Final Environmental Impact Statement
Continental Divide-Creston
Natural Gas Development Project

Volume 2: Appendices

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BLM

Wyoming High Desert District – Rawlins Field Office

NATIONAL SYSTEM OF PUBLIC LANDS
U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

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

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Introduction

As described in **Section 1.9, Public Participation**, the BLM conducted public scoping for both the Creston/Blue Gap II and the Continental Divide-Creston Natural Gas Development projects. In the fall of 2005, BLM published a Notice of Intent in the *Federal Register* and invited the public to comment on a proposal for more extensive development in the Creston/Blue Gap II natural gas field. A public meeting was held in Rawlins on October 13, 2005. During the scoping period on the Creston/Blue Gap II Project, the BLM received 29 individual comment letters, faxes, and e-mails.

Very soon after the Creston/Blue Gap scoping process had been completed, BLM RFO received a proposal from BP America Production Company (BP), representing themselves and other leaseholders, to further develop lease holdings in the Continental Divide/Wamsutter II natural gas area. The BLM decided to combine this project with the Creston/Blue Gap project into a single EIS and initiated another scoping process for the newly named Continental Divide-Creston EIS. The BLM published a Notice of Intent for this larger Continental Divide-Creston project on April 3, 2006. A public meeting to discuss the project was held at the Jeffrey Center in Rawlins on April 6. In addition to the 29 comments received during the original scoping period, 21 comment letters, faxes, and e-mails were received for the combined Continental Divide-Creston Project. Most of the respondents were the same for both projects.

Section 1.9.2, Key Issues and Concerns, describes those issues raised during the course of scoping for both phases of the project that are considered central to the analysis of impacts in this EIS- those issues that have not already been addressed as matters of law or policy, that deal with resources of high value in the project area, and that would be directly affected by the BLM's decision on natural-gas development in the project area. This Appendix includes a more comprehensive listing of the issues that were raised during the process. The Continental Divide-Creston Public Scoping Notice included a list of scoping questions representing preliminary issues identified by the BLM with regard to resources and management issues. These issues, shown below as *BLM Scoping Questions*, include air quality, cultural resources, land use, soils and vegetation, hydrology and water rights, wildlife, visual resources, noise, recreation, transportation, socioeconomic resources, and reclamation.

The BLM's scoping questions and a summary of the public comments received are described below, categorized by resource and management issue. In some instances, the BLM did not identify scoping questions for a particular issue; thus only comments are listed.

■ PHYSICAL RESOURCES

Soils

BLM Scoping Questions:

- Are there short-term, direct impacts to the soils in the project area?
- Are there long-range, indirect impacts to the soils resources in the project area?
- How much surface area will be disturbed and for how long?
- What provisions for interim reclamation will be made?
- What measures will be taken to minimize erosion and sedimentation once soil and vegetation is removed from disturbed sites?

Scoping Comments:

- Consider effects of erosion from wind, and to a lesser degree, water
- Consider mitigation measures that can reduce removal of topsoil and vegetation, and other practices that may have significant short-term impacts to soils.
- BLM must protect against soil erosion by identifying and protecting fragile, steep, or highly erosive soils, including biological soil crusts.

Water Resources

BLM Scoping Questions:

- What are the watershed characteristics of the project area?
- What existing conditions of stream banks and streambeds might be affected by the proposal?
- What is the direction and magnitude of groundwater flows in the project area?
- What are the recharge and discharge characteristics of groundwater in the area, including the relationship between ground and surface waters?
- What are the existing qualities of surface and ground water in the project area? How will the project affect surface and ground water qualities?
- How will produced water from coalbed de-watering operations be utilized and/or disposed of?
- What measures will be taken to minimize erosion and sedimentation once soil and vegetation is removed from disturbed sites?

Scoping Comments:

- Consider effects to water quality in the Colorado River.
- Consider degraded groundwater and surface water.
- Draining all the water from the ground lowers the ground level, provides no water for plants.
- Disclose whether any stream segments exceed water quality standards and/or are listed in the state's Clean Water Act. Determine if any planning and evaluation has been conducted on streams that have been evaluated as impaired, or if there is doubt as to whether any streams are achieving State water-quality standards.
- BLM must insure that waters in the project area comply with state water quality standards and with sections 401 and 404 of the CWA.
- Maintain a buffer zone and NSO around natural springs to protect water quality. Carefully evaluate the appropriate width of buffers and discourage all development or alteration of natural springs.
- BLM must comply with its obligations under the ESA concerning salt and sediment loads to and depletions from Colorado River watersheds.
- Selenium content of produced water must be 2 μ/L to protect fish, waterfowl, shorebirds, and other wildlife. Due to "bioaccumulation" in living tissue, the amount of selenium discharged (not the concentration released) must be monitored and regulated.
    - Do not discharge produced water with selenium concentrations > 2μ/L into closed containment pits or ponds for disposal by evaporation.

  - Estimate selenium and other trace element concentrations in evaporation ponds using an appropriate model, over a period of years to determine if selenium and other trace elements could post a risk to migratory birds using the pond.
- To prevent migratory bird mortality for species using evaporative ponds:
  - Using an appropriate model, estimate the sodium concentrations in produced water within the evaporation pond over a period of years to determine if sodium could pose a risk to migratory birds landing on the pond. If the model shows that sodium concentrations would exceed 17,000 mg/l, then the pond should be designed with effective wildlife exclusionary devices to prevent access by migratory birds, or other options should be considered for containment and disposal of produced water.
  - If the predictive model does not show an increasing trend in sodium concentrations, the pond should be monitored annually to verify whether levels are increasing over time. If concentrations exceed 17,0000 mg/L, netting or other effective wildlife exclusionary devices should be deployed to prevent access, or other options considered for containment and disposal of produced water.
- No surface disposal of produced water should be allowed due to increased salt loading within the Colorado River basin. In addition, it would alter the chemistry, suspended solids, water temperature and/or natural hydrograph of the watershed in the Muddy Creek drainage, which could result in elimination of native fish populations even if the water meets TDS loading set by the Colorado River Basin Salinity Control Forum in 2002.
- Evaluate the use of produced water to irrigate croplands in terms of potential land use changes.
- Analyze management of produced water through re-injection into underground reservoirs through National Pollution Discharge Elimination permits.
- Inject produced water from coalbed methane underground; no surface disposal.
- How are the formations identified for re-injection related to the formations that produce the springs that create the stream in the Muddy Creek drainage?
- Hydrostatic test water released during pipeline construction could alter stream channels, increase sediment loads, and introduce potentially toxic chemicals or invasive species. Avoid discharging hydrostatic test waters directly to streams; release them first into a temporary sediment retention basin if suspended solids concentration is significantly higher than receiving water. Use potable or freshwater well sources for hydrostatic test water.
- At no time should water from a surface source in one basin be discharged into another basin, which could spread nuisance species.
- Regarding pipeline construction and operations:
  - Pipeline crossings of perennial streams should be bored underneath the stream rather than trenching through it, especially Muddy Creek and its primary tributaries.
  - Install pipeline crossings through ephemeral streams by trenching, using riprap to stabilize stream banks. Place riprap from the channel bottom to the top of the high water line on the bank. Use double-ditching techniques to separate the top one-foot of stream-bottom substrate from deeper soil layers, and reconstruct by replacing deeper substrate first.
  - Locate pipelines that parallel drainages outside the100-year floodplain. Construct pipeline crossings at right angles to all riparian corridors and stream to minimize the area of disturbance.
  - Use the minimum practical width for rights-of-way where pipelines cross riparian areas and streams.

