg/L. For most water, reasonable estimates can be obtained by multiplying the specific conductance value by 0.44 to obtain dissolved solid concentrations.

STRATIGRAPHIC UNIT. A body of rocks recognized as a unit in the classification of the rocks of Earth's crust with respect to any specific rock character, property, or attribute or for any purpose such as description, mapping, and correlation.

STRATIGRAPHY. The science of the description, correlation, and classification of rock strata, including the interpretation of the depositional environments of those strata.

TEMPERATURE INVERSION. An atmospheric condition in which warmer air lies above colder air and is said to have an ``inverted'' temperature gradient, where temperature increases with altitude.

TERRITORY. An area defended by a male, both members of a pair or an unmated species.

TEXTURE. The visual manifestations of the interplay of light and shadow created by the variations in the surface of an object or landscape.

TOTAL DEPOSITION. Total deposition refers to the sum of airborne material transferred to the Earth's surface by both wet and dry deposition.

UNCONFINED AQUIFER. An aquifer that has a water table.

UPLAND GAME BIRDS. Game birds such as sage grouse, chukar and partridge.

VIEWSHED. The landscape that can be directly seen under favorable atmospheric conditions, from a viewpoint or along a transportation corridor.

VISIBILITY. The ability or inability to view scenic vistas. It is usually characterized by two parameters, visual range (VR) and the light-extinction coefficient (b_{ext}). The visual range parameter represents the greatest distance that a large dark object can be seen. The light extinction coefficient represents the attenuation of light per unit distance due to scattering and absorption by gases and particulate matter in the atmosphere.

VISITOR DAY. A standard measure of visitor use equal to one person visiting a site for 12 hours.

VISUAL IMPACT. Any modification in landform, water bodies, or vegetation, or any introduction of structures, which negatively interrupts the visual character of the landscape and disrupts the harmony of the basic elements (i.e., form, line, color, and texture).

VISUAL RESOURCE. The visible physical features on a landscape (e.g., land, water, vegetation, animals, structures, and other features).

VISUAL RESOURCE MANAGEMENT (VRM). The inventory and planning actions taken to identify visual values and to establish objectives for managing those values; and the management actions taken to achieve the visual management objectives.

VISUAL RESOURCE MANAGEMENT CLASSES. Categories assigned to public lands based on scenic quality, sensitivity level, and distance zones. There are four classes. Each class has an objective, which prescribes the amount of change allowed in the characteristic landscape.

WATERS OF THE US. Includes 1) all waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide; 2) all interstate waters including wetlands; 3) all other waters, such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation or destruction of which could affect interstate or foreign commerce……..; 4) all impoundments of waters otherwise defined as waters of the United States under the definition; 5) tributaries of waters identified in paragraphs (a) (1)-(4) of this section; 6) territorial seas; 7) Wetlands adjacent to waters (other than waters that are themselves wetlands); 8) Waters of the United States do not include prior converted cropland (33 CFR Part 328).

WATERSHED. The line of division between two adjacent rivers or lakes with respect to the flow of water by natural channels into them; the natural boundary of a basin.

WATER TABLE. The water table is that surface in an unconfined water aquifer at which the pressure is atmospheric. It is defined by the levels at which water stands in wells that penetrate the water body just far enough to hold standing water.

WETLANDS. Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas (33 CFR Part 328).

WILDLIFE. In this summary, the term "wildlife" refers to any wild plant, mammal, bird, reptile, amphibian, or other aquatic or terrestrial organism.

WINTER RANGE. The range that large game animals use in substantial numbers only during winter periods.

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9.0 REFERENCES CITED

American Conference of Governmental Industrial Hygienists. 2003. Threshold Limit Values for Chemical Substances and Physical Agents.

Anderson, D.W., and Picard, M.D., 1972. Stratigraphy of the Duchesne River Formation (Eocene-Oligocene), Northern Uinta Basin, Northeastern Utah. Utah Geological and Mineralogical Survey Bulletin, 97:1-28.

