

## **4.0 ENVIRONMENTAL CONSEQUENCES**

### **4.1 INTRODUCTION**

This chapter provides an analysis of the direct and indirect environmental consequences that could potentially result from the implementation of the Proposed Action, Alternatives B, C, or D. Applicant-committed environmental protection measures that would reduce or eliminate impacts were identified in **Section 2.1.15**. The analyses within this chapter assume that the alternatives, including those ACEPMs would be implemented. This chapter also provides an assessment of the known and potential cumulative impacts of the alternatives. As discussed in Chapter 2, the alternatives include a commitment/requirement for interim reclamation in areas not needed for production activities. However, for impact analyses within the following sections of this EA, direct and indirect impacts have been analyzed using the initial disturbance.

It is important to note that resource-specific surface disturbances within the analyses in this chapter may differ slightly from the total surface disturbance calculations presented in Chapter 2 as a result of GIS-based buffer and clip functions, which effectively remove any areas of special overlap between buffered features (e.g., overlapping well pad and road and pipeline ROWs). Therefore, the GIS analysis in Chapter 4 leads to slightly lower total distance values than those presented in the description of alternatives.

### **4.2 DIRECT/INDIRECT IMPACTS**

Direct impacts are defined as effects that are caused by the action and occur at the same time and/or place (40 CFR 1508.8). Indirect impacts are effects caused by the action, but occur later in time and/or in a different place. The potential direct and indirect impacts from the Proposed Action, No Action Alternative, and Buried Pipelines Alternative are discussed in the following sections.

#### **4.2.1 PROPOSED ACTION**

##### **4.2.1.1 Soils**

Potential impacts to soils from the Proposed Action include the removal of vegetation, mixing of soil horizons, soil compaction, increased susceptibility of the soils to wind and water erosion, contamination of soils with petroleum products, loss of topsoil productivity, and destruction of biological soil crusts. Surface disturbance and removal of vegetation, including biological soil crusts, could also cause indirect effects on soils by reducing their water holding capacity. The loss of water holding capacity and impacts on microorganisms from increased erosion, removal of biological soil crusts, and contamination could also indirectly lead to the loss of topsoil productivity and the ability of these soils to support vegetation.

Implementation of the Proposed Action would initially disturb up to 45 acres of the Winteridge-Moonset soil association and approximately 2.5 acres of the Towave-Gompers-Rock outcrop association. Soils would be disturbed during construction of well pads, access roads, and pipelines.

The primary effect of surface disturbances on soil resources is increased erosion and the resulting potential increase in sediment yield to nearby ephemeral drainages, Willow Creek, and livestock ponds. Excavation of proposed well pads could result in increased erosion of Tumbleweed II Project Area soils. Additional erosion may also be expected from construction of access roads and pipelines. The increased erosion of soils could potentially lead to increased sedimentation in water courses, siltation of ponds, and loss of vegetative cover if BMPs are not properly implemented.

The natural, background erosion rate for soils within the Uinta Basin is reported to be about 1.45 tons per-acre per-year (BLM 1984). The majority of the sediment included in this average rate is thought to be derived from erosion of the badlands areas that occur to the northeast of the Tumbleweed II Project Area (BLM 1984). Therefore, the erosion rate for the Winterridge-Moonset association is likely lower than this estimate.

Studies concerning the amount of increased erosion associated with the construction of oil and gas facilities have not been conducted. However, two studies conducted on sediment yield from disturbed surfaces provide some insight into the amount of increased erosion that could be expected from construction of well pads, roads, and other project facilities in the Tumbleweed II Project Area. Lusby and Toy (1976) reported that yields from reclaimed surface coal mines were initially 300 percent to 600 percent higher than from undisturbed surfaces. Frickel et al. (1975) found that yields increased to about 2.9 tons/acre/year (about a 100 percent increase) in the Piceance Basin of Colorado after construction of oil shale project facilities. Using these studies as examples, it is assumed that average erosion rates for soils in the Tumbleweed II Project Area would initially triple from about 1.45 tons/acre/year to about 4.35 tons/acre/year.

Based on this assumption, erosion rates within the 47.7-acre “zone of influence” would initially increase from a background rate of 68.8 tons/year to 206.6 tons/year. In general, erosion estimates are subject to considerable uncertainty. Factors which contribute to the uncertainty include the exact location of the various facilities, the actual road and pipeline gradients, the effectiveness of BMPs, surface roughness, the amount of vegetative cover, and climatic conditions. As such, this erosion estimate and other alternative-specific estimates should be considered to be accurate within the range of +/- 100 percent. However, because the estimates were made using the same set of assumptions for each alternative, they provide a valuable way to compare the potential increased erosion that would result under the various alternatives.

Contamination of surface and subsurface soils near gas facilities can occur in oil and gas fields. Sources of potential contamination include leaks or spills of liquid hydrocarbons from wellheads, conveyance pipelines, produced water sumps, and oil storage tanks. Other potential sources of soil contamination include leaks of saline water, liquid hydrocarbons, and hydro-fracturing chemicals from reserve pits, and spills and leaks of fuels and lubricants from vehicles and drilling equipment. Petroleum released to surface soils infiltrates the soil and can migrate vertically until the water table is encountered. Direct impacts from such a spill or leak on soils could include loss of vegetation, disruption of microbial communities, and changes to physical soil characteristics. Depending on the size and type of spill, the indirect effects on soils would primarily consist of the potential loss of soil productivity.

Compaction due to construction activities at the well pads and along access roads would reduce aeration, permeability, and water-holding capacity of the soils. An increase in surface runoff could be expected, potentially causing increased sheet, rill, and gully erosion. In addition, the segregation and reapplication of surface soils would cause the mixing of shallow soil horizons, resulting in a blending of soil characteristics and types. This blending would modify physical characteristics of the soils including structure, texture, and rock content, which could lead to reduced permeability and increased runoff from these areas. Compaction and blending could also reduce the reclamation potential of the soils.

Mapping of biological soil crusts has not been performed in the Tumbleweed II Project Area. However, based on its physical and biological characteristics, the Winterridge-Moonset soil association has a potential to support biological soil crusts. In addition to direct disturbances associated with construction activities, biological soil crusts are also vulnerable to vehicle traffic, livestock grazing, horseback riding, and pedestrian traffic. The fibers that compose the tensile strength of biological soil crusts are weak in comparison to the compressional strength placed on the crusts by machinery, human footprints, big game, livestock, or wild horse hoof prints. The impact of a given surface disturbance on biological soil crusts

depends upon its severity, frequency, timing, and type, as well as the weather conditions during and after the disturbance (Belnap et al. 2001). Biological soil crusts occurring in the Tumbleweed II Project Area have been disturbed primarily from livestock, wild horses, and wildlife. Surface disturbances associated with the Proposed Action could add to these disturbances by breaking, overturning and burying soil crusts to various degrees (Belnap et al. 2001). As stated in **Section 3.2.1**, it is assumed for purposes of this EA that biological soil crusts may occur wherever the Winterridge-Moonset association is present in the Tumbleweed II Project Area. It is further assumed that the Proposed Action could result in the direct disturbance of 47.7 acres of biological soil crusts, which is less than 1.8 percent of the 2,647 acres that of land that have potential to support biological soil crusts within the Tumbleweed II Project Area. The recovery of biological soil crusts is slow, on the order of hundreds of years. Therefore, any loss of biological crusts would be considered to be a long-term impact (Belnap et al. 2001).

#### 4.2.1.2 Water Resources

##### Surface Water

Soil erosion calculations reveal that an estimated 206.6 tons/year of additional erosion could be expected to occur as a result of the Proposed Action. Over time, short-duration precipitation events and snowmelt could erode Tumbleweed II Project Area soils, thereby increasing the sedimentation of adjacent waterways. Sedimentation into adjacent streams could potentially degrade aquatic habitat by covering drainage substrates with fine sediment and acting as a carrier for other pollutants (trace metals, pesticides, plant nutrients, etc.). Because of the soil structure and limited precipitation in the Uinta Basin, the natural sediment load during rain events and during snowmelt is extremely high. Based on data collected at USGS gauging stations (the median of the calculated sediment loadings in tons/year), existing sediment loading in Willow Creek averages about 91,615 tons/year and the annual sediment loading in the Green River at Ouray, Utah is about 6,789,000 tons. The highest sediment loading occurs during the months of May and June from snowmelt runoff. If it is conservatively assumed that all sediment from the construction of the project facilities would eventually be transported to Willow Creek, the increased sediment loading to Willow Creek would be only about 0.23 percent. If all additional sediment were delivered to the Green River, the increase in sediment loading would be about 0.003 percent. Total dissolved solids could be expected to rise by similar amounts. However, because of natural factors that attenuate sediment delivery to creeks, and the application of BMPs, the actual amount of additional sedimentation that would be delivered to Willow Creek and on the Green River would be much less. Therefore, the amount of increased sediment loading in Willow Creek and the Green River would be negligible.

The Proposed Action would not result in direct surface disturbance to any Tumbleweed II Project Area drainages, other than the slightly increased sedimentation described above. There is a slight chance that development and production activities could lead to contamination of nearby surface water resources. Sources of potential surface water contamination include leaks from wellheads, pipelines, and oil storage tanks; leaks from tanker trucks; leaks of produced water, fracturing fluids, and liquid hydrocarbons from reserve pits; leaching of contaminants from impacted soils near these facilities; and fuel spills. To reduce the potential for hydrocarbon contamination of Tumbleweed II Project Area drainages, several environmental protection measures would be implemented as described in Section 2.1.14. All pipelines would be designed to minimize the potential for spills and leaks and would be permitted through the APD or ROW grant process as appropriate. All storage tanks and production facilities that contain oil, glycol, produced water, or other potentially hazardous fluids would be surrounded by secondary means of containment for the entire contents of the largest single tank in use plus freeboard for precipitation or other appropriate containment and/or diversionary structures or equipment so that any discharge from a primary containment system, such as a tank or pipe, would not drain, infiltrate, or otherwise escape to groundwater or surface waters before cleanup is completed. In addition, a SPCC Plan, which outlines the

methodology to be used in the event of a spill, would be prepared and would be maintained onsite at all times. The SPCC Plan would describe how to contain a spill and how to facilitate rapid clean up of any spill prior to its contamination of either surface or subsurface waters. In the unlikely event that a release or spill occurs, steps would be immediately initiated to stop and contain the spill/leak and to remediate the impacted materials, thus reducing the likelihood of impacts to nearby drainages, and subsequently the Green River.

Soils compacted on existing roads, new access roads, and well pads generate more runoff than undisturbed sites. The increased runoff could lead to slightly higher peak flows in Willow Creek, potentially increasing erosion of the channel banks. The increased runoff could also lead to more efficient sediment delivery and increase turbidity in Willow Creek during storm events. The magnitude of these impacts cannot be quantified, but is expected to be minor based on the small increase in surface water runoff that would be generated.

Hydro-fracturing would be conducted as part of the Proposed Action. Hydro-fracturing is commonly used to enhance the recovery of natural gas from relatively impermeable “tight” sandstones, and involves the injection of water or other fluids, which may contain some petroleum constituents, and sand or some other “proppant” into the formation. Hydro-fracturing would occur at depths that are 12,000 feet or more below the surface. Therefore, because of the great depth at which hydro-fracturing would be conducted, the potential for impacts to surface water resources from the proposed hydro-fracturing is considered to be negligible.

Consumptive water use reduces flows throughout the Upper Colorado River Basin, leading to cumulative habitat losses for aquatic species. Water used for drilling purposes would be obtained from a private surface owner located in Main Canyon. The surface owner has been granted water use through State of Utah Application #49-123. This water is considered part of the Upper Colorado River Basin. Drilling and completion may require up to 100 days per well, therefore, up to 27.8 acre-feet of water could potentially be used for dust suppression. Total water use for drilling, completion, and dust suppression over the life of the project would be approximately 45.8 acre-feet. Given the average annual streamflow of 4,064,290 acre-feet, as recorded by the USGS Green River Gauging Station near Ouray, Utah, this project-related depletion of water is hydrologically negligible.

#### 4.2.1.3 Vegetation Resources

##### Vegetation Communities, Including Noxious and Invasive Weeds

Under the Proposed Action, a total of approximately 47.7 acres of vegetation, including approximately 21 acres of recent habitat restoration work completed by the BLM and UPCD, would be removed during construction, drilling, and completion activities. As discussed in **Section 4.2.1.1**, the removal of vegetation and disturbance to underlying soils could increase soil erosion, soil compaction, and sediment yield to nearby ephemeral drainages, Willow Creek, and livestock ponds. These impacts would result in the loss of topsoil productivity, which would decrease overall vegetative productivity and ultimately reduce available forage for livestock, wild horses, and wildlife.

According to NRCS data and recent field observations (BLM 2009b), reclamation potential in the Tumbleweed II Project Area is considered fair. Based on this information, in the Tumbleweed II Project Area where reclamation is implemented, it would be expected that ground cover by herbaceous and shrub species (e.g., rabbitbrush) could re-establish within 5 to 7 years following seeding of native plant species and diligent weed control efforts, consequently reducing soil erosion. Other vegetation types (e.g., sagebrush and pinyon-juniper woodlands) would take longer to recover. For example, it could take

approximately 20 to 50 years or more for larger shrubs and woodland species to be successfully reclaimed to pre-disturbance conditions.

The spread of non-native plants and noxious weeds is a concern in areas that are disturbed, such as along roadsides and wildlife use areas. During production, traffic associated with operational activities would continue to contribute to weed infestations and establishment. Establishment of weed species could delay or deter revegetation efforts. In addition, the season-long grazing use of the current population of wild horses would also slow the establishment of desirable plant species. Wild horses could potentially be drawn to the seeded areas and graze the newly germinated grasses and forbs. Removal of desirable vegetation could allow noxious and invasive species to establish in these disturbed areas. It is important to note that the above-mentioned impacts would be reduced under the Proposed Action by reclamation practices, weed control measures, and implementation of ACEPMs for vegetation and soil resources.

### Commercial Forests and Woodlands

Under the Proposed Action, approximately 3.2 acres of commercial forests and woodland areas in the Tumbleweed II Project Area could be directly affected; in areas where mixed conifer trees are removed to construct well pads, roads, pipelines, and associated project infrastructure. Prior to surface-disturbing activities in these areas, Stewart would obtain a permit from the BLM for removal of the timber and would compensate the BLM for its economic value.

### Vegetation Resources Mitigation

To mitigate the loss of recently completed habitat restoration work within the Tumbleweed II Project Area, the BLM will consider compensatory mitigation on an “as appropriate basis” in proportion with annual project-related disturbance. As feasible, the location of the habitat restoration work would be identified within the Tumbleweed II Project Area, and similar restoration efforts would be implemented as had previously been completed. Work would likely consist of removing encroaching pinyon and juniper trees from the sagebrush habitat in order to enhance sagebrush habitats. Vegetation mitigation would be completed at the expense of the operator. The details of this mitigation plan would be determined by the BLM and UDWR.

While the conversion of pinyon-juniper habitats into sagebrush habitats would have a beneficial effect on sage-grouse and mule deer, the proposed mitigation would reduce habitat availability for species that occur within or use pinyon-juniper habitat. However, in the Vernal Field Office the extent of pinyon-juniper habitat is far greater than that of sagebrush habitat. Thus, the positive effects of creating or improving sagebrush habitat (which is a declining vegetative community in the west and provides key habitat for a number of wildlife species) would generally outweigh the potential negative impacts of habitat loss in the more widespread pinyon-juniper community.

#### 4.2.1.4 Rangeland Management and Wild Horses

### Rangeland Management

Under the Proposed Action, livestock grazing opportunities would be directly affected by a small-scale loss of vegetation, and thus browse and forage, within the Tumbleweed II Project Area. In Horse Point Pasture #4 of the Winter Ridge Allotment, the Proposed Action would result in the initial disturbance of approximately three AUMs<sup>7</sup>. This loss would equate to an approximate 0.8 percent reduction of overall capacity of the 370 AUMs in the Tumbleweed II Project Area. However, it is important to note that this

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<sup>7</sup>47.7 acres / 14 ac/AUMs = 3.4 AUMs

loss would not affect current grazing management practices or result in a reduction of the current grazing permit. Under the Proposed Action, no new fences (aside from those surrounding reserve pits) or other features that would affect livestock movement would be built. However, livestock could be temporarily displaced from grazing areas as a result of drilling and completion construction activities, and for the life of the project in areas where well pads are located. Displaced livestock could forage in adjacent, undisturbed areas, thereby causing increased grazing impacts in those areas.