  - Any new road crossing of Muddy Creek proper is opposed; a bridge should be used to span the channel and riparian zone, and the structure should not impact or restrict flow in the channel on the 50-year flood plain.
  - For perennial tributaries in the Muddy Creek drainage, design road crossings to allow fish passage at all flows. Preferred structures in descending order: bridge spans with abutments on banks, bridge spans with center support, open-bottom box culverts, and round culverts with the bottom placed no less than one foot below existing stream grade. Perched culverts block fish passage and are unacceptable in any stream that supports a fishery.
  - Drilling should not be permitted on slopes exceeding 25%.
  - Design drill pad sites to drain storm water and other fluids into a reserve pit with capacity to intercept and hold excess precipitation. Line all reserve pits, irrespective of soil types, with an impermeable barrier to eliminate leaching.
  - Staging, refueling, and storage areas should be located away from riparian zones and flood plains. Keep all chemicals, solvents, and fuels at least 500 feet from streams and riparian areas.
  - Locate and construct all structures crossing intermittent and perennial streams so they do not decrease channel stability or increase water velocity.
- BLM must protect against degradation of water quality by implementing measures such as lining of reserve pits or pitless drilling.

Climate and Air Quality

BLM Scoping Questions:

- What emission sources and values will be generated by the project?
- How will air quality impacts be evaluated and resources protected during development and operations?

Scoping Comments:

- General concern: long-range protection of visibility.
- The EIS should be consistent with the Rawlins Draft RMP/EIS, which proposed to use a comparative, emissions-based approach.
- BLM must assure full compliance with the Clean Air Act.
- Fully explain and interpret projected impacts, summarizing modeled results and the various methods and assumptions used so that the public can easily understand them for their significance. Include specific mitigation measures, such as improved diesel engine technology and fugitive dust control.
- Estimate potential future changes in emissions. Modeling should address cumulative emissions in the Rawlins Field Office planning area that affect the same areas as C/BGII. Include information in the DEIS regarding cumulative impacts from coal production in the vicinity.
- Address reasonably foreseeable gas and other development in the area, and possible changes in this and other proposed projects. For example, the Jonah Infill gas project suggests that improved diesel engine technology may be necessary for all future gas development projects in Southwestern Wyoming to protect Class I and other air resources.
- Disclose the effects of increases in No_x and other pollutant concentrations, including regional haze, and clarify control measures.

- The fugitive dust analysis should emphasize the Pm_{10} standard and percentages of emissions that are fine and coarse particles. Address near-field impacts of fugitive dust, and whether there is potential to approach NAAQS standards.
- Describe potential air impacts of venting and flaring, and whether BLM or the State of Wyoming are considering flare less flow back or similar technology as mitigation.
- Address proposed and needed air monitoring. If BLM intends to add air monitoring stations, describe the program in sufficient detail to ascertain locations and objectives of the monitoring effort.
- The EIS must analyze the cumulative effect on air quality, including all sensitive receptors potentially affected, and acknowledging all reasonably foreseeable emission sources. Additionally, BLM must ensure compliance with all air pollution standards and discuss all mitigation measures available to prevent air quality violations, increment exceedances and adverse impacts to AQRV, including visibility impairment in Class I areas.
- We request that BLM reject use of the Scheffe model for estimation of ozone pollution and use instead an up-to-date photochemical model such as CAMx or CAMQ.

■ BIOLOGICAL RESOURCES

Vegetation and Riparian/Wetland Communities

BLM Scoping Questions:

- Are there short-term, direct impacts to the vegetation resources in the project area?
- Are there long-range, indirect impacts to the vegetation resources in the project area?
- How much surface area will be disturbed; for how long?
- What provisions for interim reclamation will be made?
- How will noxious weed populations be monitored/ controlled?
- What are the revegetation standards and requirements?
- Are there adequate reclamation bonds or other guarantees for reclamation of site disturbance?
- Will there be impacts to jurisdictional wetlands or Waters of the U.S.?
- How much surface area will be disturbed and for how long?
- What provisions for interim reclamation will be made?
- What measures will be taken to minimize erosion and sedimentation once soil and vegetation is removed from disturbed sites?

Scoping Comments:

- BLM should conduct surveys to determine the location and characteristics of native plant communities and rare or special status species and insure compliance with EO 13112 relative to invasive species.
- Outline minimum reclamation standards that emphasize use of native plant species, post-reclamation monitoring, and management.

- Riparian and wetland habitat buffer zones should preclude new surface-disturbing activities within the 100-year floodplain or within a designated buffer. Recommend buffer zones that include NSO stipulations and clarify if surface occupancy exemption may be granted, including the nature of its mitigation. Clarify if exemptions may be restricted based on the cumulative effects of similar actions in any one riparian area.
- Take measures to avoid wetland losses in accordance with Section 404 of the Clean Water Act.
- Inventory and fully describe wetlands that may be destroyed or degraded in terms of functions and values, and outline specific actions to minimize impacts and compensate for unavoidable impacts.
- Avoid impacts to riparian areas; minimize and assess functions and values in areas of unavoidable impacts, and develop and implement measures to compensate unavoidable losses.

Invasive, Non-native species

BLM Scoping Questions:

- How much surface area will be disturbed and for how long?
- What provisions for interim reclamation will be made?
- How will noxious weed populations be monitored, and controlled?

Scoping Comments:

- Describe the current trend for weed infestations. Include the location of weed infestations within and surrounding the project area, the trend in infestations, specific measures for oil and gas leases, and the annual budget available to affected counties and BLM for invasive species control.
- BLM must provide measures to impede the invasion of noxious weeds.

Terrestrial and Aquatic Wildlife

BLM Scoping Questions:

- What are the current conditions and extents of wildlife habitat in the project area?
- What are the seasonal patterns of wildlife use and movement in the project area?
- Are wildlife populations increasing or decreasing in the project area?

Scoping Comments:

- With regard to wildlife habitat fragmentation, analyze the project at a level that reflects full potential development of the area, rather than on a piecemeal basis to ensure that the consequences of full-field development are clearly understood before wildlife resources are committed.
- Address loss of wildlife habitat and habitat effectiveness, fragmentation, effects to migration corridors, harassment of wildlife by increased traffic, noise, and illegal activities.
- Evaluate where elk will be displaced to, and whether such habitat is suitable and/or herds will be tolerated by private landowners.
- Conduct raptor nest surveys and evaluate impacts to nesting. Establish mitigation such as seasonal timing restrictions, siting of facilities, and installation of artificial nesting platforms away from project disturbances and areas where they could impact Sage-grouse.