Bakko, E.B., and L.N. Brown. 1967. Breeding Biology of the White-tailed Prairie Dog.

Blackett, R. 1996. Tar Sand Resources of the Uinta Basin, Utah: A Catalog of Deposits. Utah Geological Survey Open File Report 335.

Bureau of Land Management. (BLM). 1984. Final Book Cliffs Resource Management Plan/Environmental Impact Statement. Bureau of Land Management, Vernal Field Office, Vernal, UT.

_____. 1985. Record of Decision and Rangeland Program Summary for the Book Cliffs Resource Management Plan. Prepared by Bureau of Land Management, Vernal District Office [Field Office], Vernal, Utah.

_____. 1988a. Environmental Assessment for Oil and Gas Leasing in the Book Cliffs Resource Area. Bureau of Land Management, Vernal Field Office, Vernal, UT.

_____. 1988b. Bureau of Land Management NEPA Handbook, H-1790-1.

_____. 1994. Diamond Mountain Resources Area Resource Management Plan and Record of Decision. Bureau of Land Management, Vernal Field Office, Vernal, UT.

_____. 1997. EA No. 1997-48, Environmental Assessment, Chapita Wells Unit, Uintah County, UT. Prepared by Bureau of Land Management, Vernal District Office [Field Office], Vernal, Utah.

_____. 1998. Chapita Wells Environmental Assessment No. 1997-48. Uintah County, Utah.

_____. 1998b. BLM Manual H-8270-1. General Procedural Guidance for Paleontological Resource Management.

_____. 1999. EA No. UT-080 1999-32, Environmental Assessment, Chapita Wells Unit Infill Development, Uintah County, UT. Prepared by Bureau of Land Management, Vernal District Office [Field Office], Vernal, Utah.

_____. 2002b. Biological Assessment of Threatened, Endangered and Proposed Plant and Animal Species for the Environmental Assessment UT-080-2002-21 for 2-D Seismic Exploration by Veritas DGC Land Inc. Prepared by Bureau of Land Management, Vernal Field Office, Uintah County, Utah. 23 pp.

_____. 2003. Instruction Memorandum No. ID-2003-075. Updated List of Critical Elements of the Human Environment.

_____. 2004a. BLM NEPA Guidebook.

_____. 2004b. Executive Order 11988. USDA Environmental Compliance. Floodplain Management.

_____. 2004c. Vernal Field Office Reasonable Foreseeable Development for Oil and Gas.

_____. 2004d. Air Quality Assessment Report, Vernal and Glenwood Springs Resource Management Areas. Prepared by Trinity Consultants and Bureau of Land Management. August 2004.

_____. 2004e. Mineral Potential Report for the Vernal Planning Area Encompassing Approximately 5.1 Million Acres, Duchesne, Daggett, Uintah, and Grand Counties, Utah.

_____. 2004f. Utah BLM has Record-Breaking Oil and Gas Lease Sale. http://www.ut.blm.gov/leasesalesept2004/nrsep9.htm. September 9

_____. 2004g. Online database search of authorized rights-of-way using the BLM's LR2000 system. Available at: http://www.blm.gov/lr2000/.

_____. 2004h . 43 CFR Parts 2800, 2810, 2880, 2920, 9230, and 9260 Rights-of-Way, Principles and Procedures; Rights-of-Way Under the Federal Land Policy and Management Act and the Mineral Leasing Act.

_____. 2005. Vernal Field Office Draft Resource Management Plan and Environmental Impact Statement. January 2005. Available at: www.ut.blm.gov/vernalrmp. Accessed 4/14/2005.

_____. 2005b. Air Quality Technical Report for the Draft Vernal RMP and EIS.

Bureau of Land Management and US Forest Service. (BLM and USFS). 2007. *Surface Operating Standards for Oil and Gas Exploration and Development, fourth edition.*

Bureau of Land Management, Utah Division of Wildlife Resources, U.S. Fish and Wildlife Service (BLM, UDWR, USFWS). 1999. Environmental Assessment and Finding of No Significant Impact for the Book Cliffs Resource Area Management Plan Amendment – Black-Footed Ferret Reintroduction. Coyote Basin Area, Utah. EA No. UT-080-1999-02.