Since reserve pits would be properly fenced in accordance with Onshore Order #1 to exclude livestock or wild horses, no livestock losses are anticipated due to exposure of livestock to reserve pits.

Four existing ponds used by livestock, wild horses, and wildlife are located within the Tumbleweed II Project Area. The integrity of those water sources could potentially be impacted by construction activities under the Proposed Action. Degradation of these water sources, potentially resulting from increased erosion, sedimentation, and changes to surface water runoff, could result in the displacement of livestock into Willow Creek and Meadow Creek.

### Wild Horses

Surface disturbances associated with the Proposed Action would result in the loss and fragmentation of approximately 47.7 acres of wild horse grazing habitat in the Winter Ridge Herd Area. The Proposed Action could also temporarily displace wild horses due to increased traffic activity, human presence, and noise during construction, drilling, and completion. Displaced wild horses could forage in adjacent, undisturbed areas, thereby causing increased grazing impacts in those areas. As previously stated, management guidelines in the Vernal Field Office Approved RMP have prescribed for wild horses to be removed from the Winter Ridge Herd Area (BLM 2008a). As such, any potential impacts to the existing herd as a result of the Proposed Action would only occur until these animals are removed. Implementation of the Proposed Action, which includes the construction of surface pipelines, pits, well pads, and roads, has potential to inhibit the gathering and removal process. A high level of risk is associated with gathers due to the use of low-flying helicopters and ground support. The movement of horses while they are running could be affected depending on how the horses in front react to linear pathways (e.g., roads, pipelines, etc.), as well as other surface objects (e.g., rock outcrops, trees, and human made infrastructure). The manner in which horses react is fairly unpredictable and therefore, project-related surface occupancy and surface disturbance could affect the gathering process.

Since reserve pits would be properly fenced in accordance with Onshore Order #1 to exclude livestock or wild horses; no wild horse losses are anticipated due to exposure of horses to reserve pits.

Four existing ponds used by livestock, wild horses, and wildlife are located within the Tumbleweed II Project Area. The integrity of these water sources could potentially be impacted by construction activities under the Proposed Action. Degradation of these water sources, resulting from increased erosion, sedimentation, and changes to surface water runoff, could result in the displacement of wild horses into Willow Creek and Meadow Creek.

### Rangeland Management and Wild Horses Mitigation

In order to offset potential impacts to water sources, the guzzler within Section 4, T15S, R21E could be improved for livestock, wild horse, and wildlife use. As an alternative to improving the existing guzzler, the BLM would consider requiring the construction of a new guzzler at ~ UTM 625751, 4376800. The decision as to which of these mitigation measures would be implemented will be determined following project approval but prior to additional surface disturbance.

At the direction of the BLM, the operator would improve the four existing ponds within the Tumbleweed II Project Area in order to minimize displacement of animals and to offset potential impacts to water sources.

#### 4.2.1.5 Fish and Wildlife Resources

To determine the impacts of the Proposed Action on fish and wildlife resources in the Tumbleweed II Project Area, specific project components were examined relative to the temporal and spatial patterns of both resident and migratory wildlife species and current wildlife population trends in the Tumbleweed II Project Area. The primary impacts to wildlife resources would be the loss, disturbance, and/or fragmentation of habitat, and temporary displacement from habitat due to increased traffic activity, visual disturbances on the landscape, and human presence during construction, drilling, and completion activities, as well as operational activities. The severity of these impacts would depend on factors such as the sensitivity of the species, seasonal use patterns, type and timing of project activities, and physical parameters of affected areas (e.g., topography, vegetative cover, weather, etc.). Other impacts could include increased potential for wildlife poaching as a result of increased access to, and human activity in, the Tumbleweed II Project Area, and indirect impacts to wildlife habitat quality and quantity as a result of the potential for increased levels of weed infestation and soil erosion. These impacts could temporarily decrease wildlife reproductive success and nutritional condition by increasing energy expenditure. Increased energy expenditure could result as a physical response to noise and visual disturbances.

##### General Wildlife Species

The disturbance of 47.7 acres of wildlife habitat associated with the construction of wells, roads, pipelines, and related facilities would reduce habitat availability for a variety of wildlife species. Project implementation would also indirectly increase the level of functional habitat loss and habitat fragmentation in the Tumbleweed II Project Area; however, this reduction in habitat is not expected to negatively impact common wildlife species because of the following:

Many common wildlife species are habitat generalists, meaning they are not tightly restricted to specific habitat types; and

Many of the species-specific Applicant-Required Measures (**Section 2.1.14**) and ACEPMs (**Section 2.1.15**) would afford protection to the general wildlife species discussed in this document.

In addition, implementation of the Proposed Action would result in increased traffic during construction, drilling, and completion activities, thereby increasing the potential for collisions between wildlife and motor vehicles. As such, potential direct impacts to small mammals or reptiles would also include accidental mortality from collisions with motor vehicles on Tumbleweed II Project Area roads and by equipment at the construction sites. However, as vehicle speeds on Tumbleweed II Project Area roads would be low due to the physical terrain, the potential for wildlife-vehicle collisions would be low.

##### Big Game

###### *Elk and Mule Deer*

Surface disturbances associated with the Proposed Action would result in the disturbance of approximately 47.7 acres of UDWR-designated crucial value winter elk range and substantial value winter mule deer range. Habitat loss and fragmentation resulting from these disturbances could result in reduced habitat use by both elk and mule deer within and near disturbed areas, increased animal densities in adjoining habitats, and increased stress from intra- and inter-specific competition.

Disturbance from human activity could also reduce relative habitat values for elk and mule deer (Nicholson et al. 1997), especially during periods of heavy snow cover and cold temperatures. Both species typically experience severe physiological stress during the winter, particularly gestating females, because they require higher energy levels for survival and successful reproduction (Karpowitz 1984). The increased presence of vehicles, equipment, and people within the Tumbleweed II Project Area, combined with the potential for insufficient winter forage, could result in increased energy expenditures by elk and mule deer during severe winter periods (Garrott and White 1982; Karpowitz 1984). In addition, disturbances from drilling activities and increased traffic could temporarily displace elk and mule deer from habitats (including winter range) in areas of human activity (Edge and Marcum 1991). When displaced, individual elk and mule deer would move to other adjacent habitats where competition for resources may increase.

The Tumbleweed project is exploratory in nature, and human disturbances (i.e., increased traffic, noise, and human presence) caused by construction, drilling, and completion activities may be short-term in nature.

For wells that are productive, ongoing operational activities associated with the Proposed Action (e.g., pumper visits, workovers, etc.) could result in visual and noise related impacts on wildlife populations within the Tumbleweed II Project Area that could last for the 20 to 30 year life of the project.

Overall, individual elk and mule deer may be negatively affected by the direct and indirect impacts of the proposed project; however, the majority of these impacts may be temporary (i.e., lasting only during construction, drilling and completion activities). Furthermore, application of winter surface disturbance and drilling restrictions (December 1 – April 30) would reduce impacts to elk and mule deer winter habitat values. Given the temporary nature of most impacts and possible implementation of seasonal closures, the Proposed Action is not likely to negatively impact elk or mule deer at population levels.

### *Pronghorn Antelope*

Surface disturbances associated with the Proposed Action would result in the loss and fragmentation of UDWR crucial summer pronghorn habitat. Approximately 21.4 acres of surface-disturbing activities associated with the Proposed Action would occur within UDWR substantial value summer pronghorn habitat, and long-term impacts would be reduced as a result of reclamation. Habitat loss and fragmentation, as well as visual and noise disturbances, could result in reduced habitat use by pronghorn within and near disturbed areas, increased animal densities in adjoining habitats, and increased stress from intra- and inter-specific competition.

Ongoing operational activities associated with the Proposed Action (e.g., pumper visits, workovers, etc.) could result in small-scale visual and noise related impacts on wildlife populations within the Tumbleweed II Project Area that could last for the 20 to 30 year life of the project.

It is important to note that the Tumbleweed project is exploratory in nature, and human disturbances (i.e., increased traffic, noise, human presence) caused by construction, drilling, and completion activities may be short-term in nature. While individual pronghorn might be negatively affected by the direct and indirect impacts of the project, and given the periodical occurrence of the species within the Tumbleweed II Project Area, the Proposed Action is not likely to negatively impact the species at a population level.

### *Rocky Mountain Bighorn Sheep*

Surface disturbances associated with the Proposed Action would result in the direct loss and fragmentation of approximately 15.4 acres of UDWR crucial value year-long Rocky Mountain bighorn sheep habitat, in particular with surface disturbance activities associated with wells TUF #5-8 and TUF #4-3. Habitat loss and fragmentation, as well as visual and noise disturbances, could result in reduced habitat use by Rocky Mountain bighorn sheep within and near disturbed areas, increased animal densities in adjoining habitats, and increased stress from intra- and inter-specific competition.

Ongoing operational activities associated with the Proposed Action (e.g., pumper visits, workovers, etc.) could result in small-scale visual and noise related impacts on wildlife populations within the Tumbleweed II Project Area that could last for the 20 to 30 year life of the project.

It is important to note that the Tumbleweed project is exploratory in nature, and human disturbances (i.e., increased traffic, noise, human presence) caused by construction, drilling, and completion activities may be short-term in nature. While individual Rocky Mountain bighorn sheep might be negatively affected by the direct and indirect impacts of the project, given the periodical occurrence of the species within the Tumbleweed II Project Area, the Proposed Action is not likely to negatively impact the species at a population level.

### *Bison*

The primary effect from the Proposed Action on bison would be the loss of foraging habitat. Surface disturbances associated with the Proposed Action would result in the direct loss of approximately 47.7 acres of UDWR crucial value year-long bison habitat. Habitat loss resulting from these disturbances could result in reduced foraging habitat used by bison within the Tumbleweed II Project Area, and increased bison densities in adjoining habitats.

Ongoing operational activities associated with the Proposed Action (e.g., pumper visits, workovers, etc.) could result in small-scale visual and noise related impacts on wildlife populations within the Tumbleweed II Project Area that could last for the 20 to 30 year life of the project.

### Raptors

Temporary displacement of raptors from foraging habitats could occur due to the presence of humans and noise; however, after completion of construction, drilling, and completion operations, these impacts would be minimal. The Proposed Action would also result in a loss of approximately 47.7 acres of habitat for prey species. Given the abundance of foraging habitat in the surrounding area, habitat losses are not expected to reduce raptor prey bases to levels where take would occur. Based on the operator's commitment to conduct raptor nest inventories and to avoid construction or drilling activities within species-specific buffers of active raptor nests during the nesting season (see **Section 2.1.15.8**), the project is not likely to affect raptor nesting activity.

Ongoing operational activities associated with the Proposed Action (e.g., pumper visits, workovers, etc.) could result in small-scale visual and noise related impacts on raptors within the Tumbleweed II Project Area that could last for the 20 to 30 year life of the project.

It should be noted that the bald eagle, golden eagle, ferruginous hawk, and MSO are special status species and, therefore, impact analyses for these species are discussed under Special Status Species.

## Migratory Birds

The Proposed Action would result in a direct loss of 47.7 acres of habitat for migratory birds. Impacts to migratory birds in the Tumbleweed II Project Area would be dependent upon the seasons of construction, drilling, and completion activities. If these activities are completed in the late fall, many of the migratory species would have left the Tumbleweed II Project Area for southern wintering grounds. Surface disturbance and visual and noise impacts during this time would be temporary, and project-related impacts would not likely have a measurable impact on migratory bird populations as a whole or individual species in general. If construction, drilling, and completion were to occur during the spring or summer months, the Proposed Action could result in potential disturbance of breeding or nesting activities or habitats.

This potential effect would have a greater impact on PIF Priority Species or BCC migratory bird species (**Section 3.2.5.3**) that may be nesting in the Tumbleweed II Project Area due to their smaller population sizes and limited distribution. Ground, shrub, and pinyon-juniper nesting species may be affected by habitat loss due to the removal of vegetation along pads and ROWs. As with other wildlife species discussed in this EA, displacement may cause individual birds to move into less suitable habitats or into habitats where inter- and intra-specific competition may occur. However, given the exploratory nature of this project and the short duration of construction, drilling, and completion impacts, implementation of the Proposed Action is not likely to result in a loss of viability in the Tumbleweed II Project Area, nor cause a trend toward Federal listing of these species.

Ongoing operational activities associated with the Proposed Action (e.g., pumper visits, workovers, etc.) could result in small-scale visual and noise related impacts on wildlife populations within the Tumbleweed II Project Area that could last for the 20 to 30 year life of the project.

## Wildlife Mitigation

No surface disturbing activities that would result in adverse impacts to deer and elk within crucial value winter range would be allowed from December 1-April 30.

### 4.2.1.6 Special Status Species

Section 7(a) of the ESA requires Federal agencies to evaluate their actions with respect to any species that is proposed or listed as endangered or threatened and with respect to its critical habitat, if any has been designated. Regulations implementing this interagency cooperation provision of the ESA are codified at 50 CFR 402. Section 7(a)(2) requires Federal agencies to ensure that activities they authorize, fund, or carry out are not likely to adversely affect or jeopardize the continued existence of a Federally-listed species, or result in the adverse modification or destruction of its designated critical habitat. If a Federal action “may affect, is likely to adversely affect” a Federally-listed species or its critical habitat, the responsible Federal agency must enter into formal consultation with the USFWS. Candidate and BLM Sensitive species are also managed to prevent future Federal listing as threatened or endangered. The sections below describe the special status species that may be affected by the Proposed Action.

## Colorado River Endangered Fish Species

Although Willow Creek and Upper Bottom Creek do not provide habitat elements to support the endangered Colorado River fish, fish inhabiting areas downstream of the Tumbleweed II Project Area in the Green River could be affected by implementation of the Proposed Action as a result of water depletion for drilling, completion, and dust suppression operations.

Water depletion for the Proposed Action is based on the use of water permit 49-123 in the SW¼ of Section 32, T15S:R23E. The water source for this State-approved water right consists of an unnamed spring in Main Canyon, a tributary to Willow Creek, and subsequently to the Green River. This water right is considered a historic depletion.

Water depletions from the Upper Colorado River Drainage System, along with a number of other factors, have resulted in such drastic reductions in the populations of the Colorado pikeminnow, humpback chub, bonytail, and razorback sucker that the USFWS has listed these species as endangered and has implemented programs to prevent them from becoming extinct.

Water depletions reduce the ability of the river to create and maintain the primary constituent elements that define critical habitats. Food supply, predation, and competition are important elements of the biological environment. Food supply is a function of nutrient supply and productivity, which could be limited by the reduction of high spring flows brought about by water depletions. Predation and competition from nonnative fish species have been identified as factors in the decline of the endangered fishes. Water depletions contribute to alterations in flow regimes that favor nonnative fishes.

To address depletion issues, on January 21-22, 1988, the Secretary of the Interior; the Governors of Wyoming, Colorado, and Utah; and the Administrator of the Western Area Power Administration were cosigners of a Cooperative Agreement to implement the “Recovery Implementation Program for Endangered Fish Species in the Upper Colorado River Basin” (USFWS 1987). In order to further define and clarify the process in the Recovery Program, a Section 7 agreement was implemented on October 15, 1993, by the Recovery Plan participants. Incorporated into this agreement is a Recovery Implementation Program Recovery Action Plan (RIPRAP) which identifies actions currently believed to be required to recover the endangered fishes in the most expeditious manner. Activities and accomplishments under the Recovery Program provide the reasonable and prudent alternatives which avoid the likelihood of jeopardy to the continued existence of the endangered Colorado River fishes and avoid the likely destruction or adverse modification of critical habitat in Section 7 consultations on all impacts (except the discharge of pollutants such as trace elements, heavy metals, and pesticides) associated with historic water projects in the Upper Basin. Depletion charges or other measures are not required from historic projects.

The Proposed Action would result in water depletion from removal of water from the Upper Colorado River Drainage System for drilling, completion, and dust suppression operations. Therefore, the Proposed Action “*may affect, is likely to adversely affect*” the endangered Colorado pikeminnow, humpback chub, bonytail, and razorback sucker. However, because the aforementioned water depletion to the Upper Colorado River Basin is considered historic, a depletion fee payment would not be required. In addition, this project would tier to the Biological Opinion previously issued on September 17, 2007, for the original *Tumbleweed Exploratory Drilling Project EA (EA #UT-080-05-201)*. As such, re-initiation of formal Section 7 consultation with the USFWS would not be required to evaluate and offset impacts from water depletion to the Colorado River fish and their critical habitats in the Green River under the Tumbleweed II project.