- Evaluate expected cumulative impacts to wildlife habitat and individual populations and herds relative to other energy development occurring in the area, particularly Atlantic Rim.
- Analyze impacts to each of three separate pronghorn herds, both direct and cumulative (instead of a regional or species analysis). Analyze impacts to individual herds of mule deer and elk, as well as three Sage-grouse management areas that overlay the project area.
- Evaluate impacts to mountain plovers.
- Use the lowest road densities possible to minimize habitat loss and disturbance by vehicles.
- Operators should fund necessary wildlife surveys exceeding those normally conducted annually by state and federal biologists.
- The EIS must address the impacts of oil and gas development on wildlife and wildlife habitat function, including:
  - the ecological needs of wildlife on a regional scale;
  - impacts on pocket gophers;
  - impacts on mountain plovers;
  - impacts on prairie dogs.
  - the dispersal or recovery of gray wolves in the southern Red Desert;
- BLM must ensure full compliance with BLM Manual MS-6840.06.E (Special Status Species Management), including attention to ferruginous hawks, other raptors and sage-grouse.
- We urge that BLM protect more than "critical" big game winter ranges.
- We ask that the environmental analysis provide for wildlife diversity by protecting riparian areas and other special habitats, protecting certain species, maintaining connectivity between habitats, maintaining corridors, and assessing indirect and cumulative impacts.
- BLM should adopt the provisions of the WGFD recommendations on sustaining important wildlife habitats affected by oil and gas development.
- The EIS should analyze potential impacts to wildlife habitat, including big-game crucial winter range, sage-grouse, raptors, predators, and big game in general.
- Consider the impact of road building, increased human presence and disturbance, timber harvest, mineral exploration, grazing, etc. on wildlife.
- Protect all species of migratory birds, including Bald eagle.
- The project will be detrimental to the ability to sustain area wildlife.
- Natural gas development is estimated to span 30-50 years in Desolation Flats and Continental Divide/Wamsutter II, and this project will last as long if not longer. Where will wildlife go?
- The northern portion of the project area supports the only viable assemblage of native bluehead suckers, roundtail chubs, and flannelmouth suckers known to still exist in Wyoming. This portion of the stream provides preferred breeding habitat, and movement up or downstream is restricted by the combination of physical barriers and water temperatures. Any cumulative energy development activity that negatively affects the integrity of the watershed and overall stream health may jeopardize their future existence. An NSO restriction is recommended for surface gas development between the Continental Divide north of Muddy Creek proper and the Muddy Creek/Dry Cow Creek hydrographic divide located south of Muddy Creek and upstream of the large wetland complex.

Special Status Species

BLM Scoping Questions:

- How much surface area will be disturbed and for how long?
- What provisions for interim reclamation will be made?
- Which wildlife species of importance may be impacted by the proposal?
- Will any threatened or endangered species be affected by the proposal?

Scoping Comments:

- The EIS must address the impacts on BLM sensitive plants.
- Assemble regional habitat-use data from published data where available for T&E species and other key species. Include impacts of road density on local species, distance of road effects to determine the width of effect zones, and species dispersal distances to evaluate the size of core areas.
- The following T&E Species, or species proposed for listing, may be present in the project area:

  Bald eagle (threatened; found throughout the state). Restrict activities within 1 mile of nests in open country year round. Limited disturbance home range buffer zone may extend outward in potential foraging habitat for 2.5 miles from the nest.

  Black-footed ferret (endangered; prairie dog towns). There may be impacts to two white-tailed prairie dog complexes in the project area where the species is found, and surveys may be recommended if complexes of greater than 200 acres are affected.

  Blowout penstemon (endangered; sand dunes south of Ferris Mtns). Surveys should be conducted in mid-June to early July when flowering occurs.

  Ute ladies'-tresses (threatened; seasonally moist soils & wet meadows below 7,000 feet). Surveys should be conducted.

  Colorado river fish: Bonytail, Colorado pikeminnow, Humpback chub, and Razorback sucker (endangered; downstream riverine habitat, Yampa, Green and Colorado). Formal consultation is required for projects that may lead to depletion of the waters including ponds, lakes, reservoirs, hydrostatic testing of pipelines, wells, dust abatement, diversion structure, and water treatment facilities.

  Include an estimate of the amount and timing of average annual water depletion, both existing and new; describe estimating methods, location of depletion, if and when water will be returned to the system, and what the depletion is being used for.

  Yellow-billed cuckoo (candidate). Provide status of the species in and near the project area.

  Sensitive species, as identified on the Wyoming Natural Diversity Database.

  Pygmy Rabbit. Encourage project planning measures that retain large tracts of suitable habitat and corridors to adjacent habitat.

  Greater Sage-grouse (species of concern).

  - Closely evaluate any activities that result in loss or degradation of sagebrush habitat.
  - Contact Wyoming Game & Fish to identify important habitats, and survey/map important habitats where local information is not available.
  - Evaluate long-term and cumulative effects on the species, since reclamation may not restore populations to pre-activity levels.

- Unless site-specific information is available, manage habitat following Western Association of Fish and Wildlife Agencies guidelines.

Mountain plover (species of concern). Develop protective measures with an assurance of implementation should they be found in the project area.

- Consider whether potential impacts to listed species on state and private lands will occur as a result of actions on BLM managed lands, and develop measures to avoid or minimize impacts.
- The EIS must address the impacts of oil and gas development on wildlife and wildlife habitat function, including:
  - implementation of a conservation community "blueprint" for Sage-grouse and Sage-grouse habitat throughout the project area;
  - impacts on mountain plovers;
- BLM must analyze how ESA and BLM-sensitive species would be affected by failure to conserve white-tailed prairie dogs, including the impact on black-footed ferret recovery and on BLM-Sensitive and Colorado River Endangered fish species.
- Native fish species in the Muddy Creek drainage are considered sensitive (Status I Species) to both State and Federal agencies. Therefore, habitat function is to be maintained. WGFD's Strategic Habitat Plan identifies the Muddy Creek watershed as the #2 habitat priority for both aquatic and terrestrial wildlife in most of Southwestern Wyoming.
- BLM must analyze how other ESA and BLM-sensitive species would be affected by the project, including BLM-Sensitive and Colorado River Endangered fish species.
- Baseline studies on pygmy rabbits and impact on this species should be included in the EIS.
- Full-field development will destroy habitat value for sage-grouse leks, hastening their listing under the Endangered Species Act.
- In addition to direct habitat loss for greater Sage-grouse, evaluate secondary disturbance to Sage-grouse in undisturbed habitats adjacent to the project area.
- Evaluate expected impacts and habitat avoidance by Sage-grouse due to structures (particularly power lines)
- Consider development of artificial leks near existing roadside leks to attract grouse to safer areas.
- Identify and map all existing disturbances of Sage-grouse habitat near the project and evaluate the degree of existing habitat fragmentation, as well as how it would be accelerated by this proposal.

Wild Horses & Burros

A cumulative impact analysis is recommended examining regional effects to the area including South Baggs, Atlantic Rim, Desolation Flats, Pacific Rim, Table Rock, and Vermillion Creek natural gas fields, and the Black Butte Mine. Include the overpopulation of feral horses and nonstandard fences in the analysis of effects on wildlife.