Braun, C.E. 1995. Distribution and Status of Sage-Grouse in Colorado. Prairie Naturalist 27:1-9.

_____. 1998. Sage-grouse declines in western North America: what are the problems? Proceedings of the Western Association of State Fish and Wildlife Agencies. 78:139-156.

Braun, C.E., M.F. Baker, R.L. Eng, J.S. Gashwiler, and M.H. Schroeder. 1976. Conservation committee report on the effects of alteration of sagebrush communities on the associated avifauna. Wilson Bulletin 88:165-171.

Bruhn, R.L., Picard, M.D., and Isby, J.S., 1986. Tectonics and Sedimentation of Uinta Arch, Western Uinta Mountains and Uinta Basin. In: J.A Peterson, editor, Paleotectonics and Sedimentation in the Rocky Mountain Region, United States. Association of Petroleum Geologists Memoir, 41:333-352.

Bryant, B., C.W. Naeser, R.F. Marvin, H.H. Mehnert, 1990. Upper Cretaceous and Paleogene Sedimentary Rocks and Isotopic Ages of Paleogene Tuffs, Uinta Basin, Utah. And Ages of Late Paleogene and Neogene Tuffs and the Beginning of Rapid Regional Extension, Eastern Boundary of the Basin and Range Province near Salt Lake City, Utah. In: Evolution of Sedimentary Basins-Uinta and Piceance Basins. United States Geological Survey Bulletin, 1787 J., K.

Burton, D.K. 1996. *A History of Uintah County. Scratching the Surface.* Utah Centennial County History Series. Utah State Historical Society and Uintah County Commission, Salt Lake City, Utah.

Butts, K. O. 1973. Life history and habitat requirements of Burrowing Owls in western Oklahoma. M.S. thesis. Oklahoma State University, Stillwater, Oklahoma. 188 pages

Call, M.W. 1978. Nesting Habitats and Surveying Techniques for Common Western Raptors. U.S. Department of the Interior, Bureau of Land Management Technical Note TM-316. Denver Services Center. 115pp.

Cashion, W., 1967, Geology and Fuel Resources of the Green River Formation, Southeastern Uinta Basin, Utah and Colorado. USGS Professional Paper 548.

Cashion, W.B. 1982. Descriptions of Four Stratigraphic Sections of Parts of the Green River and Uinta Formations in the Eastern Uinta Basin, Uintah County, Utah, and Rio Blanco Count, Colorado. United States Geological Survey, Open-File Report 83-17, 42 pp.

Cashion, W.B. 1986. Geologic Map of the Bonanza Quadrangle, Uintah County, Utah. United States Geological Survey, Miscellaneous Field Studies Map, MF-1865.

Central Utah Water Conservation District (CUWCD). April 2003. Uinta Basin Replacement Project. Orem, UT. http://cuwcd.com

Chidsey, Thomas C. April 2003. Major Oil Plays in Utah and Vicinity, Quarterly Technical Progress Report. Utah Geological Survey. Salt Lake City, UT. http://geology.utah.gov/emp/pump/pdf/pumrpt2/pdf

Clark, J., 1957. Geomorphology of the Uinta Basin, In: Guidebook to the Geology of the Uinta Basin, Intermountain Association of Petroleum Geologists, Eighth Annual Field Conference, pp. 17-20.

Clark, T.W., D. Hinckley, and T. Rich. 1989. The Prairie Dog Ecosystem: Managing for Biological Diversity. Montana BLM Wildlife Technical Bulletin, No. 2.

Connelly, J. W., W. J. Arthur, and O. D. Markham. 1981. Sage Grouse Leks on Recently Disturbed Sites. Journal of Range Management. 34:153-154.