### Bald Eagle

Potential impacts to wintering bald eagles are likely to be negligible for the following reasons: 1) there are extensive areas of similar wintering habitat found adjacent to the Tumbleweed II Project Area and 2) surface-disturbing activities could be limited during the winter season under 43 CFR 3101.1-2, which states that at a minimum, measures shall be deemed consistent with lease rights granted provided that they do not require relocation of proposed operations by more than 200 meters; require that operations be sited off the leasehold; or prohibit new surface-disturbing operation for a period in excess of 60 days in any lease year.”

## Golden Eagle

Surface disturbances associated with the Proposed Action would result in the direct loss of approximately 47.7 acres of year-round habitat for prey species such as mammals, songbirds, and reptiles. Grant et al. (1991) suggests that incremental destruction of habitat for a raptors' prey base (e.g. ground squirrels, rabbits, mice) has had the largest effect on raptor populations in the Uinta Basin. Proposed surface disturbance and resulting prey habitat loss would be compounded by prey base losses that are already occurring in the Uinta Basin due to the ongoing drought. The loss of some prey species may limit foraging opportunities for individual golden eagles; however, prey reduction is not likely to reach the scale where take occurs.

Based on the operator's commitment to conduct raptor nest inventories and to avoid construction or drilling activities within species-specific buffers of active raptor nests during the nesting season (see **Section 2.1.15.8**), the project is not likely to affect golden eagle nesting activity.

Ongoing operational activities associated with the Proposed Action (e.g., pumper visits, workovers, etc.) could result in small-scale visual and noise related impacts on golden eagles within the Tumbleweed II Project Area that could last for the 20 to 30 year life of the project.

Overall, the Proposed Action may affect individual golden eagles, but would not likely result in a trend towards Federal listing of the species.

## Greater Sage-grouse

Although anecdotal evidence has established that oil and gas development can cause sage-grouse populations to decline, the reasons for declines are still unknown (Connelly et al. 2000, Braun et al. 2002). Some potential impacts of oil and gas development to sage-grouse include: (1) direct loss and fragmentation of habitat from well, road, and pipeline construction, (2) increased human activity causing avoidance and displacement, and (3) increased predation from installation of infrastructure (i.e., storage tanks, power lines, etc.). Braun et al. (2002) maintains that oil and gas development may have negative short-term (site construction and drilling), and long-term (road developments) effects.

Surface disturbance associated with the Proposed Action would result in the following direct loss and fragmentation of 47.7 acres of sage-grouse crucial brooding habitats in the Tumbleweed II Project Area. Sagebrush habitats in the Project Area are primarily contiguous; however, existing roads have previously fragmented these habitats. Additional development across the Project Area would continue to fragment existing habitats and may deter sage-grouse from utilizing certain portions of the Project Area.

Numerous studies have determined that sage-grouse are affected by human activity (Lyon and Anderson 2003; Remington and Braun 1991; Braun 1986). These studies have determined that hens nested farther away from leks in areas where human disturbance occurred, and that nesting initiation rates were also lower. In addition, it was also determined that male attendance at leks was lower when human activity occurred within 3.2 kilometers. Despite these trends, Remington and Braun (1991) reported that sage-grouse were displaced by surface disturbing activities but returned to fluctuating pre-disturbance levels once activity ceased. Lyon and Anderson (2003) also stated that although disturbed areas had lower initiation rates than undisturbed areas, nest success between the two areas was the same. Despite these findings, there is no evidence that populations attain their pre-disturbance levels, and population reestablishment could require 20 to 30 years (Braun et al. 2002).

Historic sage-grouse leks have been identified in the Project Area and nesting and brooding habitat does exist throughout the majority of the area. The primary effect of the Proposed Action on sage-grouse would be displacement or abandonment of these areas due to increased disturbance from human activity, increased traffic, and noise associated with construction and drilling activities. Lyon and Anderson (2003) determined that traffic disturbance of 1 to 12 vehicles per day during the breeding season may reduce nest-initiation rates and increase distances from leks during lek-site selection. In addition, Ingelfinger (2001) determined that sagebrush obligate bird densities were reduced within 100 meters of a road, regardless of traffic volumes. Noise from construction activities would also affect sage-grouse during the period those activities are taking place at a given location. Sage-grouse may be temporarily displaced by this noise and other human activities until construction activities were completed. Project related activities under the Proposed Action would likely have the greatest potential impact on lek activity in the Project Area. As outlined in the Approved RMP (BLM 2008a), and committed to by Stewart Petroleum (**Section 2.1.15.8**), no surface disturbing activities would occur within 2 miles of the active lek from March 1 to June 15. Furthermore, if a lek is active, Stewart would limit all traffic (with the exception of traffic associated with emergency repairs or maintenance) within 2 miles of the active lek between 5:00am and 9:00am from March 1 to June 15. Based on adherence to these stipulations, potential impacts to the active lek in the Project Area would be minimized. However, sage-grouse utilizing this lek could experience increased general distress due to project-related noise impacts (e.g., increased traffic near the lek) that would occur in the Project Area throughout the life of the project.

Predation is the most commonly identified cause of direct mortality for the sage-grouse (Schroeder et al. 1999, Connelly et al. 2000). Sage-grouse have many predators, which can vary in relative importance depending on the sex and age of the bird and the time of year. Sage-grouse predator populations influenced by oil and gas activities primarily include raptors (i.e., eagles, hawks, owls, falcons). Increased infrastructure associated with oil and gas development (i.e., power lines, storage tanks, fences) provide additional roosting structures that raptors can utilize for predation. No power lines or fences would be developed under the Proposed Action, however central storage tank facilities would be present. As such, installation of these facilities could potentially increase raptor predation on sage-grouse in the Project Area. However, as discussed in **Section 2.1.15.8**, for active sage-grouse leks that are not visually screened from these well pads by natural topography or vegetation, low-profile tanks would be used to prevent increased predation on sage-grouse by raptors and visually obscure development activities from the line-of-sight of strutting grounds.

Based on the above information, implementation of the Proposed Action may impact individual sage-grouse and could cause overall habitat use in the Project Area to be altered. However, with implementation of timing and spatial restrictions these impacts would be minimized. Additional ACEPMs for greater sage-grouse, that would further reduce impacts related to raptor predation, are listed in **Section 2.1.15.8**.

### Mexican Spotted Owl

As of the publication date of this EA, 2 years of MSO surveys have been completed according to USFWS protocol for Stewart's proposed well pad locations (TUF #4-3, #5-8, #9-3, #9-11, #17-4, #17-12, and #18-9) and associated road and pipeline corridors. No MSO were seen or heard during any of the inventories conducted for this project (B&A 2009). Therefore, as of August 2009, Stewart's proposed development locations in the Tumbleweed II Project Area are cleared until the 2013 breeding season.

If construction, drilling, and completion activities were to begin after this clearance has ended (i.e., more than four years have elapsed between the end of the two seasons of surveys and the initiation of surface-disturbing activities at any proposed location), another 2-year inventory would be required prior to initiating any surface-disturbing activities. As discussed in **Section 2.1.15.8**, Stewart has committed to

several ACEPMs to protect MSO and their habitat. Specifically, no surface-disturbing activities would be allowed within “good” and “fair” habitat designations or within the ½-mile buffer of those designations until two years of survey have been completed in accordance with USFWS protocol. If MSO are documented during future surveys, the BLM would consequently follow USFWS protocol for PAC establishment and raptor management protocol defined in “*Best Management Practices for Raptors and Their Associated Habitats in Utah, August 2006*” (BLM 2008a). If no owls have been detected at the completion of the two seasons of calling surveys, no additional mitigation measures or BMPs (including timing and spatial restrictions) would be implemented.

Based on these continuing survey and PAC commitments, and that no MSO were documented during the 2008 and 2009 surveys, the Proposed Action would likely have no effect on breeding, nesting or foraging MSO. Furthermore, as the Proposed Action would not include any development within the Willow Creek and Upper Bottom Canyon corridors, potential impacts to designated MSO habitat would be minimal. Specifically, under the Proposed Action, 0.1 acre of good habitat and 0.2 acre of fair habitat would be disturbed as a result of construction activities. Based on the above assessment, BLM has determined that the Proposed Action “*may affect, is not likely to adversely affect*” the MSO.

#### Special Status Species Mitigation

No new surface-disturbing activities would be allowed within ½ mile of active sage-grouse leks year-round, unless with explicit cause and after consultation with the State, the BLM grants a variance to this buffer (PLPCO 2008).

##### 4.2.1.7 Recreation

Implementation of the Proposed Action would reduce opportunities for primitive and unconfined recreation in the Tumbleweed II Project Area. Individuals that are attracted to backcountry recreation and solitude would encounter new roads, oil and gas facilities, and human activity (e.g., dust, traffic, and noise) in an area where limited surface disturbance has occurred to date. Impacts would be greatest during the construction, drilling, and completion phases, but would continue throughout the production phase. Although impacts would also extend beyond the immediate area of surface disturbance into those areas that are within sight and sound of development, proposed facilities would be located on a ridge out of sight of Willow Creek and Upper Bottom Canyon, which are the areas where most recreational use takes place. Construction and drilling visual impacts would also be isolated geographically since only one drill rig would be operating in the Tumbleweed II Project Area at any given time. Visual impacts to primitive and unconfined recreation during production would be partially mitigated by painting all production facilities to blend with the natural landscape, and through the use of low profile tanks.

Noise from construction and drilling equipment would also reduce the quality of the opportunity for recreational users seeking solitude in the immediate vicinity of the development. Noise effects would largely be temporary in that they would last only during the time it would take to construct (daytime activity only) and drill (around the clock activity) the wells. During production, a limited loss of solitude would occur from noise and associated visual effects of the development. A drilling rig would be visible and would be heard throughout the Project Area for approximately 21 days per well. Tanks, wellheads, and metering equipment would be visible evidence of natural gas development activities. Slight impacts to solitude may also occur with the limited increase that can be expected in recreational and/or administrative use of the new access roads.

The Tumbleweed II Project Area offers opportunities for high-quality hunting. Since hunting opportunities are contingent upon the presence of wildlife, adverse impacts to wildlife would also affect

hunting opportunities. Disturbance and human activity could temporarily displace wildlife during the construction phase, thus temporarily reducing opportunities for hunting in the Tumbleweed II Project Area. However, impacts would likely be short-term and small-scale given that the project would be limited to the development of nine exploratory wells from seven well pads.

The 6.1 miles of new and improved road would increase access in the Tumbleweed II Project Area and possibly attract hunters that prefer hunting with motorized vehicles. On the contrary, the change in landscape could deter a segment of the hunting population that prefers hunting by foot or horseback. Increased access could also lead to illegal poaching.

If selected, the Proposed Action would authorize construction of new roads in areas that were previously inaccessible by motorized vehicle. No gating or seasonal closures are proposed. As discussed in the **Section 3.2.10**, OHV use within the Tumbleweed II Project Area is “limited” to designated roads and trails (BLM 2008a). New and improved roads would increase opportunities for OHV use within the limited use area. All new or upgraded roads would terminate at proposed well pads. In addition, no roads would be constructed in canyons and no new loop routes would be created. Therefore, it is expected that increased OHV use in the Tumbleweed II Project Area would be minimal.

#### 4.2.1.8 Cultural Resources

Cultural resources are sensitive and nonrenewable resources that can be irreversibly damaged or destroyed by surface-disturbing activities, such as site and road construction, and secondary surface activities, such as vehicular and pedestrian traffic. Oil and gas development in the Tumbleweed II Project Area is a Federal undertaking in accordance with 36 CFR 800. Any such undertaking must consider potential effects to significant historic properties and must conform to Federal regulations in determining effects that a project may have on significant cultural resources and in mitigating those effects determined to be adverse. As defined in 36 CFR 800, adverse effects to significant historic properties include physical alteration, damage, or destruction, alteration of the character of the setting of a property that contributes to its significance, or neglect that results in deterioration or destruction.

All cultural resources in the Tumbleweed II Project Area are protected by Federal and State legislation. Under the Proposed Action, and in accordance with these mandates, required measures outlined in **Section 2.1.14.2** would minimize the potential for project-related surface disturbance to directly affect known and unidentified cultural resources within the Tumbleweed II Project Area. Prior to beginning any project-related surface disturbance, all locations proposed for surface disturbance would be examined by an archaeologist approved by the appropriate SMA to determine the presence of cultural resources (i.e., Class III cultural resource inventories with 100 percent pedestrian field survey would be completed). Additional consultation would be completed with the Utah SHPO prior to the onset of development, as set out in existing regulations. If any cultural resources eligible for listing to the NRHP are identified, recommendations would be made to avoid or recover such resources. Furthermore, if cultural resources are uncovered during surface-disturbing activities, Stewart would suspend operations at the site and immediately contact the appropriate AO, who would arrange for a determination of eligibility in consultation with the Utah SHPO and if necessary, would recommend a recovery or avoidance plan. To date, Class I and Class III inventories have been completed for the TUF #18-9, #17-4, and #17-12 proposed well pads and associated access roads and pipeline corridors. Consultations for these locations have been completed with the Utah SHPO and Native American Tribes, and site-specific adjustments to these locations have been made, as necessary, to avoid eligible sites. Section 106 consultation and Native American consultation would be re-initiated on a site-specific level as appropriate, if previously unknown sites are found during surface-disturbing activities. Based on these requirements, the Proposed Action would likely have no direct impacts on known cultural resources or historic properties within the

Tumbleweed II Project Area. In addition, direct impacts to unidentified cultural resources or historic properties would be expected to be negligible.

Implementation of the Proposed Action could, however, result in indirect impacts to cultural resources throughout the Tumbleweed II Project Area. Cultural resources in the Tumbleweed II Project Area could be vulnerable to indirect impacts that frequently result from secondary surface activities (e.g., increased vehicular and pedestrian traffic). Secondary surface activities would result from increased human activity near construction sites, which would increase the potential for vandalism, surface artifact collection, illegal excavation of artifacts, and fugitive dust and erosion from OHV or other motorized vehicle use. These activities could lead to the damage, destruction, or removal of scientific information, the loss of research potential, the loss of interpretation possibilities, and the destruction of the character or setting of a site. These impacts could be short-term or could continue into the future. For example, impacts related to increased erosion would likely last until reclamation is successful. In the interim, these impacts would be minimized by reclamation activities, dust suppression, and ACEPMs to control erosion. The potential for other indirect impacts to affect cultural resources would be minimized by ACEPMs to educate employees, contractors, and subcontractors about relevant Federal regulations intended to protect archaeological and cultural resources. All personnel would be informed that collecting artifacts, including arrowheads, is a violation of Federal law and that employees engaged in this activity would be subject to disciplinary action.

Overall, the extent of project-related impacts on cultural resources would be dependent upon the presence of cultural resources in uninventoried portions of the Tumbleweed II Project Area. For the purposes of analysis in this EA, previously inventoried portions of the Tumbleweed II Project Area have been used to quantify the potential number, types, and distribution of cultural resources that may occur in uninventoried portions of the Tumbleweed II Project Area. As discussed in **Section 3.2.8**, surveys conducted for the 2,460 inventoried acres in the Tumbleweed II Project Area have resulted in the identification of 36 prehistoric and historic cultural resources. If the site density of these resources is assumed to be constant over the entire Tumbleweed II Project Area, a rough estimate of 100-110 cultural resources would be expected to be present in the Tumbleweed II Project Area. This estimate should be considered as a loose approximation because the inventories conducted to date may not be representative of the entire Tumbleweed II Project Area. For example, this estimate is likely high because a significant portion of the uninventoried area consists of steep cliff walls between Willow Creek and Winter Ridge. To date, inventories conducted of the western canyon wall have resulted in the identification of very few sites. Based on similar topography, it is assumed that very few new sites will be encountered in uninventoried areas associated with the eastern canyon wall.

Under the Proposed Action, most of the proposed well pads and associated infrastructure would be constructed on Winter Ridge. From the rim of Willow Creek to the rim of Upper Bottom Canyon, Winter Ridge covers approximately 2,685 acres. Of these lands, nearly 1,870 acres (or 70 percent) have been inventoried for cultural resources and eight archaeological sites have been identified. These cultural resources were all identified on or near the rims of the bounding canyons. To date, no cultural resources have been identified on the flat ridgetop. Given the extent of survey work previously conducted on Winter Ridge and the known distribution of sites in this area, it is assumed that very few new sites will be encountered in uninventoried areas and those that are found will likely be associated with canyon rims.