■ HUMAN ENVIRONMENT

Visual Resources

BLM Scoping Questions:

- Will there be visual impacts from the project?
- Can visual impacts be mitigated to conform with the existing landscape and visual quality objectives

Scoping Comments:

- The project will destroy natural vistas and open spaces. BLM should avoid development in areas where the impacts of development would be visible for long periods of time or from long distances
- BLM must protect visual character and scenic resources, including protection from light pollution and impacts to the appearance of the night sky..
- A sensitive landscape that warrants special protection for its visual quality is a "a small portion of the Red Lake Dunes Citizens' Proposed Wilderness" located in the dune field immediately west of the gravel road leading northward to Hay Reservoir.
- Identify and set aside important scenic and undeveloped areas so that the public has a few unimpaired lands left to visit after this project is underway.
- The North Flattop unit is an area of high importance for visual resources that is not protected under the Great Divide RA RMP, that should be excluded from O&G development. Other such areas are Red Lake Dunes and Cyclone Rim (Class I).
- Protect visual quality in a "5-mile buffer" associated with the Continental Divide Trail (Class I) and with the Cherokee and Overland trails (Class II).
- The EIS should analyze the impacts to scenic quality from effects to visibility and of impacts to the landscape from drilling.

Recreation

BLM Scoping Questions:

- How would the proposal affect recreation in the immediate and general areas?
- Are there opportunities to enhance recreational opportunities in and around the project area as a result of the proposal?

Scoping Comments:

- Evaluate whether increased well densities and roads will further impact recreational use (including hunting). If there is any potential for closing public lands near gas company facilities, address it in the EIS.
- Fragmented/shrinking habitat due to road development could increase grazing competition with wild herds and also decrease hunting success and/or hunter numbers.
- Opposition was expressed to the implied notion of having industry enhance recreational opportunities.

- BLM should explicitly address "unquantified environmental values" such as the value of the project area and nearby lands for primitive and unconfined recreation and for "simple open space values."
- Map of recreational resources identifies two areas of "Citizens' Proposed Wilderness" that potentially affect the project area. These are associated with the Red Lake Dunes WSA and the Adobe Town WSA.

Cultural and Historical Resources

BLM Scoping Questions:

- Will there be impacts on historic and archaeological resources in the project area as a result of development and operations?
- Are there any cultural resources located in the project area that would be eligible for the National Register of Historic Places?

Scoping Comments:

- Conduct thorough archaeological studies and provide mitigation to protect paleontological, historic, prehistoric, or cultural resources in the project area.
- Give specific attention to historic trails in the area.
- Give great consideration to the effects of further authorized development on visitors to historic trail corridors.
- Work with recognized experts to prevent damage to historic trail ruts, considering the economic costs of damage.
- Ensure that there is sufficient inventory of cultural resources in order to avoid resource conflicts.
- BLM must pursue consultation with Native American tribes and protect native sites, and must meet its Section 110 and Section 106 obligations and the requirements that it consult with appropriate Native American groups.

Socioeconomics

BLM Scoping Questions:

- How would populations of Sweetwater and Carbon Counties be affected by the project?
- How much income to Carbon and Sweetwater Counties and the region would be generated by the project?
- How will the project affect the tax base of local government?
- Will there be any impact to local social services, law enforcement, schools or other local community services as a result of the project?
- Will there be an impact on housing costs in Rawlins, Wamsutter, and other Carbon and Sweetwater County communities as a result of the project?
- What will be the impact of the project on the economies of Rawlins, Wamsutter and other Sweetwater and Carbon County communities?

Scoping Comments:

- BLM must estimate the amount of gas that is both technically and economically recoverable.
- Economically recoverable reserve estimates must include the costs of exploration, development, production, profit, transportation costs, non-market costs, off-site mitigation costs such as increased water treatment costs.
- Please complete a marginal revenue cost analysis of estimated gas production levels. Please compare and contrast the marginal revenues with the marginal costs for the full range of drilling levels.
- Socioeconomic impacts to surrounding communities should be assessed including labor competition, housing demand and government expenditures.
- Request that BLM's socioeconomic assessment should follow the approaches set out in the scoping briefs "*Socioeconomic Framework for Public Land Management Planning: Indicators for the West's Economy*" and "*The Economic and Social Impacts of Oil and Gas Development*."
- BLM should utilize a Total Economic Valuation Framework for evaluating proposed oils and gas development projects.
- The scope of the BLM analysis should extend beyond the surrounding areas.
- BLM must recognize wilderness characteristics and other natural qualities as valuable resources that provide multiple uses for the public.
- Request that BLM fully consider the indirect role of wild lands in attracting non-recreational businesses and retirees.
- A full accounting of all hidden costs of oil and gas drilling is needed. Hidden costs include:
  - changes in direct use of lands within and adjacent to the analysis area,
  - changes in community conditions such as air water and noise pollution,
  - reductions in the value of the area for study of natural ecosystems,
  - off-site environmental effects on other uses of the land,
  - effects on biodiversity, effects on ecosystem services, effects on passive use.
- The BLM should avoid IMPLAN or other input-output models that are grounded in economic base theory when estimating jobs and income for each alternative. We recommend that BLM use the EPS model developed by and available free from the Sonoran Institute.
- The NEPA analysis should be based on reasonable (BLM) budget expectations, which should be clearly stated and the BLM must include a fiscal analysis of alternative implementation and mitigation costs.
- To provide socioeconomic context, the BLM should examine historic trends in county income and employment, using the Sonoran Institute Economic Profile System.
- Request that the agency identify all applicable federal state and local tax laws including exceptions and reductions and make realistic and accurate estimates of net tax revenues from oil and gas production, based on economically recoverable reserves and including the net environmental and community costs from drilling and production.
- Estimate the socioeconomic costs to communities from oil and gas development.
- Increased costs to private landowners and residents.
- Increased costs to local governments.

- Economic instability and loss of economic diversity.
- Estimate and evaluate the environmental costs of oil and gas development.
- Bonding requirements for industry must be estimated and included in the analysis.
- BLM must include an analysis of the costs of implementing each alternative, including the cost of mitigation measures. These costs must then be contrasted with the anticipated budget levels to assess the probability of mitigation measures being fully implemented. BLM should include a reasonable budget limitation and evaluate a set of management alternatives that are constrained by that budget level.
- The costs of enforcement of environmental protection and mitigation requirements must be estimated and included in the NEPA analysis.
- The project specific and cumulative effects of increased costs and decreased revenues on affected grazing operators should be assessed.
- Recommend that the EIS include a full and thorough social and economic impact analysis including impacts to livestock grazing.
- The EIS should include an assessment of the potential for loss of environmental, historic and social values associated with livestock grazing and the importance of such losses to area residents and visitors.
- BLM must address state and federal as well as local benefits associated with royalty payments and tax revenues derived from natural gas production associated with the CD-C project.
- The benefits of increased supplies of natural gas to the consumer must be analyzed and discussed.
- The EIS should contain a detailed analysis of the socioeconomic impacts and positive effects of the proposed action and alternatives for the State of Wyoming and affected counties and communities.
- The local economy significance criteria should be discussed.
- The EIS should consider potential project effects on local communities including housing, schools, water and wastewater services, increased road traffic with associated dust and hazardous materials spill potential and easier human access to wildlife habitat with associated increased potential for wildlife disturbance. Methods to avoid or mitigate identified impacts should be discussed.
- The assessment should consider the effects of reasonably foreseeable development on area communities.