Coyner, J. 1990. Report For Population Study: Spiranthes diluvialis. (Mutual Project between BLM and Red Butte Gardens.) 27pp.

Coyner, J. 1991. Ute Ladies'- Tresses (Spiranthes diluvialis) 19pp. 28 pp.

Cully, J.F., Jr. 1993. Plague, prairie dogs, and black-footed ferrets. Pages 38-49 *in* J.L. Oldemeyer, D.E. Biggins, B.J. Miller, and R. Crete, editors. Proceedings of the symposium on the management of prairie dog complexes for the reintroduction of the black-footed ferret. Biological Report 13. July 1993. U.S. Department of the Interior, U.S. Fish and Wildlife Service, Washington, D.C.

Cully, J.F., Jr., and E.S. Williams. 2001. Interspecific Comparisons of Sylvatic Plague in Prairie Dogs. Journal of Mammalogy 82(4):894-905.

Dalton, L.B., J. Price, and L.A. Romin. 1990. Fauna of Southeast Utah and Life Requisites Regarding Their Ecosystems. Publication 90-11. Utah Department of Natural Resources – Division of Wildlife Resources. 326pp.

Day, K.S. 1994. Observations on Mountain Plovers (Charadrius montanus) Breeding in Utah. Southwestern Naturalist 39:298-300.

Dinsmore, J.J. 1983. Mountain Plover (*Charadrius montanus*). Pages 185-196 in J.S. Armburster, Editor. Impacts of Coal Surface Mining on 25 Migratory Bird Species of High Federal Interest. U.S. Department of the Interior, Fish and Wildlife Service Publication OBS-83/35.

Douglass, E., 1914. Geology of the Uinta Formation. Bulletin of the Geological Society of America, 25: 417-420.

Ellison-Manning, A.E., and C.M. White. 2001. Breeding Biology of Mountain Plover (Charadrius montanus) in the Uinta Basin. W.N.A. Nat. 61 (2):223-228.

Energy Information Administration (EIA). 2005. Country Analysis Briefs. http://www.eia.doe.gov/emeu/cabs/usa.html

EOG Resources, Inc. (EOG). 2004. Consideration of the Use of Directional Drilling to Extract Hydrocarbons, Chapita Wells-Stagecoach Area Uintah County, Utah. Prepared for the BLM, Vernal Field Office by EOG Resources, Inc., Denver Colorado.

Evans, D. L. 1982. Status reports on twelve raptors. U.S. Department of the Interior Special Science Report 238. 68 pp.

Fagerstone, K.A. 1987. Black-footed Ferret, Long-tailed Weasel, and Least Weasel. Pages 548-573 in M. Novak, J.A. Baker, M.E. Obbard, and B. Mallock, editors. Wild Fitzgerald, J.P., C.A. Meaney, and D.M. Armstrong. 1994. Mammals of Colorado. Denver Museum of Natural History and University Press of Colorado. Niwot, CO. 467pp.

Ferris, C. 1997. Effects of Interstate 95 on Songbirds and White-tailed Deer in Northern Maine. Ph.D. Thesis, University of Maine, Orono. 48 pp.

FLAG. 2000. Federal Land Managers' Air Quality Related Values Workgroup (FLAG) - Phase I Report. 2000. USDOI-National Park Service, Air Resources Division. Denver, CO. Available at http://www2.nature.nps.gov/ard/flagfree/FLAG--FINAL.pdf. December 2000.

Flynn, J.J. 1986. Correlation and Geochronology of Middle Eocene Strata from the Western United States. Paleogeography, Paleoclimatology, Paleoecology, 55:335-406.

Fouch, T.D. 1992. Hydrocarbon and Mineral Resources of the Uinta Basin. Utah Geological Association Guidebook 20. 1992 Field Symposium.

Furbearer Management and Conservation in North America. Ministry of Natural Resources, Ontario.

Garrott, R.A., and G.C. White. 1982. Age and sex selectivity in trapping mule deer. J. Wildl. Manage. 46:1083-1086.