#### 4.2.1.9 Air Quality

The Proposed Action has different emission sources associated with two project phases: well development and well production. Well development includes emissions from earth-moving equipment, vehicle traffic, drilling, and completion activities. During well production there are continuous emissions from separators, condensate storage tanks, and daily tailpipe and fugitive dust emissions from operations

traffic. Air pollutant emissions from these sources would include: NO<sub>x</sub>, CO, PM<sub>10</sub>, PM<sub>2.5</sub>, and VOCs. Benzene, toluene, and n-hexane would be the primary HAPs emitted.

During the construction, drilling, and completion phase, vehicle and road dust emissions would be emitted within the Project Area. Vehicle emissions would result from work crews commuting to and from the work site and from the transportation and operation of equipment to construct wells pads, access roads, and pipelines. NO<sub>x</sub>, SO<sub>2</sub>, and CO would be emitted from vehicle tailpipes. Fugitive dust concentrations would increase with additional vehicle traffic on unpaved roads and from wind erosion in areas of soil disturbance. Drill rig and fracturing engine operations would result mainly in NO<sub>x</sub> and CO emissions, with lesser amounts of SO<sub>2</sub>. These temporary emissions would be short-term during the drilling and completion times. Air quality impacts will be greatly reduced at the conclusion of construction and drilling activities.

Overall, emissions during the long-term production phase are less than emissions during development. During the operational phase of the Proposed Action, NO<sub>x</sub>, CO, VOC, and HAP emissions would result from the long-term operation of condensate storage tank vents, and well pad separators. Additionally, road dust (PM<sub>10</sub> and PM<sub>2.5</sub>) would be produced by vehicles servicing the wells.

Emissions associated with gas compression were not evaluated because the existing Wolf Point Compressor has capacity to handle the additional gas from the Proposed Action. The air quality impacts for the Wolf Point Compressor were analyzed in the Questar Winter Ridge Pipeline EA, UT-080-06-362, ROW number UTU-76115.

Annual estimated emissions from the Proposed Action are summarized in **Tables 4-1, 4-2, and 4-3**. All development-related emission calculations, including well pad and road construction, well drilling, and well completion, assume all that nine wells and seven well pads would be developed in one year. Production and development emissions were calculated with the conservative assumption (i.e. assumption may overestimate effects) that all nine wells would be productive, and incorporating the ACEPMs identified in **Section 2.1.15.1 – Air Quality**.

Emission rates were calculated using applicable EPA emission factors and anticipated level of operational activities, such as estimated vehicle trips, load factors, and hours of operation. Development-related emissions would produce elevated pollutant levels but would be short-term and localized for the duration of the activities. Detailed emission calculations for each activity are shown in **Appendix D**.

Table 4-1. Annual Emissions for Development of the Proposed Action

Pollutant	Development Emissions (tons/year) <sup>1</sup>					Total (tons/yr)
	Construction	Wind Erosion	Drilling	Completion	Interim Reclamation	
NO <sub>x</sub>	2.60	-	20.0	1.46	1.76E-02	24.1
CO	0.91	-	12.4	4.58	0.14	18.1
VOC	0.17	-	1.79	1.37	1.1E-02	3.33
SO <sub>2</sub>	0.07	-	0.77	2.6E-02	1.1E-03	0.87
PM <sub>10</sub>	11.78	0.05	69.7	7.64	2.50	91.7
PM <sub>2.5</sub>	1.53	7.78E-03	8.00	0.87	0.26	10.7
Benzene	-	-	3.58E-03	0.03	-	0.03
Toluene	-	-	1.30E-03	0.03	-	0.03

Pollutant	Development Emissions (tons/year) <sup>1</sup>					Total (tons/yr)
	Construction	Wind Erosion	Drilling	Completion	Interim Reclamation	
Ethylbenzene	-	-	-	2.52E-03	-	2.5E-03
Xylene	-	-	8.91E-04	1.26.E-02	-	1.3E-02
n-Hexane	-	-	-	0.07	-	0.07
Formaldehyde	0.06	-	3.64E-04	8.68E-04	-	0.06

<sup>1</sup> Assumes 9 wells, 7 well pads developed in 1 year.  
Note: Please see appendix for emission calculations

Table 4-2. Total Annual Production Emissions from the Proposed Action<sup>1</sup>

Pollutant	Tons/Year			Total (tons/year)
	Well site Storage Tanks + Flare	Well site Heaters	Operations Vehicle	
NO <sub>x</sub>	0.4	3.83	0.11	4.3
CO	1.9	3.22	1.17	6.3
VOC	10.1	0.21	0.06	10.4
SO <sub>2</sub>	-	0.0	7.48E-03	7.5E-03
PM <sub>10</sub>	-	0.29	24.1	24.4
PM <sub>2.5</sub>	-	0.29	2.41	2.71
Benzene	0.33	8.1E-05	-	0.3
Toluene	0.08	1.3E-04	-	0.1
Ethylbenzene	0.00	-	-	0.0
Xylene	0.02	-	-	0.0
n-Hexane	0.15	0.07	-	0.2
Formaldehyde	-	2.9E-03	-	2.9E-03

<sup>1</sup> Emissions include 9 producing wells on 7 well pads (including associated operations traffic) Note: Please see appendix for emission calculations

Table 4-3. Tumbleweed Proposed Action Annual Emissions (tons/year)<sup>1</sup>

Pollutant	Development	Production	Total
NO <sub>x</sub>	24.1	4.3	28.4
CO	18.1	6.3	24.4
VOC	3.33	10.4	13.7
SO <sub>2</sub>	0.87	7.5E-03	0.9
PM <sub>10</sub>	91.7	24.4	116.1
PM <sub>2.5</sub>	10.7	2.71	13.4
Benzene	0.03	0.3	14.1
Toluene	0.03	0.1	3.5
Ethylbenzene	2.5E-03	0.0	0.2
Xylene	1.3E-02	0.0	0.8
n-Hexane	0.07	0.2	6.4
Formaldehyde	0.06	2.9E-03	0.1

<sup>1</sup> Emissions include 9 producing wells and associated operations traffic during the year in which the project is developed.

Note: Please see appendix for emission calculations

**Criteria Pollutant Ambient Air Quality Impacts**

Development PM<sub>2.5</sub> emissions from the three closest wells were evaluated. The emissions scenario consisted of one well pad/road being constructed, one well being drilled, and one well being completed. Each modeled well site had a well pad and one mile of road. As the locations are conceptual and the Project Area is relatively flat, AERMOD was run with the flat terrain option. **Table 4-4** shows the maximum predicted potential impacts of the Proposed Action development phase.

Table 4-4. Criteria Pollutants Maximum Predicted Impacts from the Proposed Action, Development Phase

Pollutant	Period	Project Impact (µg/m <sup>3</sup> )	Percent of PSD Class II Increment (Percent)	Uinta Basin Background Concentration <sup>d</sup> (µg/m <sup>3</sup> )	Maximum Project Impact Plus Background (µg/m <sup>3</sup> )	National and Utah Ambient Air Quality Standard (µg/m <sup>3</sup> )	Percent of NAAQS
PM <sub>2.5</sub>	24-hour Maximum Average	3.6 <sup>a</sup>	NA	15 / 52 <sup>e</sup>	18.6 <sup>f</sup>	35	53 %
	Annual Mean	0.06	NA	11	11.06	15	74 %
PM <sub>10</sub>	24-hour Maximum Average	8.2 <sup>b</sup>	27	71.5	70.8	150	48 %
NO <sub>2</sub> <sup>c</sup>	Annual Mean	1.97	8	17	18.97	100	19 %
CO	1-hour Maximum	403	NA	1,111	1,514	40,000	4 %
CO	8-hour Maximum Average	190	NA	1,111	1,301	10,000	13 %
SO <sub>2</sub>	3-Hour	22	4	20	42	1300	3 %
	24-Hour	5.8	6	10	15.8	365	4 %
	Annual	0.7	4	5	5.7	80	7 %

<sup>a</sup> Concentration estimate represents a 3-year average of the 8<sup>th</sup> highest 24-hour PM<sub>2.5</sub> concentrations.

<sup>b</sup> Concentration estimate represents a 5-year average of the 6<sup>th</sup> highest 24-hour PM<sub>10</sub> concentrations

<sup>c</sup> Modeled NO<sub>x</sub> converted to NO<sub>2</sub> (multiplied by 0.75)

<sup>d</sup> Source: Utah Division of Environmental Quality - Division of Air Quality (UDAQ).

<sup>e</sup> The state of Utah currently does not require PM<sub>2.5</sub> modeling for new sources and does not have an official background. The PM<sub>2.5</sub> concentrations given in this table represent 98<sup>th</sup> percentile values from limited PM<sub>2.5</sub> monitoring conducted in Vernal, Utah. The smaller figure is representative of average summer concentrations, while the larger value is representative of winter inversion conditions, based on this monitoring.

<sup>f</sup> Because the winter inversion PM<sub>2.5</sub> value does not represent typical conditions in the project area for the reasons described below, the value for average summer conditions was used in analyzing PM<sub>2.5</sub> impacts from the Proposed Action. The PM<sub>2.5</sub> monitoring location in Vernal, Utah was located in an urban setting with a high density of inhabitants and in proximity to highways (Highway 40 and Highway 191). As such, the higher, winter time inversion PM<sub>2.5</sub> concentration value reflects impacts from activities and activity levels not expected in the rural and sparsely inhabited region of the Proposed Action. Potential impacts from agricultural activities and wood burning would not be expected to measurably contribute to PM<sub>2.5</sub> concentrations in the region of the Proposed Action.

Operations

The production facilities were analyzed using AERMOD with terrain. **Table 4-5** shows the maximum-predicted air quality impacts with the appropriate NAAQS. As shown, the predicted impacts would be less than the applicable NAAQS during the operations phase of the Proposed Action. The maximum impacts are predicted to occur at the edge of the 18-9 well pad where the NO<sub>x</sub> sources include three heater separators.

Table 4-5. Criteria Pollutants Maximum Predicted Impacts from the Proposed Action, Operational Phase

Pollutant	Period	Project Impact (µg/m <sup>3</sup> ) well pad	Percent of PSD Class II Increment (%)	Uinta Basin Background Concentration <sup>d</sup> (µg/m <sup>3</sup> ) road	Maximum Project Impact Plus Background (µg/m <sup>3</sup> )	National and Utah Ambient Air Quality Standard (µg/m <sup>3</sup> )	Percent of NAAQS
PM <sub>2.5</sub>	24-hour Maximum Average	4.4 <sup>a</sup> well pad under construction	NA	15 / 52 <sup>e</sup>	19.4 <sup>f</sup>	35	55%
	Annual Mean	1.4	NA	11	12.4	15	83%
PM <sub>10</sub>	24-hour Maximum Average	4.7 <sup>b</sup>	16%	28	32.7	150	22%
NO <sub>2</sub> <sup>c</sup>	Annual Mean	13.8	55%	17	30.8	100	31%
CO	1-hour Maximum	387.3	NA	1111	1498.3	40,000	4%
CO	8-hour Maximum Average	169.9	NA	1111	1280.9	10,000	13%

<sup>a</sup> Concentration estimate represents a 3-year average of the 8<sup>th</sup> highest 24-hour PM<sub>2.5</sub> concentrations

<sup>b</sup> Concentration estimate represents a 5-year average of the 6<sup>th</sup> highest 24-hour PM<sub>10</sub> concentrations

<sup>c</sup> Modeled NO<sub>x</sub> converted to NO<sub>2</sub> (multiplied by 0.75)

<sup>d</sup> Source: Utah Division of Environmental Quality - Division of Air Quality (UDAQ).

<sup>e</sup> The state of Utah currently does not have an official background value for PM<sub>2.5</sub>. The PM<sub>2.5</sub> concentrations given in this table represent 98<sup>th</sup> percentile values from limited PM<sub>2.5</sub> monitoring conducted in Vernal, Utah and recorded in 2007. The smaller figure is representative of average summer concentrations, while the larger value is representative of winter inversion conditions, based on this monitoring.

<sup>f</sup> Because the winter inversion PM<sub>2.5</sub> value does not represent typical conditions in the project area for the reasons described below, the value for average summer conditions was used in analyzing PM<sub>2.5</sub> impacts from the Proposed Action. The PM<sub>2.5</sub> monitoring location in Vernal, Utah was located in an urban setting with a high density of inhabitants and in proximity to highways (Highway 40 and Highway 191). As such, the higher, winter time inversion PM<sub>2.5</sub> concentration value reflects impacts from activities and activity levels not expected in the rural and sparsely inhabited region of the Proposed Action. Potential impacts from agricultural activities and wood burning would not be expected to measurably contribute to PM<sub>2.5</sub> concentrations in the region of the Proposed Action.

Based on the model results, and the negligible amount of project-specific emissions, the Proposed Action is not likely to violate, or otherwise contribute to any violation of any applicable air quality standard, and may only contribute a small amount to any projected future potential exceedance of any applicable air quality standards.

Emissions of NO<sub>x</sub> and VOC, ozone precursors, can be seen to be 28.4 tons/yr for NO<sub>x</sub>, and 13.7 tons/yr of VOC from **Table 4-1** and **Table 4-2** (above) during the year of development. Thereafter emissions during production would decrease to 4.3 tons/yr for NO<sub>x</sub>, and 10.4 tons/yr of VOC. As can be seen from Table 4.9 below, emissions during project operations are estimated to represent less than 0.05% of the projected Uinta Basin emissions for NO<sub>x</sub> and VOC. Project emissions of ozone precursors would be dispersed and/ or diluted to the extent where any local ozone impacts from the Proposed Action would be indistinguishable from background conditions. Emissions of these infinitesimal levels can be expected to have a negligible impact on ozone formation.

#### Hazardous Air Pollutant (HAP) Ambient Air Impacts

The primary sources of HAPs are from oil storage tanks and smaller amounts from other production equipment. Small amounts of HAPs are emitted by construction equipment. However, these emissions are estimated to be less than 1 ton per year, and were not modeled. The central production facilities were modeled using AERMOD with terrain.

Modeled HAP concentrations were compared to available dose-response assessment data used by the EPA Office of Air Quality Planning and Standards for risk assessments of HAPs. Short-term impacts from HAP exposure were assessed by comparing maximum 1-hour average impacts to the HAP-specific acute reference exposure level (REL) and annual average impacts to the HAP-specific reference concentration (RfC for continuous inhalation exposure). The REL is the acute concentration at or below which no non-cancer adverse health effects are expected. The RfC is the average concentration (i.e., an annual average) at or below which no long-term, non-cancer adverse health effects are expected. As shown in **Table 4-6** the predicted concentrations for all HAPs are below non-cancer effect risk.

Table 4-6. Proposed Action Non-Carcinogenic Acute REL and RfC Impacts

HAP	REL <sup>a</sup> (µg/m <sup>3</sup> )	Predicted Maximum One-Hour Impact	Percent of REL	RfC <sup>d</sup> (µg/m <sup>3</sup> )	Predicted Maximum Annual Impact (µg/m <sup>3</sup> )	Percent of RfC
Benzene	1,300 <sup>b</sup>	63.1	4.9	30	1.6	5.33%
Benzene	160,000 <sup>c</sup>	22.3	0.01	NA	NA	NA
Toluene	37,000 <sup>a</sup>	15.8	0.04	5,000	0.4	0.01
Ethylbenzene	350,000 <sup>d</sup>	0.23	0.00	1,000	0.01	0.00
Xylenes	22,000 <sup>a</sup>	7.9	0.04	100	0.20	0.20
n-Hexane	390,000 <sup>d</sup>	31.6	0.01	700	0.8	0.11

<sup>a</sup> REL is the California EPA reference exposure level for no adverse effects from EPA Air Toxics Database, Table 2 (EPA 2002a) <http://www.epa.gov/ttn/atw/toxsource/summary.html>

<sup>b</sup> REL for benzene is based on a 6-hr exposure (OEHHA 1999), predicted concentration is a 6-hr average.

<sup>c</sup> Immediately Dangerous to Life or Health (IDLH)/10 [determined by the National Institute of Occupational Safety & Health (NIOSH)], EPA Air Toxics Database, Table 2 (EPA 2007a) since no available 1-hr REL

<sup>d</sup> RfC is the reference concentration for no observed adverse effect from chronic inhalation (non-cancer) EPA Air Toxics Database, Table 1 (EPA 2007a) <http://www.epa.gov/ttn/atw/toxsource/summary.html>

The risk from long-term exposure to carcinogenic HAP emissions is assessed by comparison to the generally acceptable risk range of one additional cancer per one million exposed persons ( $1 \times 10^{-6}$ ) to one additional cancer per 10 thousand exposed persons ( $1 \times 10^{-4}$ ) (40 CFR § 300.430 (e) (2) (i) (A) (2)). Benzene and formaldehyde, the project HAP carcinogens, are evaluated.