Transportation

BLM Scoping Questions:

- Will motor vehicle traffic be associated with the proposed operation?
- How will employees, contractors, supplies reach the site?
- Will new roads need to be constructed?
- How will infill development affect existing transportation systems including highways, county roads and project area transportation?
- Can transportation planning reduce and mitigate some of the impacts from further development?

Scoping Comments:

- Evaluate likely increases in subdivisions, sale of small private tracts, permanent roads, power lines and fences resulting from this project, and the major negative impacts to all wildlife species in the project area.
- Generate infrastructure scenarios prior to field development, providing multiple road scenarios for potential infrastructure. Include both generous and conservative estimates of infrastructure construction, based on estimates of hydrocarbon resources for the field. Take particular care if unconventional or continuous-type deposits are involved.
- Reduce road density to create blocks of core habitat at a minimum distance from roads (.25 miles for bighorn sheep, pronghorn, and mule deer). Use the Society's landscape fragmentation metrics to guide management decisions regarding transportation routes for other wildlife species, with the goals of reducing road density and edge effects and increasing core areas to provide greater habitat security.
- Establish priorities and best management practices to close and reclaim roads and other routes.
- Create a responsible transportation plan, incorporating detailed guidance from NEPA and FLPMA, specifically:
    - Consider the environmental consequences of the proposed action based on accurate scientific information of high quality [40 CFR 1500.1(b)], and conduct a high-quality analysis of the information collected.
    - Take any action necessary to prevent unnecessary or undue degradation of the lands and minimize adverse impacts on the natural, environmental, scientific, cultural, and other resources and values (including fish and wildlife habitat) of the public lands involved. (FLPMA).
    - Following selection of an alternative, continue to monitor the plan, and make appropriate revisions to ensure it is meeting its objectives.
- Use of existing roads and pipeline corridors should be maximized, and extraordinary steps taken where new pipelines or roads cross the trails.
- Use BMPs to locate roads, pipelines, and wells.
- Include the amount of aggregate needed to support anticipated road development in the analysis. The division is concerned about the availability of aggregate from currently permitted operations and the possible need for new sources.

Noise

BLM Scoping Questions:

- How much noise will be associated with the proposed project and what are those noise sources?
- Will sound effects be audible for specific distances from certain points.
- How will topography affect audibility distances?

Scoping Comments:

- The environmental analysis should address issues related to noise in terms of remoteness and quietness.

■ MANAGEMENT ENVIRONMENT

Lands and Realty

BLM Scoping Questions:

- What is the current and planned land use policy for the project area?
- What would be the impact on local land use patterns in the project area?
- How does the "checkerboard" surface ownership created by the Union Pacific Land Grant affect the EIS analysis and possible future gas development?

Rangeland Management

BLM Scoping Questions:

- How much surface area will be disturbed and for how long?
- What provisions for interim reclamation will be made?
- How will noxious weed populations be monitored, and controlled?

Scoping Comments:

- Consider the feasibility of supplemental feeding of livestock on permitted grazing land in areas where road construction will decrease available forage.
- Fragmented/shrinking habitat due to road development could increase grazing competition with wild herds. Consider supplemental feeding of livestock or other mitigation measures if necessary to minimize impacts to rangeland.
- The Federation supports water development projects if the water is of high quality. Produced water could be pumped to stock ponds and reservoirs and new storage reservoirs created.
- Consider impacts to rangeland for wildlife as well as domestic animals.
- The scoping notice did not identify grazing or rangeland management as significant issues, and this is a serious and disrespectful omission.
- Road traffic in the Rawlins FO area has led to livestock deaths and injuries from collisions.
- The introduction and growth of noxious weeds has weakened and killed livestock and crowded out forage.
- The significant increase in road dust has diminished the palatability and nourishment of forage.
- Damaged cattle guards, cut fences, and unlocked gates have raised unnecessarily repair costs and diverted labor to search for lost livestock, some of which were never found.
- Loss of water from artesian and flowing wells has weakened livestock health, reduced weight gain and available forage, induced weeds.
- Reclamation has been poor, resulting in further loss of forage.
- Potential conflicts should be characterized as "probable," not "possible" as currently written.
- Data from the Fremont County study conducted by the University of Wyoming should be included in the EIS.
- The BLM, grazing permittees, and proponent should work cooperatively throughout the life of the project to make site-specific, case-by-case decisions.

- Research and monitoring conducted by the operators should include movement of livestock to an open allotment or pasture, purchase of hay in lieu of allotment use, monitoring of development impacts, including use of the Wyoming Rangeland Monitoring Guide of August 2001, construction of water and range improvements on either public or private land, purchase or lease of additional grazing land to replace lands lost to grazing, and reimbursement to producers for loss of AUMs and pastures.
- Analyze the impacts of the loss of open space, scenic vistas and historic rural landscape as related to loss of grazing lands.
- The impact of this project upon food and habitat for domestic animals deserve the same study and documentation as for fish and wildlife.
- Include the positive effects of livestock grazing on the environment and as a tool to achieve environmental objectives, and the impacts of the project on limiting the ability of livestock grazing to achieve positive effects.
- Evaluate how development of additional wells would affect distribution of livestock and feral horses, and effects of changes to grazing on sage-grouse, mountain plover, and big game.
- Address worker housing, the necessity to commute, and the resulting heavy deposition of dust on vegetation and adjacent habitats. Evaluate and mitigate negative effects and loss of AUM's/wildlife forage.

Areas of Critical Environmental Concern

- Give priority to the designation and protection of ACECs for wildlife.
- Designate ACECs in areas of crucial winter range and at pinch points of migration routes, with management prescriptions that include no creation of new routes or expansion of existing routes, no new leasing unless designated NSO, no new energy development, no cross-country travel, limitation of off-road vehicles to designated routes, and closure of unnecessary routes.
- Red Lake Dunes and Chain Lakes proposed ACEC should be withdrawn from drilling

Wilderness

- Wilderness characteristics and other natural qualities must be recognized as a valuable resource.

General and Administrative Issues

- BLM should not approve the project prior to revision of the Rawlins RMP so that the project can be pursued under the framework of an updated RMP.
- The Rawlins Field Office (RFO) is preparing a revision to its RMP that will assess options for preservation of migration corridors and environmentally sensitive areas, including new technologies and other impact-reducing measures. A revised scoping notice for Creston/Blue Gap II removed the requirement that the RMP be complete before a decision is issued for C/BGII; this violates the NEPA process and will delay implementation of RMP decisions, likely allowing more lenient mitigation measures for C/BGII.
- The proponent is bound by stipulations in the Great Divide Resource Management Plan, and in future by the Rawlins Resource Management Plan.