Gelbard, J. L. 2003. Understanding the distribution of native vs. exotic plant diversity in California's grassland landscapes. Ph.D. Dissertation. University of California, Davis.

Grand River Institute. 2004. Class I Cultural Resource Inventory Report for the Chapita Wells/Stagecoach Project Area for EOG Resources, Inc. and Buys & Associates. GRI Project No. 2477. October 28, 2004.

Grant, C.V., B.B. Steele, and R.L. Bayn, Jr. 1991. Raptor Population Dynamics in Utah's Uinta Basin: The Importance of Food Resource. Southwest Naturalist 36:265-280.

Greenspan, Alan. April 12, 2005. Oil Shale and Oil Sands Resources Hearing. U.S. Senate Committee on Energy & Natural Resources. Washington D.C. http://energy.senate.gov/public/index.cfm?FuseAction=Hearings.Testimony&Hearing_ID=1445&Witness_ID=2934

Goodrich, S., and Neese, E. 1986. Uinta Basin Flora. USDA Forest Service- Intermountain Region- Ogden, Utah 1986 in cooperation with USDA FS- Ashley National Forest & USDOI BLM - Vernal District.

Hall, E.R. and K.R. Kelson. 1959. The Mammals of North America. The Ronald Press Company, New York. 1083pp.

Harris, C.M. 1991. Handbook of Acoustical Measurements and Noise Control. McGraw-Hill, Inc., New York, NY 1991

Harris 1991. Cyril M. Harris, Handbook of Acoustical Measurements and Noise Control, McGraw-Hill, Inc., New York, NY, 1991.

Haug, E., and L. W. Oliphant. 1990. Movements, activity patterns, and habitat use of Burrowing Owls in Saskatchewan. Journal of Wildlife Management 54:27-35.

Heath, B., R. Straw, S. Anderson, and J. Lawson. 1996. Proceedings of the Greater Sage-grouse Workshop. Pinedale, WY.

Hintze, L.F. 1964. Structural Behavior of Utah. In: Guidebook to the Geology and Mineral Resources of the Uinta Basin, Intermountain Association of Petroleum Geologists, Thirteenth Annual Field Conference, pp. 41-45.

Hood, J.W., 1976, Characteristics of Aquifers in the northern Uinta Basin area, Utah and Colorado, Utah Department of Natural Resources Technical Publication 53

Hood, J.W., and Fields, F.K., 1978, Water Resources of the Northern Uinta Basin Area, Utah and Colorado, With Special Emphasis on Ground-Water Supply.

Hoogland, J.L. 2001. Black-tailed, Gunnison's, and Utah prairie dogs reproduce slowly. Journal of Mammalogy 82(4):917-927.

Howe, F.P. and M. Hanberg. 2000. Willow Flycatcher and Yellow-billed Cuckoo Surveys along the Green and San Juan Rivers in Utah, 2000. Utah Division of Wildlife Resources Publication Number 00-31.

Howells, L., Longson, M.S., and Hunt, G. L., 1987, Base of Moderately Saline Ground Water in the Uinta Basin, Utah, with an Introductory Section Describing the Methods Used in Determining its Position: U.S. Geological Survey and the Department of Natural Resources; U.S. Geologic Survey Open-File Report 87-394/Utah State Department of Natural Resources Technical Publication No. 92, 59p., and 2 plates.

Isby, J.F., and Picard, M.D., 1983, Currant Creek Formation: A Record of Tectonism in Sevier-Laramide Orogenic Belt, north-central Utah, in University of Wyoming Contributions to Geology, v. 22, no. 2, 1983.

James, L., J. Evans, M. Ralphs, and R. Child, editors. 1991. Noxious Range Weeds. Westview Press. Boulder, CO.

Johnsgard, P.A. 1988. North American Owls: Biology and Natural History. Smithsonian Institute Press, Washington. 295pp.