Screening level risk assessment involves application of a HAP-specific unit risk factor. The unit risk factor is an upper-bound estimate of the probability of one additional person contracting cancer based on continuous exposure to  $1\text{-ug/m}^3$  of the substance over a 70-year lifetime. Exposure adjustment factors are calculated to adjust for actual exposure times. Cancer risk is estimated for two exposure scenarios: the most likely exposure (MLE) that individuals will experience and the maximally exposed individual (MEI).

The MLE scenario assumes people living in the Project Area. For the MLE exposure adjustment factor, it is assumed a family stays at a residence an average of 9 years and spends 64 percent of the day away from the home (EPA 1997). It is further assumed that households are exposed to one-quarter of the maximum concentration the remaining (36 percent) of the time. This results in an adjustment factor of 0.094  $[(9/70)*((0.64*1)+(0.36*0.25))]$ .

An example of an MEI could be that a pumper that visits well sites daily. For the MEI exposure adjustment factor, exposure is assumed to occur continuously (12 hours per day, 265 days per year) for the life of project (assumed to be 31 years). This results in an adjustment factor of 0.111  $[(12/24)*(265/365)*(31/70)]$ .

**Table 4-7** presents the unit risk factor, exposure adjustment factor, and the estimated cancer risk for the MLE and MEI exposure scenarios for benzene. A range of unit risk factors is available for benzene. Both cancer risk ranges are in the acceptable range of cancer risk.

Table 4-7. Proposed Action Carcinogenic HAP Risk

Exposure Scenario	Hazardous Air Pollutant	Unit Risk Factor ( $1/\mu\text{g/m}^3$ )	Exposure Adjustment Factor	Modeled Annual Impact ( $\mu\text{g/m}^3$ )	Cancer Risk
Most Likely Exposure	Benzene	7.8 in a million	0.094	1.6	1.2 in a million
	Formaldehyde	13 in a million	0.094	0.014	0.02 in a million
	<b>MLE MAX TOTAL RISK</b>				<b>1.2 in a million</b>
Maximally Exposed Individual	Benzene	7.8 in a million	0.111	1.6	1.4 in a million
	Formaldehyde	13 in a million	0.111	0.014	0.02 in a million
	<b>MEI MAX TOTAL RISK</b>				<b>1.4 in a million</b>

MEI = maximally exposed individual  
MLE = most likely exposure

There is uncertainty involved in adding cancer risk estimates together when exposure is to a mixture. Compounds in mixtures can interact synergistically (amplifying effects), antagonistically (reducing the effects), independently (no interaction), or they can have additive effects. The 'Max Total Risk' rows in **Table 4-7** represent the benzene risk which is likely to be a conservative risk estimate. As a result of the Proposed Action it is possible that 1.2 additional people out of 1,000,000 people exposed at the most

likely exposure level could contract cancer. A maximally exposed individual would have a 1.4 in 1,000,000 increased chance of contracting cancer.

Evaluation of Air Quality Applicant-Committed Environmental Protection Measures

Stewart Petroleum has committed to the implementation of several air quality ACEPMs as outlined in **Section 2.1.15.1**. The implementation of these ACEPMs would result in lower emissions from the Proposed Action, both during the development phase (lower NOx emissions) and during production operations (lower VOC emissions). These measures were quantified where possible.

In the short-term, as can be seen from **Table 4-8**, if the proposal is approved NOx emissions from drill rig engines during well development would be reduced by 44% during the year development occurs by the implementation of the ACEPMs. Long-term VOC emissions from well site stock tanks would be reduced by 95% for the life of the project by the implementation of the ACEPMs.

Table 4-8. Emission Reductions due to Tumbleweed II Air Quality ACEPMs

	Without ACEPMs (tons/yr)	With ACEPMs (tons/yr)	Emission Difference (tons/yr)	Percent Change
<b>Project Development</b>				
NOx Emissions from Drill Rig Engines	43.5	19.2	-24.3	-44%
<b>Project Operations</b>				
VOC Emissions from Well Site Tank Emissions	195.8	9.8	-186.0	-95%

Note: see **Appendix D** for emission calculations

4.2.1.10 Visual Resources

As discussed in **Section 3.2.10**, the Tumbleweed II Project Area offers a predominantly natural appearing landscape with little evidence of human activity. The construction and operation of natural gas facilities and associated features, such as roads and pipelines, would result in both short-term and long-term impacts to the visual landscape and cause a direct loss of naturalness. These noticeable visual intrusions would change the visual character of the landscape.

Exposure of new bare ground in previously vegetated areas would introduce changes to the area's predominate colors of sage green and dark woodland green. Nighttime drilling activities would involve safety lighting, breaking up the generally black effect of night in the Tumbleweed II Project Area. Increased fugitive dust from activities conducted on bare ground would create dust plumes and result in visual change in the landscape for short intervals during construction. The placement of permanent facilities, including tanks batteries on well pads would introduce new elements of line, form, color, and texture, which contrast with the natural landscape.

All proposed wells would be located along a ridge located out of sight of both Willow Creek and Upper Canyon Bottom. Due to the rugged topography and vegetative diversity of the Tumbleweed II Project Area, many facilities would be visually screened.

Visual resource impacts in the Tumbleweed II Project Area are analyzed in terms of consistency of the Proposed Action with the existing VRM classification. The proponent has agreed to a number of measures which would reduce the above-mentioned visual impacts. In particular, all permanent facilities located on site longer than 6 months would be painted a color to match the surround environment; water

or other approved suppressants would be used during construction activities to abate fugitive dust; interim reclamation would be implemented on all disturbed areas that are not needed for production activities; and low profile tanks would be used if determined necessary. Implementation of these measures would minimize direct, indirect, short- and long-term impacts to the visual landscape. Therefore, the Proposed Action would be consistent with the area's VRM Class III designation.

#### 4.2.1.11 Non-WSA Lands with Wilderness Characteristics

Under the Proposed Action, development of up to seven well pads with nine<sup>8</sup> deep exploratory wells, construction of up to 4.2 miles of new road surface, upgrading of up to 1.9 miles of existing road, and installation of production facilities would directly disturb approximately 47.7 acres within the Wolf Point wilderness characteristics area. Indirect impacts would extend beyond the 47.7 acres of direct disturbance, and would include those areas within sight and/or sound of construction activities or production facilities. To determine potential indirect effects of the project on wilderness characteristics, the assumption was made that areas within ½-mile of oil and gas related development and roads would lose the constituents used to define wilderness (i.e., naturalness and possessing opportunities for solitude and primitive and unconfined recreation). Using this assumption, a ½-mile sight and sound buffer was placed around the proposed well pads, roads, and pipelines and GIS calculations were run to determine how much of the wilderness characteristics area would be within ½ mile of development if the Proposed Action were implemented. Based on this analysis, a total of approximately 3,380 acres would be within ½ mile of development under the Proposed Action and would lose the constituents used to define wilderness characteristics

**Figure 4-1** illustrates the Proposed Action within the 11,802-acre portion of the Wolf Point area that were found to have wilderness characteristics. Impacts to the individual components of wilderness characteristics are described below:

*Size:* Implementation of the Proposed Action would directly disturb approximately 47.7 acres or less than one percent of the total area with wilderness characteristics. Although linear surface disturbances would be introduced into the natural landscape, the size of the wilderness characteristics area would not be segmented into areas less than 5,000 acres.

*Naturalness:* Changes in naturalness are often described in terms of human modification of the natural landscape. The construction and operation of natural gas facilities and associated roads and pipelines, would result in both short-term and long-term impacts to the area's predominantly natural appearing landscape that currently has little evidence of human activity. Proposed roads, pipelines, and well pads would cause a direct loss of naturalness on 47.7 acres (less than one percent of the total wilderness characteristics area) and change the natural character of the landscape. This loss would be dispersed throughout much of the wilderness characteristics area and would not be concentrated or centralized within one area.

Indirect impacts would include all changes in the natural environment that would be visible to the casual observer from within the wilderness characteristics areas (e.g., surface disturbance, construction equipment, and production facilities). Under the Proposed Action, it is assumed that the indirect loss of naturalness (i.e., those wilderness characteristics areas that fall within the ½ mile sight and sound buffer of development) could be up to 3,380 acres. However, due to the rugged topography, vegetation, and overall size of the impacted area, many facilities would be visually screened. Therefore, naturalness may still exist in isolated pockets throughout the impacted area.

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<sup>8</sup> As discussed in **Appendix B**, the TUF #18-9 was drilled and completed in 2007. However, given that the DR approving that well was remanded, the surface disturbance and impacts of that existing well pad, well, and associated roads, pipelines, and facilities are fully analyzed within this new EA, including potential effects on wilderness characteristics.

*Outstanding Opportunities for Solitude:* Noise from construction and drilling equipment would reduce the quality of the opportunity for solitude in the immediate vicinity of the development. These noise effects would be temporary in that they would last only during the time it would take to construct (daytime activity only) and drill (around the clock activity) the wells. During production, a limited loss of solitude would occur from noise and associated visual effects of the development. A drilling rig would be visible and would be heard throughout the Project Area for approximately 21 days per well. Tanks, wellheads, and metering equipment would be visible evidence of oil and gas development activities. Slight impacts to solitude may also occur with the limited increase that can be expected in recreational and/or administrative use of the new access roads. Constructing, drilling and maintaining the proposed wells, road, and pipeline would result in a direct loss of solitude on 47.7 acres (or less than one percent of the total unit) that were previously undisturbed. Implementation of the Proposed Action could indirectly impact approximately 3,380 acres of the wilderness characteristics area and opportunities for solitude.

*Outstanding Opportunities for Primitive and Unconfined Recreation:* Opportunities for primitive and unconfined recreation would be diminished in proportion to the expected loss of naturalness and solitude. In disturbed locations, the loss of opportunity for primitive recreation would be related to the change from an undeveloped setting to a more industrial setting. Due to the rugged topography and overall size of the impacted area, some of the facilities would be visually screened. Therefore, opportunities for primitive and unconfined recreation may still exist in isolated pockets throughout the impacted area; these opportunities would no longer be outstanding.

In summary, impacts to wilderness characteristics would last the life of the project until reclamation is complete. Although the proponent has agreed to a number of measures which would reduce the above-mentioned impacts (e.g., all permanent facilities located on site longer than 6 months would be painted a color to match the surround environment; water or other approved suppressants would be used during construction activities to abate fugitive dust; interim reclamation would be implemented on all disturbed areas that are not needed for production activities; and low profile tanks would be used if determined necessary), it is expected that wilderness characteristics would be degraded in the Wolf Point area. If all wells were developed and productive, the Wolf Point non-WSA lands with wilderness characteristics would lose their natural values due to the additive affect of surface disturbing activities, roads, pipelines, and production facilities. As predicted in Chapter 4 of the Vernal Proposed Plan/Final EIS (2008), the amount of lands currently under lease in the Wolf Point wilderness characteristics area - in combination with the anticipated development of those leases - would cause this area to lose the naturalness value and degrade the solitude and primitive recreation opportunities of the wilderness characteristic lands.

#### 4.2.2 NO ACTION ALTERNATIVE

Under the No Action Alternative, current management plans would continue to guide management of the Tumbleweed II Project Area, and the proposed natural gas exploration project, access road construction, and pipeline construction would not be implemented. As such, there would be no additional oil and gas related direct or indirect impacts to resources as a result of this alternative. Existing roads within the Tumbleweed II Project Area would continue to be used for access to existing oil and gas operations (i.e., the TUF #18-9 and Winter Ridge pipeline), grazing, and other land use activities. Future natural gas exploration in the Tumbleweed II Project Area could be considered on a case-by-case basis through the APD process or under separate NEPA analysis.

##### 4.2.2.1 Soils

Project-related impacts to soil resources, including biological soil crusts, would not occur under the No Action Alternative. Disturbance to Tumbleweed II Project Area soils would continue at present levels from existing oil and gas development, livestock grazing, wild horses, and recreational use.

#### 4.2.2.2 Water Resources

Project-related impacts to water resources would not occur under the No Action Alternative. Impacts to water resources would continue at present levels from existing oil and gas development, livestock grazing, and recreation.

#### 4.2.2.3 Vegetation Resources

Project-related impacts to vegetation resources would not occur under the No Action Alternative. Impacts to vegetation would continue at present levels from existing oil and gas development, livestock grazing, rangeland management, and recreational use. Weed infestation related to these activities would also continue at present levels or could potentially increase in the absence of weed control mitigation.

#### 4.2.2.4 Rangeland Management and Wild Horses

Project-related impacts to rangeland management and wild horses would not occur under the No Action Alternative. Impacts to rangeland management and wild horses would continue at present levels and from existing oil and gas development, and recreational use.

#### 4.2.2.5 Fish and Wildlife Resources

Project-related impacts to fish and wildlife would not occur under the No Action Alternative. Habitat loss/fragmentation, displacement, and other impacts would continue at present levels from existing oil and gas development, livestock grazing, and recreational use.

#### 4.2.2.6 Special Status Species

Project-related impacts to special status species would not occur under the No Action Alternative. Impacts to special status species would continue at current levels from existing oil and gas development, livestock grazing, and recreation.

#### 4.2.2.7 Recreation

Project-related impacts to recreation would not occur under the No Action Alternative. Impacts to recreation would continue at present levels from existing oil and gas development and livestock grazing.

#### 4.2.2.8 Cultural Resources

Under the No Action Alternative, project-related impacts to cultural resources would not occur. Impacts to cultural resources would continue at present levels from existing oil and gas development and recreational use.

#### 4.2.2.9 Air Quality

Under the No Action Alternative the proposed exploratory gas wells would not be drilled and there would be no additional impacts to air quality. Effects on ambient air quality would continue at present levels from existing oil and gas development in the region and other emission producing sources.

#### 4.2.2.10 Visual Resources

Under the No Action Alternative the proposed exploratory gas wells would not be drilled and there would be no additional impacts to visual resources.

#### 4.2.2.11 Non-WSA Lands with Wilderness Characteristics

Under the No Action Alternative, oil and gas related surface disturbance within the portion of the Wolf Point area found to have wilderness characteristics would be limited to the existing TUF #18-9 and associated road and pipeline. Under the No Action Alternative, additional well pads and associated pipelines, roads, and production facilities would not be developed and there would be no additional impacts to wilderness characteristics from oil and gas related activities. To estimate the indirect impacts under the No Action alternative, a ½ mile sight and sound buffer was applied to the existing TUF 18-9 well and associated access roads and pipelines. This GIS-based exercise showed that approximately 2,234 acres of the Wolf Point wilderness characteristics areas falls within ½-mile of existing oil and gas related development and roads and have lost the constituents used to define wilderness characteristics.

Additional project-related impacts to non-WSA lands with wilderness characteristics would not occur under the No Action Alternative. Disturbance to these areas would continue at present levels from existing oil and gas development, livestock grazing, and recreational use.

Impacts to the individual components of wilderness characteristics are described below:

*Size:* Under the No Action Alternative no additional well pads, access roads, or pipelines would be developed in the Tumbleweed II Project Area and there would be no further reduction in size of the wilderness characteristics area.

*Naturalness:* The continued operation of the TUF #18-9 and associated road and pipeline within the Tumbleweed II Project Area would continue to result in both short-term and long-term impacts to the predominantly natural appearing landscape that has little evidence of human activity. These oil and gas production facilities would continue to affect the natural character of the landscape in the southwest portion of the Wolf Point area. This existing infrastructure would continue to cause a direct loss of naturalness on approximately 7 acres. However, this loss is concentrated and centralized in one area within the wilderness characteristics lands, thus the naturalness of the area as a whole basically remains unchanged.

Indirect impacts would include all changes in the natural environment that would be visible to the casual observer from within the wilderness characteristics areas (e.g., surface disturbance, construction equipment, and production facilities). Under the No Action Alternative, it is assumed that the indirect loss of naturalness could be up to 2,234 acres. However, as the TUF# 18-9 well pad is located on a treed ridge, it is not visible from the majority of the surrounding wilderness characteristics area.