- The ROD for this EIS will be held up indefinitely because of delays in preparation of the Rawlins RMP FEIS.
- It is unwise to combine the Creston-Blue Gap and Continental Divide projects because one is an infill project in a largely industrial area and the other includes vast stretches of undeveloped lands.
- This proposal is consistent with the Energy Policy Act of 2005.
- Comment indicated concerns regarding multiple-well EAs/EISs.
- Include PacifiCorp in the process to ensure that their rights to site, construct, operate, and maintain their facilities are considered and protected.
- Work cooperatively with Wyoming Game and Fish, local government, and non-government organizations
- Grant the Alliance for Historic Wyoming "interested party" status for Section 106 procedures for this EIS.
- Hold multiple public hearings.
- Judging from the list of issues, concerns, and opportunities issued by BLM to date, we are destroying what makes Wyoming Wyoming.
- Endless pollution from drilling has cost $70 million in cleanup costs to taxpayers
- No drilling should be allowed on BLM land unless an insurance policy bond is posted for cleanup costs
- The entire American public is skeptical of our energy policy and secret meetings.
- The rate of development in the eastern Red Desert is completely out of control, following on the heels of Atlantic Rim and soon to be followed by Continental Divide.
- Increased gas supplies from this area, as well as Wamsutter, will be necessary within the next two years to ensure that the Kinder-Morgan/Sempra pipeline to Ohio carries Wyoming gas rather than from other states.
- The writers support the project and development of the EIS.

Scoping and Approach

- BLM should define the scope of the environmental analysis to include analysis of the cumulative effects of actions/projects that have impacts in common with those resulting from natural gas development.
- BLM should consider, analyze, and wherever appropriate, facilitate, international efforts to prevent environmental decline.
- BLM cannot define the purpose and need for the project as just to allow natural gas to be developed; it must also include strong environmental protections as at least a co-equal purpose and need.
- BLM must establish the baseline condition or all resources in the area in order to evaluate environmental conditions and impacts in an informed manner.
- Require incorporation of all NEPA policies and goals
- BLM should "infuse" the goals and policies of the National Environmental Policy Act into the environmental review and decision document.

- Generate landscape metrics for all infrastructure, including density, infrastructure effect zones, and core areas. Metric parameters and evaluation of results should be relevant to ecological conditions, species present, and human use of the landscape. Integrate results into management plans,
- We urge BLM to require that development activities not cause unnecessary or undue degradation.
- Notify all lessees of their responsibility to comply with federal and other applications regardless of land or mineral ownership.
- If BLM, surface owners, and lessees agree, non-BLM lands can be included in section 7 consultation on federal lands.
- Specific management actions like the proposed project must be done pursuant to multiple use and sustained yield principles.
- The environmental analysis and decision document should emphasize resource and ecosystem protection, which will best ensure that future options are retained.
- No new project area disturbance should commence prior to completion of formal consultation under Section 7 of the ESA, preparation of a BA.
- Trade approved APDs for a new APD.
- Provide access to State mineral leases.
- Continue development on fee lands when access across adjoining BLM-administered land has already been approved.
- Permit rights-of-way (pipelines) for previously approved projects.
- Suspend operations on undeveloped federal leases.
- Permit drainage wells for Federal minerals on a case-by-case basis.
- If surface disturbance and other impacts can be shown to be below that analyzed in the EIS, additional wells may be permitted. If reclamation activities can result in reduced surface impacts to a point below that analyzed in the EIS, additional wells may be permitted.
- Set a schedule for completion of the EIS and adhere to it, identifying and explaining the reason for any delays to the National Energy Policy Office.
- Analysis completed for previous projects in this area will provide opportunities to reduce the time and cost required to prepared this EIS. Analysis from other documents should not be duplicated.
- Analyze the impacts associated with the proposed action only.
- Honor the MOU with the Wyoming State Land Office concerning access to state lands and honor private property rights. Make a statement in the EIS addressing BLM's right to restrict access to private lands beyond a customary 30-day right-of-way application period.
- Consult with and use BLM's Reservoir Management Group to assess the requirements to adequately drain natural resources and prevent waste.
- Planned or phased development of the area is not feasible unless one operator controls leases on the entire area because it could create a taking by BLM through restriction of development of a leasehold.
- Consider cumulative impacts of this and other area projects.
- A cumulative impact analysis is recommended examining regional effects to the area including South Baggs, Atlantic Rim, Desolation Flats, Pacific Rim, Table Rock, and Vermillion Creek natural gas fields, and the Black Butte Mine.

- A landscape-level analysis should consider direct, indirect, and cumulative impacts of this larger combined project.
- Consider adhering to multiple use under FLPMA.
- Use drilling rigs powered by electricity, natural gas, or biodiesel rather than conventional diesel.
- Overall comments focus on harmonious, coordinated resource management that considers the relative values of resources.
- Any development should be slow and should only occur after reclamation of existing disturbances.
- Development in Wamsutter makes it that much more important to protect remaining pristine landscapes like Adobe Town, Jack Morrow Hills, and Wild Cow Creek.
- No drilling should be allowed the eastern Red Desert
- No coalbed methane development due to as-yet unknown long-term consequences
- All support facilities (roads, power lines, pipelines, and well site facilities) should be included in the APD and Sundry Notice permit process.
- New categorical exclusions can only be legally utilized following an analysis of whether extraordinary circumstances (per NEPA, the ESA, NHPA, etc.) may prevent their application.
- The NEPA analysis should be based on reasonable budget expectations to ensure that mitigation measures and resource protection will be funded, and BLM should include a fiscal analysis of alternative implementation and mitigation costs.
- Given their stewardship responsibilities, governments should encourage or undertake activities that protect the environment and discourage or prohibit those that do not. It is also appropriate for government to own and use land and water resources to protect the environment and to support others in doing the same.
- Government should continually seek to improve the efficiency of its environmental and resource management programs without compromising its responsibilities (a mixture of regulations, incentives, and public ownership of resources). It should aim to bring about as high a level of environmental quality for a given expenditure.

Alternatives Development

- IM 2005-047 provides guidance for NEPA compliance in oil and gas that supports the Energy Policy Act of 2005 and may not be valid under existing law. Specific concerns include the development of alternatives that increase/accelerate development and use of new categorical exclusions.
- We ask that at least one alternative fully explore phased development and directional drilling to the maximum extent possible.
- Consider an alternative that would only allow minimal surface disturbance.
- We ask BLM to consider an alternative that would only allow development to occur from existing oil and gas well pads, with maximum use being made of directional drilling technologies.
- Similarly, we ask BLM to consider an alternative that would not allow for any additional road construction.
- APDs that have expired will not be extended so that pending APDs may be permitted.

- Alternatives must consider geological, technical, and other issues such as correlative and leasehold rights.
- Any constraints in the alternatives should also evaluate the additional difficulties they may generate.

Directional Drilling

- Directionally drill wells from existing well pads
- Evaluate the effect of intense development and high-density gas wells on the Department's management of Chain Lakes Wildlife Habitat Management Area, including the feasibility of using directional drilling in wetlands and sensitive areas associated with the lakes and use of artificial pads or pontoons to access development sites.
- Directional drilling is appropriate in some areas but should not be mandated for areas where it is not appropriate. Because it increases both cost and risk, directional drilling should be considered only at the site-specific analysis level.
- Use directional drilling and cluster up to 32 wells per pad and avoid intrusion into sensitive wildlife habitats.
- At the very least, directional drilling using 32 wells per pad should be required.
- Require the industry to cluster wells, up to 64 per pad, to minimize surface impacts.
- If directional drilling is to be allowed, why not specify it as the preferred method of extraction? It is a proven, economical technology that minimizes damage.
- If directional drilling is not considered a "reasonable alternative" please be specific as to the meaning of that phrase in the context of the project and its environmental impacts.
- Multiple wells should be drilled at a single location when feasible, and wildlife disturbance minimized (e.g. by automated pumping facilities).
- Include mitigation such as directional drilling and BMPs in all alternatives.
- Require directional drilling and cluster development
- Address the potential for directional drilling to minimize habitat fragmentation;
- Directional drilling should be used to access subsurface gas leases from outside the NSO area.