Johnson, W.C., and S.K. Collinge. 2004. Landscape effects on black-tailed prairie dog colonies. *Biological Conservation* 115:487-497.

Karpowitz, J. 1984. Book Cliffs Big Game Inventory and Productivity Study. Utah State Department of Natural Resources, Vernal, Utah. Publication No. 84-10.

Kay, J.L. 1934. The Tertiary Formations of the Uinta Basin, Utah. Annals of the Carnegie Museum, 23:357-371.

Kay, J.K. 1957. The Eocene Vertebrates of the Uinta Basin, Utah. In: Guidebook to the Geology of the Uinta Basin. International Association of Petroleum Geologists Eighth Annual Field Conference, pp. 110-114.

Knopf, F.L. 1996. Review of latest data on Mountain Plover and shortgrass species in general. in D. P. Coffin, editor. Summary report - shortgrass prairie/Mountain Plover workshop. Denver Audubon Society, Aurora, Colorado. pp17-19.

Knopf, F. L., and B. J. Miller. 1994. Charadrius montanus - Montane, Grassland, or Bare-Ground Plover? Auk 111:504-506.

Knowles, C.J. 2002. Status of the white-tailed and Gunnison's prairie dog. Environmental Defense and National Wildlife Federation. Fauna West Wildlife Consultants. Boulder, Colorado.

Knowles, C.J., C.J. Stoner, and S.P. Gieb. 1982. Selective Use of Black-tailed Prairie Dog Towns in Montana. Condor 84: 71-74.

Knowles, C.J. and P.R. Knowles. 1984. Additional Records of Mountain Plovers using Prairie Dog Towns in Montana. Prairie Naturalist 16(4): 183-186.

Leachman, B. and B. Osmundson. 1990. Status of the mountain plover: a literature review. U.S. Department of the Interior, Fish and Wildlife Services, Fish and Enhancement, Folden, CO. 83pp.

Lechleitner, R.R., L. Kartman, M.I. Goldenberg, and B.W. Hudson. 1968. An epizootic of plague in Gunnison's prairie dogs *(Cynomys gunnison*i) in south-central Colorado. Ecology 49:734-743.

Mader, B.J. 2000. Pseudodiplacodon, a New Generic Name for Diplacodon progressum Peterson (Mammalia, Perissodactyla, Brontotheriidae), Journal of Vertebrate Paleontology, 20(1): 164-166.

Manning A.E.E. and C.M. White. 2001. Breeding biology of mountain plovers (Charadrius montanus) in the Uinta Basin. Western North American Naturalist 61:223-228.

Marsh, O.C. 1870. Professor Marsh's Rocky Mountain Expedition: Discovery of the Mauvaises Terres Formation in Colorado. American Journal of Science, 2nd series, 59:292.

Marsh, O.C. 1875. Notice of New Tertiary Mammals, IV. American Journal of Science, 3rd Series, 9:239-250.

Menkens, G.E., Jr., and S.H. Anderson. 1989. Temporal-spatial variation in white-tailed prairie dog demography and life histories in Wyoming. Canadian Journal of Zoology 67:343-349.

Montana Bald Eagle Working Group. 1990. Bald Eagles of the Upper Columbia Basin: Timber Management Guidelines. USDA-Forest Service, Billings, MT.

National Energy Technology Laboratory (NETL). July 2004. Project Facts, North Hill Creek 3-D Seismic Exploration. www.netl.doe.gov

National Energy Technology Laboratory (NETL). 2005. Major Oil Plays in Utah and Vicinity. www.netl.doe.gov/scngo/Petroleum/publications/projfactsheets/E&P/15133UTGS.pdf

National Park Service. (NPS). 1982. The Nationwide River Inventory. January 1982.

Natural Gas Supply Administration. 2004. Natural Gas Demand. http://www.naturalgas.org/business/demand.asp

NewsMax.com Wires. Oct. 18, 2005. Energy Demand Opens More Land to Oil Drilling. http://www.newsmax.com/archives/articles/2005/10/18/143540.shtml.