*Outstanding Opportunities for Solitude:* Noise from production equipment and pumper traffic has reduced the quality of the opportunity for solitude in the immediate vicinity of the producing well, pipelines and roads. The tanks, wellhead, metering equipment, and pipeline are visible evidence of the existing oil and gas activity. Slight impacts to solitude occur with the limited increase that can be expected in recreational and/or administrative use of the 0.6-mile, existing access road to the well pad. Maintaining the producing #18-9 well, road, and pipeline has resulted in a direct loss of solitude on approximately 7 acres in a concentrated and centralized area was previously undisturbed. However, under the No Action Alternative this existing development plus other development in the wilderness characteristics area would indirectly impact approximately 2,234 acres. Because the existing oil and gas

activity is limited within the 11,802-acre wilderness characteristics area, outstanding opportunities for solitude would basically remain unchanged outside of the existing disturbances.

*Outstanding Opportunities for Primitive and Unconfined Recreation:* Opportunities for primitive and unconfined recreation have been diminished in proportion to the loss of naturalness and solitude associated with existing development in the Tumbleweed II Project Area. Because existing oil and gas development is limited, the loss of opportunity for primitive recreation and change from an undeveloped setting to a more developed setting would be less than that under the Proposed Action. However, as the TUF# 18-9 well pad is located on a treed ridge, the facility is not visible from the majority of the surrounding wilderness characteristics area. Under the No Action Alternative, opportunities for primitive and unconfined recreation still exist throughout the majority of the Tumbleweed Project Area portion of the wilderness characteristics area except for the concentrated area of development near the TUF #18-9 location.

In summary, under the No Action Alternative, impacts to wilderness characteristics in the Wolf Point wilderness characteristics area would be directly impacted on approximately 7 acres within the Tumbleweed II Project Area.

#### 4.2.3 ALTERNATIVE C – BURIED PIPELINES

Under Alternative C, project-related impacts would be similar in nature to those discussed under the Proposed Action. However, surface disturbance would be slightly greater than under the Proposed Action as all 10-inch OD pipelines would be buried, which would require a wider ROW. Specifically, total surface disturbance in the Tumbleweed II Project Area would be approximately 62 percent (or 29.8 acres) greater under Alternative C than under the Proposed Action. Resource-specific differences are discussed in the sections below. In addition, it should be noted that recommended mitigation for certain resources (i.e., vegetation, wildlife, special status species, and rangeland management and wild horses) would be identical to that described under the Proposed Action.

##### 4.2.3.1 Soils

Potential impacts to soil resources would be similar in nature to those discussed under the Proposed Action. However, under Alternative C, there would be a total of 77.5 acres of surface disturbance. Erosion rates within the 77.5-acre disturbance area would increase from a background rate of approximately 112.4 tons/year to 337.1 tons/year until successful reclamation stabilizes disturbed soils. In addition, implementation of Alternative C could result in the long-term disturbance of approximately 74 acres of biological soil crust in the Winteridge-Moonset soil association, which is greater than 60 percent more disturbance of this soil type compared to the Proposed Action. The loss of biological crusts would have no effect on the reclamation potential of soils in the area.

##### 4.2.3.2 Water Resources

Potential impacts to water resources would be similar in nature to those discussed under the Proposed Action. However, surface waters that would be avoided by surface pipeline crossings under the Proposed Action would be impacted from buried pipelines under Alternative C. Additionally, there would be 77.5 acres of initial surface disturbance. Soil erosion calculations reveal that an estimated 337.1 tons/year of additional erosion could be expected to occur as a result of Alternative C.

##### 4.2.3.3 Vegetation Resources

Potential impacts to vegetation resources would be similar in nature to those discussed under the Proposed Action. However, under Alternative C, there would be 77.5 acres of surface disturbance and

habitat loss, which is approximately 62 percent more than that under the Proposed Action. Of this disturbance, approximately 27.4 acres of recent habitat restoration and approximately 4.1 acres of commercial forests and woodlands would be disturbed, which accordingly are 30 percent (or 6.4 acres) and 28 percent (or 0.9 acres) more than that under the Proposed Action. The potential for weed infestation would be higher under Alternative C given the increase in surface disturbance and construction activities associated with burying pipelines.

#### 4.2.3.4 Rangeland Management and Wild Horses

Potential impacts to rangeland management and wild horses would be similar in nature to those discussed under the Proposed Action. However, under Alternative C, there would be 77.5 acres of surface disturbance and habitat loss for range/horse habitat.

#### 4.2.3.5 Fish and Wildlife Resources

Potential impacts to fish and wildlife resources would be similar in nature to those discussed under the Proposed Action. However, under Alternative C, there would be 77.5 acres of surface disturbance and wildlife habitat loss.

#### 4.2.3.6 Special Status Species

Potential impacts to special status species would be similar in nature to those discussed under the Proposed Action. However, under Alternative C, there would be approximately 77.5 acres of surface disturbance and habitat loss.

#### 4.2.3.7 Recreation

Potential impacts to recreation would be similar in nature to those discussed under the Proposed Action. However, under Alternative C, there would be approximately 77.5 acres of initial surface disturbance.

#### 4.2.3.8 Cultural Resources

Potential impacts to cultural resources would be similar to those discussed under the Proposed Action; however, as a result of the increased initial surface disturbance there is a slight increase in the possibility of impacts to unknown, subsurface cultural deposits.

#### 4.2.3.9 Air Quality

The sources of emissions for Alternative C are identical to those described for the Proposed Action. However, emissions from earth-moving equipment as well as fugitive dust emissions would be slightly higher because of pipeline excavation/trenching activities. Impacts from drilling, completion, and well production would be the same as those addressed under the Proposed Action.

#### 4.2.3.10 Visual Resources

Potential impacts to Visual Resources would be similar in nature to those discussed under the Proposed Action. However, under Alternative C, there would be approximately 77.5 acres of initial surface disturbance. In the short-term, removal of vegetation and trenching/excavation would create additional landscape contrasts. However, provided reclamation efforts are successful, burial of pipelines could reduce long-term visual resource impacts because surface pipelines would introduce new elements of line, form, color, and texture into the landscape that would last for the life of the project.

#### 4.2.3.11 Non-WSA Lands with Wilderness Characteristics

Under the Buried Pipeline Alternative, Stewart would drill nine exploratory wells accessed from seven well pads as described in the Proposed Action. However, the pipelines would be buried instead of surface-laid, contributing 29.8 acres greater surface disturbance than the Proposed Action. The well pads and the associated pipelines, roads, and production facilities would directly disturb approximately 77.5 acres within the Wolf Point non-WSA lands with wilderness characteristics area. Indirect impacts would extend beyond the 77.5 acres of direct disturbance, affecting approximately 3,380 acres of the wilderness characteristics area that would be within ½ mile of development and would lose the constituents used to define wilderness characteristics.

As analyzed in the Proposed Action, impacts to wilderness characteristics would last the life of the project until reclamation is complete. Although the proponent has agreed to a number of measures which would reduce the above-mentioned impacts (e.g., all permanent facilities located on site longer than 6 months would be painted a color to match the surround environment; water or other approved suppressants would be used during construction activities to abate fugitive dust; interim reclamation would be implemented on all disturbed areas that are not needed for production activities; and low profile tanks would be used if determined necessary), it is expected that wilderness characteristics would be degraded in the Wolf Point area. As predicted in Chapter 4 of the Vernal Proposed Plan/Final EIS (2008), surface disturbance associated with the development of leased lands would cause this area to lose the naturalness value and degrade the solitude and primitive recreation opportunities of the wilderness characteristic lands.

**Figure 4-1** illustrated the proposed development within the Wolf Point wilderness characteristics area. Impacts to the individual components of wilderness characteristics would be similar to those discussed under the Proposed Action.

#### 4.2.4 ALTERNATIVE D – DIRECTIONAL DRILLING

Under Alternative D, project-related impacts would be similar in nature to those discussed under the Proposed Action. However, these impacts would be slightly less in extent than those described above under the Proposed Action. Under Alternative D, Stewart would drill nine exploratory wells from four well pads. As such, total surface disturbance in the Tumbleweed II Project Area would be approximately 20 percent (or 9.5 acres) less than under the Proposed Action. Resource-specific differences are discussed in the sections below. In addition, it should be noted that recommended mitigation for certain resources (i.e., vegetation, wildlife, special status species, and rangeland management and wild horses) would be identical to that described under the Proposed Action.

##### 4.2.4.1 Soils

Impacts to soil resources under Alternative D would be similar in nature to those discussed under the Proposed Action; however, surface disturbance would be limited to the Winteridge-Moonset association soil type and the magnitude of the impacts to soils would be reduced in proportion to reductions in the amount of surface disturbance (approximately 9.5 acres fewer acres disturbed under Alternative D as compared to the Proposed Action) and therefore, a marginal decrease in the amount of erosion.

##### 4.2.4.2 Water Resources

Impacts to water resources under Alternative D would be similar in nature to those discussed under the Proposed Action; however, the magnitude of the impacts to water resources would be reduced in proportion to reductions in the amount of surface disturbance (approximately 9.5 acres fewer acres

disturbed under Alternative D as compared to the Proposed Action) and therefore, a marginal decrease in the amount of erosion and potential sediment yield.

#### 4.2.4.3 Vegetation Resources

Impacts to vegetation under Alternative D would be similar in nature to those discussed under the Proposed Action; however, the magnitude of the impacts to vegetation communities, fugitive dust, and weed invasion would be reduced in proportion to reductions in the amount of surface disturbance (approximately 9.5 acres fewer acres disturbed under Alternative D as compared to the Proposed Action). Of this disturbance, approximately 15.7 acres of recent habitat restoration and approximately 0.8 acres of commercial forests and woodlands would be disturbed, which accordingly are 25 percent (or 5.3 acres) and 75 percent (or 2.4 acres) less than that under the Proposed Action.

#### 4.2.4.4 Rangeland Management and Wild Horses

Impacts to rangeland management and wild horses under Alternative D would be similar in nature to those discussed under the Proposed Action; however, the magnitude of the impacts to wild horse habitat and AUM loss would be slightly reduced in proportion to reductions in the amount of surface disturbance (approximately 9.5 acres fewer acres disturbed under Alternative D as compared to the Proposed Action).

#### 4.2.4.5 Fish and Wildlife Resources

Impacts to fish and wildlife resources under Alternative D would be similar in nature to those discussed under the Proposed Action; however, the magnitude of habitat loss and disturbance would be slightly reduced in proportion to reductions in the amount of surface disturbance (approximately 9.5 acres fewer acres disturbed under Alternative D as compared to the Proposed Action).

#### 4.2.4.6 Special Status Species

Impacts to special status species under Alternative D would be similar in nature to those discussed under the Proposed Action; however, the magnitude of habitat loss and disturbance would be slightly reduced in proportion to reductions in the amount of surface disturbance (approximately 9.5 acres fewer acres disturbed under Alternative D as compared to the Proposed Action).

#### 4.2.4.7 Recreation

Impacts to recreation under Alternative D would be similar in nature to those discussed under the Proposed Action; however, the magnitude of the impacts would be reduced in proportion to reductions in the amount of surface disturbance (approximately 9.5 acres). When compared with the Proposed Action, the construction of fewer well pads, roads, and pipelines, as well as the centralization of permanent facilities, including tanks batteries on four well pads) would minimize impacts to primitive and unconfined recreation. Impacts to primitive and unconfined recreation would specifically be decreased in the northern portion of the Tumbleweed II Project Area.

#### 4.2.4.8 Cultural Resources

Impacts to cultural resources under Alternative D would be similar in nature to those discussed under the Proposed Action; however, direct impacts to unidentified cultural resources, which could occur as a result of well pad, road, and pipeline construction, would be reduced in proportion to reductions in the amount of surface disturbance (approximately 9.5 acres).

#### 4.2.4.9 Air Quality

The sources of emissions under Alternative D are identical to those described for the Proposed Action. Under Alternative D, the most highly developed well pad, TUF #18-9, could support up to three well heads, three heater separators, and six oil tanks. Since the maximum impacts from the Proposed Action occur at the edge of the well pad with identical facilities, the impacts under Alternative D would be identical to those described under the Proposed Action for all criteria and hazardous pollutants.

#### 4.2.4.10 Visual Resources

Visual resource impacts under Alternative D would be similar in nature to those discussed under the Proposed Action; however, the magnitude of the impacts would be reduced in proportion to reductions in the amount of surface disturbance (approximately 9.5 acres). The construction of fewer well pads, roads, and pipelines would partially mitigate impacts to the visual landscape which can result from the exposure of new bare ground in previously vegetated areas. In addition, the centralization of permanent facilities, including tanks batteries on four well pads (as opposed to seven well pads under the Proposed Action) would decrease long-term visual contrasts. Impacts to visual resources would be specifically reduced in the northern portion of the Tumbleweed II Project Area, which currently has little evidence of human activity.

#### 4.2.4.11 Non-WSA Lands with Wilderness Characteristics

Under the Directional Drilling Alternative, Stewart would drill nine exploratory wells accessed from four well pads. The well pads and associated pipelines, roads, and production facilities would directly disturb approximately 38.2 acres within the Wolf Point wilderness characteristics area. Indirect impacts would extend beyond the 38.2 acres of direct disturbance, affecting approximately 2,810 acres of the wilderness characteristics area that would be within ½ mile of development and would lose the constituents used to define wilderness characteristics.

Potential impacts to the Wolf Point wilderness characteristics area would be similar in nature to those discussed under the Proposed Action but would be less extensive based on the 20% reduction in surface disturbance as compared to the Proposed Action, and concentration of production facilities on four well pads instead of seven well pads as under the Proposed Action. Under Alternative D, there would be 38.2 acres of initial surface disturbance (a decrease of 9.5 acres from the Proposed Action Alternative) due to directional drilling off of fewer well pads. This would decrease total surface disturbance by 20 percent as compared to the Proposed Action. Directional drilling under Alternative D would also reduce the indirect impacts to wilderness characteristics values from that which is described under the Proposed Action analysis.

Under the Directional Drilling Alternative, impacts to wilderness characteristics would last the life of the project until reclamation is complete. Although the proponent has agreed to a number of measures which would reduce the above-mentioned impacts (e.g., all permanent facilities located on site longer than 6 months would be painted a color to match the surround environment; water or other approved suppressants would be used during construction activities to abate fugitive dust; interim reclamation would be implemented on all disturbed areas that are not needed for production activities; and low profile tanks would be used if determined necessary), it is expected that wilderness characteristics would be degraded in the Wolf Point area. If all wells were developed, the Wolf Point non-WSA lands with wilderness characteristics would lose their natural values. As predicted in Chapter 4 of the Vernal Proposed Plan/Final EIS (2008), the surface disturbance associated with the development of the leased

lands would cause this area to lose the naturalness value and degrade the solitude and primitive recreation opportunities of the wilderness characteristic lands.

**Figure 4-2** illustrates the proposed development under the Directional Drilling Alternative within the Wolf Point wilderness characteristics area.

#### 4.2.5 CUMULATIVE IMPACT ANALYSIS

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 Vernal Field Office Approved RMP (BLM 2008a) included detailed analyses of broad cumulative impacts for oil and gas development. This project incorporates by reference the analyses within the RMP.

This section of the EA discusses cumulative impacts as the incremental effect to specific resources or issues that would occur under Alternatives A, C, or D, in conjunction with other cumulative actions. In support of the cumulative impact discussion, this chapter provides discussion on past and present oil and gas activities in the Uinta Basin, both of which serve as introductions to the outlook for reasonably foreseeable development (RFD) in the Tumbleweed II Project Area and the greater Uinta Basin. Other significant activities would be livestock grazing, vegetative management through prescribed burning, and recreational projects. The Cumulative Impact Analysis Area (CIAA) for most resources is the Vernal planning area. For some resources, (i.e., air quality), the CIAA is much larger.

##### 4.2.5.1 Oil and Gas

In 2002 as part of the land use plan revision process, the BLM prepared a RFD scenario to project environmental impacts of oil and gas exploration and development across a 15-year period. Projections included in-depth reviews of potential for occurrence, past well production, current well production, and future potential for production. Since that time, the BLM has carefully monitored industry trends and has concluded that the RFD can be considered accurate for up to approximately 5 years from the time the ROD for the Approved RMP was signed (October 31, 2008). Within the next approximately 5-year timeframe, the BLM intends to monitor the impacts to resources in the Vernal planning area and ensure that the impacts that were disclosed in the Vernal Field Office Proposed RMP and Final EIS analysis are not exceeded by the pace of development.

Exploratory drilling is currently proposed in the western and southwestern portions of the Uinta Basin on BLM-administered, Tribal and National Forest lands. Exploratory wells are typically characterized by larger, deeper, more remote locations requiring greater per-well expenditures, potential delays in infrastructure access, and greater financial risk (Linden 2003). If exploratory drilling within the Tumbleweed II Project Area is successful, it can reasonably be expected that Stewart would attempt to fully develop the natural gas resources within their lease areas in the future.