Mitigation and Monitoring

- Mitigation plans should include goals and objectives, methodologies, time frames for implementation, success criteria, monitoring, and a contingency plan if unsuccessful.
- Apply a standard NSO stipulation to all riparian zones and a 500-ft corridor from the outermost limit of the riparian habitat.
- During pipeline construction, avoid stripping riparian canopy or stream bank vegetation if possible. Crush or shear streamside woody vegetation rather than completely removing it. Revegetate immediately after stream bank crossings are completed.
- BLM must ensure that the impacts of any coalbed methane development are mitigated.
- Address the exception process for seasonal wildlife stipulations, which are expected to be numerous on a project this size. Note that additional data needed to accommodate industry requests should be funded by industry.

- Consider lease and development stipulations to protect critically important wildlife and their habitats.
- Consult with Wyoming Fish and Game and USFWS early in the process to protect critical habitat.
- Discuss and evaluate monitoring data from existing gas development before developing habitat protection strategies and mitigation measures.
- Establish zones of habitat protection of areas of high wildlife value and develop habitat improvement needs in other areas.
- With regard to wildlife habitat fragmentation:
  - Develop a transportation plan to reduce access roads and traffic.
  - Bury power lines within the right-of-way to avoid impacts to raptors and other bird species.
  - Power generators by natural gas to reduce toxic emissions, and fit compressors with high-quality mufflers to keep noise to a minimum
  - Enforce any commitments agreed to by operators during the APD.
- Establish seasonal stipulations on development and production activities in big game habitats, and treatment or modification of remaining habitat or intervening fences to increase the amount or value of crucial winter habitat.
- Address mitigation for short-term and long-term impacts to habitat, and exclusion of waivers for wildlife habitat mitigation.
- Develop and implement route closure and reclamation plans to restore and maintain critical big-game habitat and linkages:
  - ***Mule deer***: increase the amount of core area greater than 1,542 feet from route within crucial winter range and along migration corridors.
  - ***Pronghorn***: Increase the amount of core area greater than 3,168 feet from a route and reduce route densities below one mile per square mile within crucial winter range and along migration corridors.
  - ***Elk:*** Reduce route densities below one mile per square mile within crucial winter range and along migration corridors.
  - Prohibit drilling and surface occupancy in big-game wintering areas between November 5 and April 30
  - Implement seasonal traffic restrictions on all roads within 656 feet of Sage-grouse winter habitat (9:00 a.m. to 5:30 p.m., mid-November through April) within 3 miles of breeding and nesting areas (9:00 a.m. to 5:30 p.m., April through mid-May), and in brood-rearing areas (900 a.m. to 5:3 p.m., June through mid-July). Impose a speed limit of 30 miles per hour during non-restricted hours.
  - Combine these species-specific recommendations with more general provisions to benefit all wildlife species in the area such as:
    - planning for staged development of energy resources
    - restricting new roads and energy development, especially within crucial winter range and at pinch points of migration routes
    - allowing few exceptions to temporary occupancy restrictions
    - imposing rigorous standards for ecological restoration of closed routes
    - for all new roads that are built, following the road construction guidelines of the Wyoming Game and Fish Department to minimize the effect of routes on wildlife

    - including clear enforcement mechanisms to minimize impacts to wildlife
    - continuing to research the effects of the transportation network on wildlife species and using this knowledge in adaptive management.

- Develop a clearly defined management plan to protect the grouse population and monitor the success of on-site and off-site mitigation.
- Recommend NSO designation for Sage-grouse breeding habitat between April 1 and June 30 annually and no project-related disturbance from November 15 through April 14.
- Require NSO protections within miles of Sage-grouse breeding leks.
- Consider noise mitigation alternatives such as seasonal timing stipulations, or modifying or enclosing compressors to minimize or eliminate loud, continuous noise during strutting periods from April 1 through May 20 each year. Avoid noise-generating activities from 6 PM to 9 AM within 2 miles of strutting grounds.
- Average nose mitigation levels should be attained no more than 200 meters from the noise source.
- Mitigation should include a 1¼-mile protection buffer and a 2-mile seasonal protection for the duration of the breeding season.
- Identify mitigation to protect nest sites and nesting pairs. Consider construction of artificial nesting poles.
- Include "no fencing" mitigation for roads and facilities that block pronghorn migration. Consider the possibility that pronghorn will trail along plowed access roads during periods of deep snow, and consider plowing escape ramps off roadways.
- Maintenance personnel should visit wells at midday to reduce harassment when seasonal stipulations are in effect.
- Establish mitigation to prevent exceedance of average noise standards so that courtship season is not disrupted.
- The EIS must address:
    - the extent and mitigation required for sagebrush habitat;
    - the mitigation standards for crucial winter range;
    - the use of 1-mile buffers around ferruginous hawk nest sites and burrowing owl nests;
    - implementation of a conservation community "blueprint" for Sage-grouse and Sage-grouse habitat throughout the project area;
- Screens should be fitted to burners on production facilities to prevent songbird deaths
- The overall scale of the project makes serious adverse impacts inevitable for wildlife, fisheries, and recreational opportunities. The following restrictions are requested on all development in the project area:
    - A minimum of 95-percent flareless completion on all wells
    - Directional drilling used to its full extent to reduce footprint and habitat fragmentation
    - Remote monitoring of condensate tanks
    - Bus crews rather than individual trips
    - Monitor and police traffic during critical winter range periods
    - Cluster well pads

  - Intensive mitigation to reduce noise and light pollution affecting Sage-grouse during strutting and parturition
  - Dust abatement
  - A minimum 3:1 ratio for off-site mitigation work to compensate for habitat fragmentation
  - Reclamation with a forb/shrub mixture consisting of native plants and grasses, rather than the BLM grass mixture.
- Monitor and analyze habitats surrounding the project area to reevaluate habitat protections such as the width of buffer zones, to provide suitable habitat as development proceeds.
- Incorporate wildlife monitoring and research projects, funded by the operators.
- Apply any stipulations only where least restrictive and absolutely essential, and then only after they have been peer reviewed.
- COAs for directional drilling in sensitive areas should require BMPs in accordance with IMI2005-247 and IM2004-194, and the Gold Book, including but not limited to:
  - ACECs
  - lands with wilderness characteristics and sensitive or important wildlife habitat
  - closed-loop (pitless) drilling to help protect soils and water
  - requiring maximum use of existing roads
  - drilling multiple wells from a single pad
  - centralizing production facilities to reduce surface disturbance
  - noise reduction techniques and designs
  - wildlife monitoring
  - interim restoration to ensure lands are returned to their natural condition as soon as possible.
  - Collect baseline data and fund long-term monitoring.
- The Red Lakes Dunes citizen-proposed wilderness and other lands with wilderness characteristics should be inventoried and protected using VRM Class I or II designation, NSO limitations, and application of other BMPs.
- Include an aggressive noxious/invasive species control program (to protect forage).
- Attempt to mitigate vehicle-caused livestock losses due to increased vehicle traffic.
- Consider mitigation measures to prevent harm to agricultural water uses, including a detrimental drop in the water table.
- Require “green completions” for each new well and prohibit pit flaring during completion and fracking.
- Cease building new roads when maximum road densities are reached, until at least an equal amount of old roads are closed.
- Close and reclaim roads to dry well sites, completed wells, and where redundant or unnecessary.
- Address the use of on-site and off-site mitigation.
- Impose speed limits on heavily traveled roads where big game road kill is a concern.