Nicholson, M.C., R.T. Bowyer, and J.G. Kie. 1997. Habitat selection and survival of mule deer: tradeoffs associated with migration. J. Mammal. 78(2):483-504.

Oakleaf, B., H. Downing, B. Raynes, M. Raynes and O.K. Scott. 1982. Wyoming Avian Atlas. Wyoming Game and Fish Department and Bighorn Audubon Society. 87pp.

Occupational Safety and Health Administration (OSHA). 1970. Occupational Noise Exposure Regulations (Standards – 29 CFR). Part Number 1910, Subpart G, Standard Number 1910.95(b)(1). Accessed online, January 27, 2005 at: http://www.osha.gov/pls/oshaweb

Olson, S.L. and D. Edge. 1985. Nest Site Selection By Mountain Plovers in North Central Montana. Journal of Range Management 38: 280-282.

Osborn, H.F. 1895. Fossil Mammals of the Uinta Basin; Expedition of 1894. Bulletin of the American Museum of Natural History, 7: 71-105.

Osborn, H.F. 1929. The Titanotheres of Ancient Wyoming, Dakota, and Nebraska, Volume 1. United States Geologic Survey, Monograph 55. 701pp.

Parrish, T.L., S.H. Anderson, and W.F. Oelklaus. 1993. Mountain Plover Habitat Selection in the Powder River Basin, Wyoming. Prairie Naturalist 25 (3):219-226.

Paxton, E. H. 2000. Molecular genetic structuring and demographic history of the willow flycatcher (*Empidonax traillii*). A thesis submitted in partial fulfillment of the requirements for the degree of Master of Science in Biology. Northern Arizona University, May 2000.

Peterson, O.A. 1919. Report Upon the Material Discovered in the Upper Eocene of the Uinta Basin by Earl Douglass in the Years 1908-1909, and by O.A. Peterson in 1912. Annals of the Carnegie Museum, 12:10-169.

Peterson, O.A. and Kay, J.L., 1931. The Upper Uinta Formation of Northeastern Utah. Annals of the Carnegie Museum, 20:293-306.

Peterson, O.A., 1934. New Titanotheres form the Uinta Eocene of Utah. Annals of the Carnegie Museum, 22:351-361.

Prothero, D.R., 1990. Magnetostratigraphy of the Middle Eocene Uinta Formation, Uinta Basin, Utah. Journal of Vertebrate Paleontology, 10(3):38A.

Prothero, D. R. 1996. Magnetic Stratigraphy and biostratigraphy of the middle Eocene Uinta Formation, Uinta Basin, Utah, *in* Prothero, D. R., and Emry, R. J. editors, The Terrestrial Eocene-Oligocene Transition in North America, p. 3-24.

Prothero, D.R. and Swisher, C.C., III., 1990. Magnetostratigraphy and 40Ar/39Ar Dating of the Middle Eocene Uinta Formation, Utah. Geological Society of America, Abstracts with Programs, 22(7):A364.

Prothero, D.R. and Swisher, C.C, III., 1992. Magnetostratigraphy and Geochronology of the Terrestrial Eocene-Oligocene Transition in North America. In: D.R. Prothero and W.A. Berggren (eds.), Eocene-Oligocene Climatic and Biotic Evolution. Princeton University Press, Princeton, NJ. pp 74-87.

Pruitt, R., 1961, The Mineral Resources of Uinta County, Utah Geological and Mineralogical Survey Bulletin 71.

Rasmussen, D.T. and Townsend, K.E., 1995. New Small-Bodied Mammals from the Uinta Formation, Uinta Basin, Utah, Contrast with the Coeval Small Mammals of California. Journal of Vertebrate Paleontology, 15(supp. 3):49.

Rasmussen, D.T., Conroy, G.C., Friscia, A.R., Townsend, K.E., and Kinkel, M.D., 1999. Mammals of the Middle Eocene Uinta Formation. In: D.D. Gillette, (editor),