Future oil and gas development in the Uinta Basin and the Tumbleweed II Project Area would depend not only upon the results of exportation, but a number of other variables including the cost to develop the resources, and technological advancements. Development of Tribal lands will continue and perhaps increase as exploratory wells are drilled in the Hill Creek Extension, which is adjacent to the Tumbleweed II Project Area. Future oil and gas exploration in the Ashley National Forest will likely increase as a result of new leasing and management strategies. However, the level of future development on Tribal and National Forest System lands is unknown.

As of March 2007, there were 5,671 producing oil and gas wells in the Vernal Field Office planning area (UDOGM 2007). According to the above-mentioned RFD scenario prepared by the BLM, an additional 6,530 wells could be drilled in the CIAA over the next 5 years, for a total of 12,201 wells. The nine proposed wells in the Tumbleweed Unit would constitute less than 0.5 percent of the cumulative scenario. The following surface disturbance assumptions have been applied regarding future construction associated with oil and gas development and power lines in the Vernal planning area:

- Surface disturbance for a well pad: 2.4 acres;
- Surface disturbance for an access road, assuming 0.2 mile/well: 0.73 acres/well; and
- Surface disturbance for pipelines and flow lines: 0.47 acres/well.

Based on these assumptions, the additional surface disturbance of the cumulative scenario for oil and gas development would be 28,835 acres, for a total surface disturbance within the CIAA of 44,091 acres. The details of this estimation are shown in **Table 4-9**.

Table 4-9. Cumulative Surface Disturbance from Oil and Gas Development

Planning Area	Existing Wells	RFD Wells	Total # Wells	Well Pads (acres) <sup>1</sup>	Access Roads (acres)	Total Pipelines (acres)	Compressor Stations (acres)	Total Disturbance (acres)
Vernal Field Office	5,671	6,530	12,201	29,282	8,907	5,734	168	44,091

<sup>1</sup>Well pad disturbance is overestimated, since it assumes one well per pad. In some cases, two or more wells may be drilled from a single well pad.

#### 4.2.5.2 Soils

Cumulative impacts to soils in the planning area would result from existing and reasonably foreseeable oil and gas activities, livestock grazing/management, and recreational activities when combined with the anticipated impacts under Alternatives A, C, or D. Based on RFD projections, vegetation disturbance, impacts on biological soil crusts, and erosion and sediment yield within the Vernal planning area is likely to continue to increase. Each acre of disturbance adds to a cumulative effect by increasing erosion, destroying native vegetation, and increasing potential spread of noxious weeds.

Alternatives A, C, or D would disturb relatively small areas (47.7, 77.5, and 38.3 acres, respectively) of surface soils. However, any increase in surface disturbance must be acknowledged as incrementally and cumulatively adding to soil disturbance within the CIAA. The total estimated cumulative disturbance of 44,091 acres in 1,691,116 acre-Vernal planning area would increase by 0.09 percent to 0.18 percent due to project construction, depending on the action alternative selected. Additional BLM-authorized actions (oil and gas development, livestock grazing, prescribed burning, and recreation) that could result in increased erosion and sediment yield within the CIAA are also likely to occur. Of these potential soil-disturbing activities, existing and proposed roads are the features of highest concern. Unlike surface and buried pipelines, active roadways are not reclaimed, thus sediment yield from roads can continue at rates two to three times above background rates into the indefinite future. The Proposed Action would create an additional 6.1 miles of new or upgraded roadway in the CIAA.

Rangeland Health Standard 1 states that “upland soils should exhibit permeability and infiltration rates that sustain or improve site productivity, considering the soil type, climate, and landform”. Alternatives A, C, or D would add to other actions that have a negative impact on the attainment of this standard, due

to compaction and blending of soils in some locations. Compaction due to construction activities at the well pads and along access roads would result in a small increase in surface runoff from the area. This slightly increased runoff could in turn cause increased sheet, rill, and gully erosion. The construction and operation of the wells would also incrementally increase the chance that leaks or spills of saline water, hydro-fracturing chemicals, fuels, and lubricants would occur within the CIAA. Spills of this nature could increase the loss of soil productivity within the area.

Assuming successful implementation of Applicant-Required Measures and ACEPM, erosion and sediment yield impacts from the 47.7 acres of vegetation and soil disturbance under the Proposed Action (77.5 acres under Alternative C, 38.2 acres under Alternative D) would be minor. In the context of cumulative impact analyses, each acre of vegetation and soil disturbance subsequently adds to cumulative soil resource impacts in the Vernal planning area by incrementally increasing erosion and sediment yield; however, these contributions would be minor.

#### 4.2.5.3 Water Resources

Cumulative impacts to water resources in the planning area would result from agriculture, livestock grazing, recreation, vehicular traffic, oil and gas development, and mining and industrial activities when combined with the anticipated impacts under Alternatives A, C, or D.

Alternatives A, C, and D would result in a slight increase in erosion rates and sediment yield. If reclamation and mitigation measures are not successful, additional sedimentation and turbidity of surface water could result. The increased erosion, combined with increases associated with other oil and gas development, recreational activities including OHV use, livestock grazing, and mining, could have cumulative negative impacts on aquatic habitat within affected drainages.

As a result of the Proposed Action, the estimated annual sediment loading to Willow Creek, based on the median suspended solids concentration and the average annual runoff recorded at USGS station 09307500, is about 21,560 tons. Therefore, if all additional sediment was delivered to Willow Creek, the increased sediment loading to Willow Creek at this location would be about 0.5 percent. The alternative-specific contributions from the other action alternatives would be similar and would incrementally contribute to cumulative sediment loading. The alternatives could also incrementally contribute to TDS loading to Willow Creek.

The design features of the alternatives, including the placement of sedimentation control devices along new roads and at drilling locations, would reduce the amount of additional sediment that actually reaches the ephemeral and perennial streams in the CIAA. Because the Green River is about 41 miles away, additional sediment loading to the Green River would be negligible under either alternative.

Soils compacted on existing roads, new access roads, and well pads contribute slightly greater runoff than undisturbed sites. The increased runoff could lead to slightly higher peak flows in Willow Creek, potentially increasing erosion of the channel banks. The increased erosion would increase turbidity in the river during storm events.

Assuming three wells would be drilled per year, project-related water consumption would deplete the flow in Main Canyon by 15.3 acre-feet per year for three years. The water rights for this source of water were filed in 1921, therefore, use of this water is considered to be a historical depletion. Combined with other oil and gas activities, the cumulative depletion to the Green River would be less than 1 percent. Therefore, no diversions or alterations of flow regimes of the Green River are expected to occur.

Alternatives A, C, or D, combined with other oil and gas development and increased recreational activities, would slightly increase the chance that accidental spills of fuels, lubricants, and other petroleum products would occur and contaminate surface water within the CIAA. Spills of fuels or produced fluids from well pads, pipelines, and compressor stations also have the potential to contaminate the shallow alluvial groundwater along Tumbleweed II Project Area drainages.

Alternatives A, C, or D could result in a slight increase in erosion rates and sediment yield to floodplains in the CIAA. The increased erosion, combined with increases associated with other oil and gas development, recreational activities including OHV use, and livestock grazing, could have cumulative negative impacts on floodplain ecological functioning within the CIAA.

#### 4.2.5.4 Vegetation Resources

Cumulative impacts to vegetation in the planning area would result from oil and gas activities, livestock grazing/management, and recreational activities reasonably certain to occur when combined with the anticipated impacts under Alternatives A, C, or D. Alternatives A, C, or D would disturb relatively small areas (47.7, 77.5, and 38.3 acres, respectively) of vegetation. However, any increase in surface disturbance must be acknowledged as incrementally and cumulatively adding to vegetation disturbance within the Vernal planning area. Specifically, the total estimated cumulative disturbance of 44,091 acres in the 1,691,116 acre-Vernal planning area would increase by 0.09 percent to 0.18 percent due to project construction, depending on the action alternative selected. Assuming successful implementation of Applicant-Required Measures and ACEPMs, vegetation losses from the 47.7 acres of disturbance under the Proposed Action (77.5 acres under Alternative C, 38.2 acres under Alternative D) would be minor. Each acre of vegetation disturbance subsequently and incrementally adds to cumulative vegetation impacts in the Vernal planning area; however, these contributions would be minor.

#### 4.2.5.5 Rangeland Management and Wild Horses

Cumulative impacts to rangeland resources and wild horses in the planning area would result from past, present, and reasonably foreseeable oil and gas activities, livestock grazing/management, and recreational activities. Continued loss of vegetation would in turn, decrease potential livestock grazing habitat (i.e., AUMs) across the Winter Ridge Allotment. Cumulative habitat loss in the 42,189-acre (3,013-AUM) Winter Ridge Allotment would increase by approximately 0.09 to 0.18 percent due to surface disturbing activities depending on the action alternative selected. Similarly, cumulative habitat loss in the 46,500-acre Winter Ridge Herd Area for wild horses would increase by approximately 0.08 to 0.17 percent due to surface disturbing activities depending on the action alternative selected.

Provided successful implementation of Applicant-Required Measures, ACEPMs, and mitigation measures, impacts from the initial removal of somewhere between 38.2 to 77.5 acres of vegetation (2.7 - 5.5 AUMs) under alternatives would be negligible. In the context of cumulative impact analyses, loss of each individual AUM and each acre of wild horse habitat incrementally adds to cumulative losses in the CIAA; however, these contributions would be minor

#### 4.2.5.6 Fish and Wildlife

Alternatives A, C, or D would cumulatively add to losses of big game foraging habitats; raptor breeding/nesting areas, and/or cover; habitat displacement; and mortality resulting from past, present and reasonably foreseeable future projects in the planning area. Based on Stewart's compliance with protective Federal stipulations on timing of project operations, implementation of Applicant-Required Measures, ACEPMs, mitigation measures, and the short-term and small-scale nature of exploratory drilling, Alternatives A, C, or D would result in minor impacts to fish and wildlife in the Tumbleweed II

Project Area. Although, any impact on wildlife habitats and behaviors incrementally adds to the cumulative effects of other activities on fish and wildlife within the planning area, these contributions would be minor. Cumulative impacts would not occur under the No Action Alternative.

#### 4.2.5.7 Special Status Species

Alternatives A, C, or D would add to cumulative impacts to special status species from the loss of foraging habitats; breeding/nesting areas, and/or cover; habitat displacement; and mortality from past, present, and reasonably foreseeable future projects in the planning area. With the exception of potential depletions to Colorado River Basin and consequent impacts to the endangered Colorado River fish, based on Stewart's compliance with protective Federal stipulations regarding threatened and endangered species, implementation of the ACEPMs and mitigation measures, Alternatives A, C, or D would result in negligible impacts on special status species. Although, any impact on special status species incrementally adds to the cumulative effects of other land use projects on special status species within the Vernal planning area, these contributions would be minor. Cumulative impacts to threatened, endangered, candidate, and sensitive species would not occur under the No Action Alternative.

Declines in the abundance or range of many special status species (such as the endangered Colorado River fish) have been attributed to various human activities on Federal, State, and private lands, such as human population expansion and associated infrastructure development; construction and operation of dams along major waterways; water retention, diversion, or dewatering of springs, wetlands, or streams; recreation, including off-road vehicle activity; expansion of agricultural or grazing activities, including alteration or clearing of native habitats for domestic animals or crops; and introductions of non-native plant, wildlife, or fish or other aquatic species, which can alter native habitats or out-compete or prey upon native species. Many of these activities are expected to continue on State and private lands within the range of the various Federally-protected wildlife, fish, and plant species, and could contribute to cumulative effects to the species that would occur as a result of Alternatives A, C, or D. Species with small population sizes, endemic locations, or slow reproductive rates, or species that primarily occur on non-Federal lands where landholders may not participate in recovery efforts, would generally be highly susceptible to cumulative effects.

Reasonably foreseeable future activities that may affect river-related resources in the area include oil and gas exploration and development, irrigation, urban development, recreational activities, and activities associated with the Upper Colorado River Endangered Fish Recovery Program. Implementation of all or any of these projects has affected and continues to affect the environment including but not limited to water quality, water rights, socioeconomic, and wildlife resources.

#### 4.2.5.8 Recreation

The CIAA for recreation includes the Vernal planning Area, and the Book Cliffs hunting units as established by the UDWR, respectively.

Implementation of Alternatives A, C, or D would contribute to the loss of primitive and unconfined recreational opportunities in the CIAA and result in an increase in OHV use; however, these contributions would be minor.

Impacts from the Tumbleweed project would also cumulatively add to a loss of hunting opportunities in the Book Cliffs. However, the Tumbleweed II Project Area constitutes only a fraction of the limited entry Book Cliffs Hunting Units, which for mule deer and elk incorporates a substantial portion of Uintah and Duchesne Counties, and for cougar and black bear incorporates a substantial portion of Uintah and Grand Counties (UDWR 2007b; UDWR 2007c; UDWR 2007d). Given that activities would be short-term and

small-scale, impacts to the CIAA would be minor. It is not anticipated that the Alternatives A, C, or D would result in a reduction in the number of permits issued by the UDWR or change the allowed uses of the land within the Tumbleweed II Project Area, which currently includes hunting.

#### 4.2.5.9 Cultural Resources

The CIAA for cultural resources is the Tumbleweed II Project Area. Cumulative impacts on cultural resources in the CIAA would primarily result from activities associated with surface and subsurface disturbance such as oil and gas development projects, increased visitation to the Tumbleweed II Project Area, recreational/OHV use, and fire management. Impacts may result from specific cultural resource management decisions and from non-surface-disturbing activities that create atmospheric, visual, and/or auditory effects. These latter impacts would apply to sites or locations that together comprise the overall cultural experience for all visitors to the area, and especially to those deemed sacred or traditionally important by Native American Tribes and used by these groups in such a manner that atmospheric change, visual obstructions, and/or noise levels impinge upon that use. These types of impacts cumulatively affect not only the historic setting, feeling, and viewshed of cultural properties, but also their eligibility potential for nomination to the NRHP.

Based on cultural survey and avoidance requirements outlined in **Section 2.1.14.2**, the Tumbleweed project would likely have no direct impacts on known cultural resources or historic properties within the CIAA, and direct impacts to unidentified cultural resources or historic properties would be expected to be negligible. The greatest cumulative threat to cultural resources would be indirect impacts. When considered alongside other past, present, and RFD actions, the impacts of Alternatives A, C, or D may cumulatively and incrementally impact unknown cultural resources in the CIAA by introducing atmospheric, visual, and auditory intrusions on the landscape. In addition, secondary surface activities (e.g., increased vehicular and pedestrian traffic) may also cumulatively and incrementally impact unknown cultural resources in the CIAA by increasing the potential for vandalism, surface artifact collection, illegal excavation of artifacts, and fugitive dust and erosion from OHV or other motorized vehicle use. Collectively, these potential project-related impacts could result in irreversible damage to, or loss of, important cultural resources across the CIAA, or contribute to an alteration of the overall historical setting within the CIAA. However, these contributions would be expected to be minor due to the small size of the project and provisions to reduce, minimize, or avoid project-specific and cumulative impacts on cultural resources.

As noted in **Sections 2.1.14** and **2.1.15**, the project alternatives incorporate several required measures and ACEPMs that are intended to reduce, minimize, or avoid project-specific and cumulative impacts on cultural resources. In addition, many potential cumulative impacts on cultural resources would be reduced or eliminated through the implementation of Federal regulatory laws, actions, and guidelines designed to protect cultural resources, and through the consultation process with the Utah SHPO and Native American Tribal representatives.

#### 4.2.5.10 Air Quality

The CIAA for air quality is the Uinta Basin. Cumulative air quality impacts are defined as the combination of emissions resulting from the Proposed Action, existing nearby permitted sources, and Reasonably Foreseeable Development (RFD) within the region. Areas of concern include the Uinta Basin, the High Uinta Wilderness Area, as well as nearby mandatory federal PSD Class I areas such as Arches and Canyonlands National Parks and Flat Tops Wilderness. Potential Air Quality Related Value (AQRV) impacts to sensitive areas include regional impacts on visibility, total nitrogen and sulfur deposition, and Acid Neutralization Capacity (ANC).

Air quality assessments presented in the technical support document (BLM 2005) for the Vernal RMP and Final EIS (BLM 2008d) have recently addressed the impacts to air quality in the Uinta Basin and surrounding areas of special concern, considering both existing permitted sources and an extended look at development over a fifteen year timeframe. The development alternatives were based on BLM's proposed plans for resource development, which included estimates for the number of wells drilled for oil and gas, compressor stations, and pipelines, along with other foreseeable development activities by non-BLM entities. In general, results from this analysis, and based on Reasonable Development Scenarios in conjunction with existing sources, indicate that existing air quality in the region is good.

In particular, based upon recent regional and large-scale air analyses, cumulative well development activities in the Uinta Basin are not expected to affect attainment of NAAQS standards or regional PSD increments. Existing and RFD stationary sources including compressor engines and turbines, while of greater concern, are anticipated to be adequately spaced to allow for favorable dispersion conditions. For a much larger project within the Uinta Basin analyzing approximately 800 wells, a cumulative analysis looked at air quality impacts for comparison to the NAAQS, except for ozone, and found that project impacts would not result in any exceedance of any non-ozone NAAQS. Additionally, the cumulative effects analysis on visibility impairment within nearby Class I and selected Class II areas found that potential changes in visibility and acid deposition were within acceptable guidelines (*West Tavaputs Plateau Natural Gas Full Field Development Plan Draft Environmental Impact Statement UT-070-05-055*, BLM, February 2008). Based upon this qualitative comparison, the addition of 9 wells to the Uinta Basin will not cause any exceedance of any non-ozone NAAQS, or adversely impact visibility within nearby Class I and Class II areas.

Several oil and gas exploration and development projects are underway or proposed within the Uinta Basin. Implementation of the Proposed Action (or Alternatives C or D) would cumulatively contribute insignificant emissions levels to the area immediately adjacent to the Project Area and within the greater Uinta Basin.

Temporary incremental increases in emissions of NO<sub>x</sub>, SO<sub>2</sub>, CO, and VOCs from the Proposed Action (or Alternatives C or D) during development would be expected to occur in the short term from mobile combustion sources associated with construction and drilling equipment and the temporary increase in vehicle traffic.

In general, the increase in emissions associated with Alternatives A, C, or D would be localized, in some cases temporary (well development phase), and on a much smaller scale in comparison with regional emissions. BLM requires operators to comply with all applicable air quality regulations. In addition, the project proponent has committed to additional mitigation measures to further reduce the already negligible emissions levels from the project.

The Proposed Action would not result in any appreciable cumulative air quality impacts. Impacts to air quality from development would be short term and entirely negligible. No cumulative effects from project operation emissions are anticipated based upon the negligible emission levels and the temporary nature of the emissions from the proposed project activities.

### Ozone

For regional ozone issues, when the emissions inventory for the production phase of the Proposed Action is compared to the regional emission inventory compiled during the WRAP Phase III study for the Uinta Basin, 2006 Baseline Emissions, (WRAP, 2009), it can be seen from **Table 4-10** that the VOC and NO<sub>x</sub> emissions from the Proposed Action comprise a small percentage of the WRAP baseline emissions.

Table 4-10. Proposed Action versus 2012 WRAP Phase III Emissions Inventory Comparison

Species	Proposed <sup>a</sup> Action Production Emissions (ton/yr)	WRAP Phase III 2012 Uintah Basin Emission Inventory <sup>b</sup> (ton/yr)	Percentage of Proposed Action to WRAP Phase III
NO <sub>x</sub>	4.3	16,547	0.03%
VOC	10.4	127,495	0.01%

<sup>a</sup> see Table 4-2

<sup>b</sup> [http://www.wrapair.org/forums/ogwg/PhaseIII\\_Inventory.html](http://www.wrapair.org/forums/ogwg/PhaseIII_Inventory.html) Uintah Basin Data

The WRAP Phase III baseline inventory for the Uinta Basin for VOC emissions in 2006 was 71,546 tons/yr. For 2012, the NO<sub>x</sub> and VOC emissions are projected at 16,547 and 127,495 ton/yr, respectively. Potential VOC emissions from the Proposed Action represent only 0.01% of the total 2012 VOC estimated emissions for the region, and potential NO<sub>x</sub> emissions from the Proposed Action represent only 0.03% of the total 2012 VOC estimated emissions for the region.

Based on the magnitude of the projected increase in VOC emissions for the Uinta Basin from 2006 to 2012, and the inconsequential contribution that would be emitted from the Proposed Action, an accurate analysis of potential ozone impacts from the Proposed Action is not feasible. Any cumulative ozone impacts from the Proposed Action would be indistinguishable from, and dwarfed by, the margin of uncertainty associated with the regional cumulative VOC and NO<sub>x</sub> emission inventory. Thus the potential cumulative ozone impact from the Proposed Action cannot be modeled with any accuracy due to the level of the emissions from the Proposed Action, the size of the project, and the lack of model sensitivity. When compared to regional emissions inventories, the amounts of ozone precursors emitted from the Proposed Action are not expected to have a measurable contribution or effect on regional ozone formation.

The Independent Petroleum Association of Mountain States (IPAMS), in cooperation with the oil and gas operators in the Uinta Basin, the Bureau of Land Management (BLM), and other regulatory agencies conducted the Uinta Basin Air Quality Study (UBAQS) to estimate changes to air quality and air quality related values (AQRV) within the Uinta Basin that may result from future industrial activity, including oil and gas development.

Data used as input for the UBAQS consisted of the most complete, accurate and current emissions and meteorological data available. Emissions data included the WRAP Phases II and III inventories for oil and gas sources in addition to other non-oil and gas emissions sources.

Scaling factors, based on expected rates of development, were applied to the baseline emissions 2006 inventory, and “on-the-books” regulations were applied to the uncontrolled 2012 emissions projections to generate the final 2012 emissions projections by county for the six-county focus area of the UBAQS that comprises the Uinta Basin.

The Uinta Basin Air Quality Study (UBAQS) model results indicate that average ambient concentrations of criteria pollutants will remain below the NAAQS within the six-county Uinta Basin area. Specifically, the UBAQS results estimated that the Uinta Basin would be in attainment of the 8-hour ozone NAAQS for 2012 (Uinta Basin Air Quality Study (UBAQS), Executive Summary and Overview, IPAMS, June 2009)

In terms of cumulative effects from the Tumbleweed II project, the Proposed Action is within the modeled scope of projected development, and as such, would not violate, or otherwise contribute to any

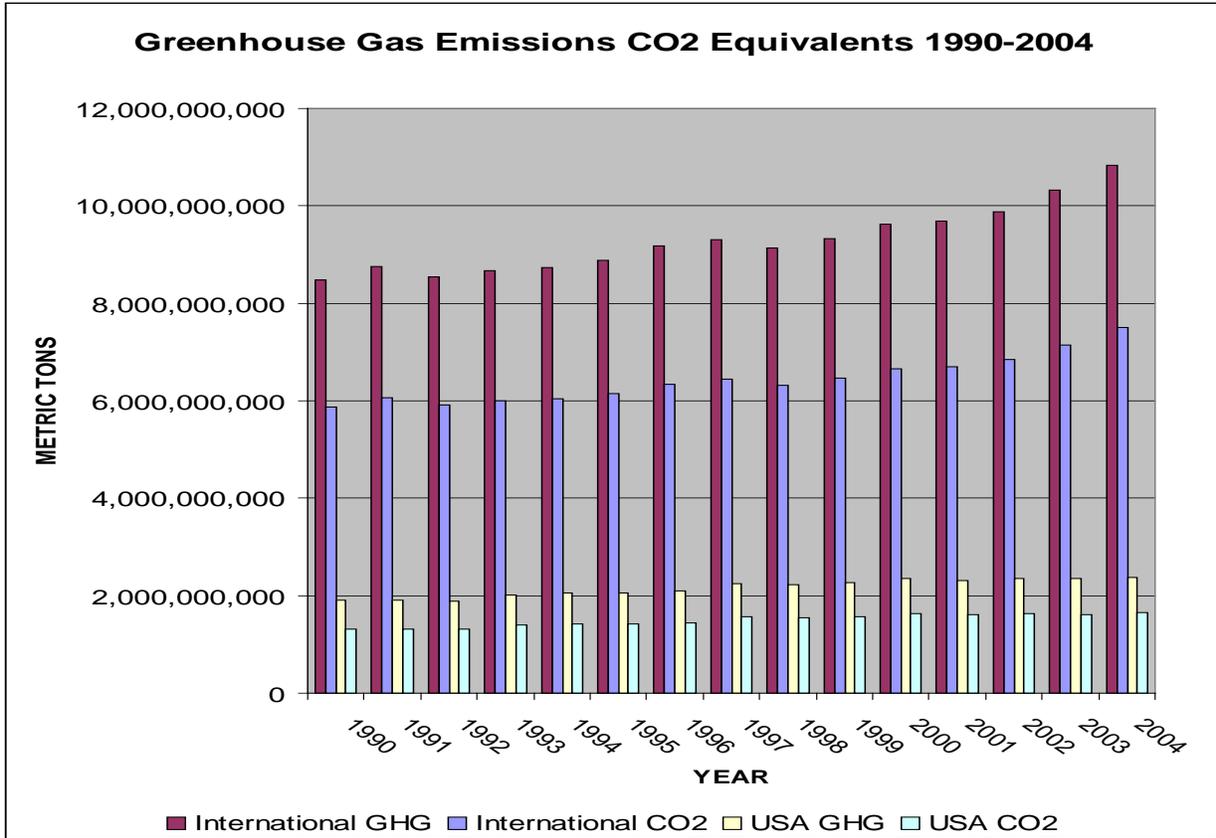
violation, of any applicable air quality standard, and it would not contribute to any projected future potential exceedance of any applicable air quality standards.

### Greenhouse Gas (GHG) Emissions

The extent of climate change effects, and whether these effects prove harmful or beneficial, will vary by region, over time, and with the ability of different societal and environmental systems to adapt to or cope with the change (IPCC, 2007).

The IPCC concludes that “impacts of climate change will vary regionally but, aggregated and discounted to the present, they are likely to impose net annual costs which will increase over time as global temperatures increase.” The IPCC estimates that for increases in global mean temperature of less than 1-3°C (1.8-5.4° F) above 1990 levels, some places and sectors will see beneficial impacts while others will experience harmful ones. Some low-latitude and polar regions are expected to experience net costs even for small increases in temperature. For increases, in temperature greater than 2-3°C (3.6-5.4°F), the IPCC says it is likely that all regions will experience either declines in net benefits or increases in net costs. “Taken as a whole,” the IPCC concludes, “the range of published evidence indicates that the net damage costs of climate change are likely to be significant and to increase over time.”

The following chart shows the trend in global and USA total GHG and CO<sub>2</sub> from fossil fuel combustion from 1990 to 2004, the latest year that data are readily available. USA emissions rose until 2000, and then have been relatively constant to present. However, worldwide GHG emissions have steadily risen from approximately **8.5 billion metric tons** per year in 1990 to **10.8 billion metric tons** per year in 2004, an increase of 27.1 percent. Although data are not readily available, it is reasonable to expect international GHG emissions have continued to increase beyond 2004 levels because of the economic development especially in China and India. EPA data indicate that USA emissions have been relatively constant beyond 2004 levels (EPA 2008a).



Source: <http://www.epa.gov/climatechange/economics/international.html>

Estimated GHG emissions from the Proposed Action are on the order of 8,100 metric tons. When compared to annual GHG emissions for the United States and worldwide, potential emissions from the Tumbleweed project are substantially less (see **Table 4.11**).

Table 4.11. Comparison of Tumbleweed II EA Greenhouse Gas Emissions to 2004 USA and Global Totals (metric tons/year)

Tumbleweed GHG Emissions	8,100
Tumbleweed % of USA GHG Emissions	0.0004%
Tumbleweed % World GHG Emissions	0.0001%

In light of the uncertainties of the spatial distribution of precipitation pattern changes, global warming could cause the Uinta Basin to warm if GHG emissions increase and if the long-term computer models are correct. At the same time, precipitation could increase or decrease. If precipitation decreases, semi-arid desert conditions could worsen in the Uinta Basin. However, if precipitation increases, vegetation could increase in the Uinta Basin.

The assessment of GHG emissions and climate change is still in its earliest stages of formulation. At present, under current scientific data and models, it is not technically feasible to know with any certainty the net impacts to climate due to global emissions, let alone regional or local emissions. The inconsistency in results of scientific models used to predict climate change at the global scale, combined with the lack of scientific models designed to predict climate change on regional or local levels, prohibits the ability to quantify potential future impacts of decisions made at the local level, particularly for small scale projects such as the Proposed Action.

Drilling and development activities from the Proposed Action would contribute a negligible amount of hydrocarbon emissions, including GHGs, released into the local airshed. The incremental contribution to global GHG gases from the Proposed Action cannot be currently analyzed to provide potential effects at the present time.

#### 4.2.5.11 Visual Resources

The CIAA for visual resources is the Vernal Planning Area. Oil and gas activities are the predominant source of modification to the visual landscape within the CIAA. Other activities which could potentially have an impact on the scenic quality of the landscape are OHV use, trail and/or road development, vegetation manipulation, and fire management.

Construction and operation of natural gas facilities and associated features such as roads and pipelines within the Project Area would incrementally contribute to the loss of naturalness within the Book Cliffs region and greater Uinta Basin. Implementation of Alternatives A, C, or D would introduce new elements of line, form, color, and texture contrast with the existing landscape.

All activities that occur on Federal lands in the CIAA are required to conform to the VRM Class objectives set forth in the Vernal Approved RMP. The VRM system provides the BLM with a way to identify and evaluate scenic values, preserve those scenic vistas that are deemed most important, and to design or mitigate visual intrusions to the extent possible in other areas.

Lands managed by the State of Utah, the Ute Indian Tribe, or private individuals that are interspersed with BLM-administered lands in the Vernal planning area do not have requirements relating to the protection of visual resources. Therefore, activities proposed on these lands would contribute to cumulative visual impacts across the CIAA.

#### 4.2.5.12 Non-WSA Lands with Wilderness Characteristics

The CIAA for wilderness characteristics is within the Vernal planning area as a whole. Included in the cumulative impact analysis are all lands found by BLM to possess wilderness characteristics since 1996. These areas possess all of the values needed for wilderness including size, naturalness, and opportunities for solitude or primitive and unconfined recreation.

During the wilderness characteristics review between 1996 and 2007, there were 411,319 acres re-inventoried by BLM (see Chapter 3, Vernal Proposed Plan/Final EIS) of which 133,723 acres were found not to have wilderness characteristics. Of the 277,596 acres found to have wilderness characteristics, 106,198 acres are protected, preserved, and maintained for their wilderness values in the Vernal ROD as BLM natural areas. In accordance with management prescriptions in the ROD, these areas would remain in a pristine state. The remaining 171,398 acres do not have prescribed management to protect the wilderness values, and allow for uses that can degrade the wilderness characteristics of these areas. The Wolf Point wilderness characteristics area falls within this latter category of lands.

Alternatives A, C and D would preclude BLM from preserving the wilderness values in the Wolf Point wilderness characteristics area due to surface disturbance associated with proposed natural gas development. It is expected that all 11,802 acres of the Wolf Point wilderness characteristics area would no longer retain wilderness characteristics due to the additive and cumulative effects of oil and gas development.

Loss of the 11,802 acres of wilderness characteristics lands in Wolf Point area would result in the loss of 4 percent of all 277,596 acres of non-WSA lands with wilderness characteristics in the Vernal Field Office. Of the 178,398 acres that were not carried forward for their protection, preservation and maintenance of wilderness values in the Vernal ROD, 6.9 percent of that land base would be foregone based on development of the Wolf Point area.

Additional reasonably foreseeable oil and gas development could affect other non-WSA lands with wilderness characteristics within the Vernal Field Office area. Other past and present oil and gas projects that have been approved and could or already have impacted non-WSA wilderness characteristics lands in the White River area include Kerr McGee's Bonanza project, Enduring Resource's West Bonanza project, the Resource Development Group (RDG) project, Enduring Resources' Rock House Project, and Kerr McGee's Greater Natural Buttes project. The Resources Development Group (RDG) project and Enduring Resource's Big Pack EA would impact the Lower Bitter Creek non-WSA lands with wilderness characteristics. Stewart's Tumbleweed EA has impacted the Wolf Point non-WSA lands with wilderness characteristics. XTO's Kings Canyon EA, Gasco's EIS, EOG's 8 Alger Pass Wells EA, and Uintah County's As-is-Where-is Road UTU69125-20 would impact the Desolation Canyon non-WSA lands with wilderness characteristics. Cochrane's Horse Point Well EA would impact the Hideout Canyon non-WSA lands with wilderness characteristics.