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APPENDIX B: OPERATORS' PROJECT DESCRIPTION

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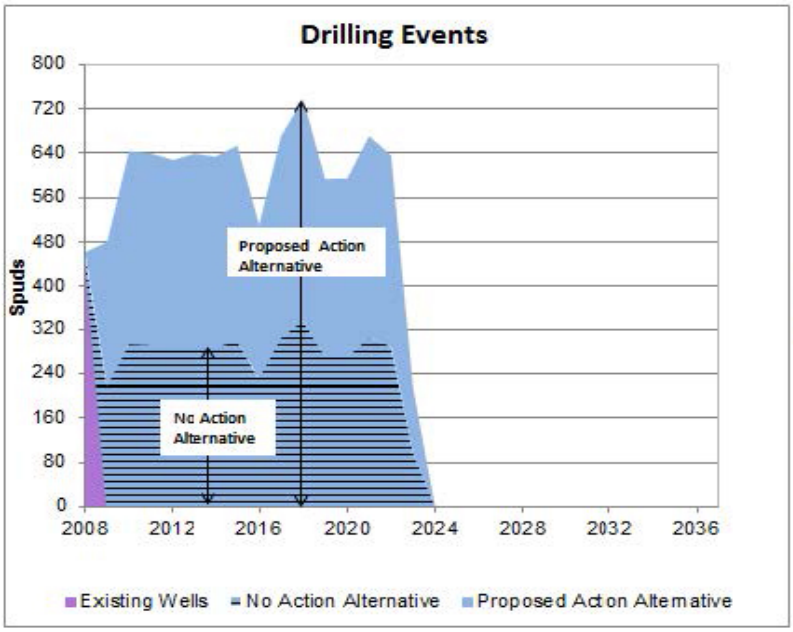
INTRODUCTION

The Continental Divide-Creston (CD-C) Operators submitted their project description for the CD-C project to the BLM in September 2006. The project description was subsequently revised in late 2007 to reflect a reduction in plans for coalbed natural gas (CBNG) development within the project area. The original project description had said that potentially 500 to 900 of the proposed 8,950 wells could be CBNG wells. The 2007 revision reduced that amount to "up to 500" CBNG [CBM] wells. The 2007 version of the project description is the one reproduced in this appendix.

Since the submittal of the revised 2007 project description, other changes and clarifications have been made to the Operators' development plans. Although no formal revision of the project description has been made, the changes have been incorporated into **Section 2.2.1, The Proposed Action**, and **Section 2.2.7, Features Common to All Alternatives,** of the CD-C Environmental Impact Statement (EIS). The changes were most often made because of advances in drilling technology since the project was originally proposed or because the analysis of project impacts necessitated a more detailed definition of the Operators' plans to adequately address the effects. The changes occurred over the five years between 2007 and 2012 and were generally evolutionary in the way they developed, with frequent emails and phone conversations discussing the changes before a decision was made to alter the development proposal. The Operators have agreed that the following descriptions of those changes and clarifications accurately reflect their intent and the project description is hereby amended as follows:

1. **Number of wells drilled annually.** Section 1-1 of the project description says that "Collectively, the Operators propose to drill approximately 8,950 wells in addition to the wells that currently exist in the Project Area." and that "All proposed wells are anticipated to be drilled during an approximate 10 to 15 year period after project approval." Throughout the EIS, this drilling proposal is characterized as an annual drilling rate of about 600 wells per year. In order, however, to calculate peak emissions for the project, the air quality analysts requested the operators' best estimate of the annual variation that could occur in drilling over the 15 year development period of the project. The operators provided an estimate based on maintaining a constant natural gas production level for the CD-C project area (CD-C Operators 2009). The estimate is not a prediction and the actual drilling rate would depend on technical, environmental, and economic conditions that are not known at this time. The operators' estimate of annual drilling is shown in the figure below; it depicts a peak year of drilling shown in 2018, when 738 wells would be drilled. The use of this estimate in the air quality analysis is described in **Section 2.1.4** of the **AQTSD**. The estimate of annual drilling is also used in the CD-C socioeconomic analysis, as described in EIS **Section 4.15.4.1**.



2. **Number of days required to drill a well.** The project description said that drilling each gas well "will take about 10 to 20 days" and that completion and testing operations typically will "require approximately 10 to 20 (up to 30) days." Given the improvements in drilling technology, the drilling time for each gas well, as described in **Section 2.2.7.2** of the EIS, **Well Construction, Drilling, and Completion Activities**, has been reduced to "about 7 to 10 days." The description of the time for completion and testing operations has been changed to "approximately 10 to 20 days."

3. **Number of drill rigs active in the project area.** The project description anticipated that the number of rigs necessary to achieve development objectives "will range from about 34 to 70 rigs at any particular time." As described in **Section 2.2.7.2, Well Construction, Drilling, and Completion Activities**, the Operators have reduced that count to "up to 25 rigs at any particular time," largely because the time needed to drill a well has decreased.

4. **Compression and gas treatment facilities.** The Operators estimated in the project description that "one large central pipeline compression facility" may be required for the project and that "as many as ten additional compressor sites" and " individual well site compression" as needed would be added to the existing infrastructure. They also said that "Compression requirements and associated horsepower estimates will be developed in association with the air quality analysis." In addition, "It is anticipated that two or more central gas processing/stabilization facilities will be needed."

   After considerable analysis and discussion, rather than trying to estimate the breakdown between the number, type, and size of compression facilities that would be needed, the Operators summarized compression needs in a single metric, the total amount of horsepower (hp) that would be required for future production. **Section 2.2.7.5** of the CD-C EIS, **Compression, Gas Treatment, and Ancillary Facilities**, now states that an estimated 24,936 hp of additional compression may be needed as the project is developed for dedicated compressor sites and for additional compression at well sites.

   In addition, the number of new central gas-processing/stabilization facilities has been reduced from two to one.

5. **Sources of water used for project development.** The project description describes the use of approximately 20,000 to 30,000 barrels of water per well for drilling operations (Section 4-1 of the project description), approximately 4,000 to 12,000 barrels of water for completion and testing

operations (Section 4-4), and approximately 2,700 gallons of water to test each mile of four-inch gas pipeline (Section 5-2). This "water will come from existing and new water supply wells within the project area, as well as from produced water sources which will conserve fresh water aquifers. Water from reserve pits may be transferred and used for drilling." (Section 4-1)

The project description does not mention the use of any surface water and subsequent discussions with the Operators indicated that it was their intention that the statements in the project description were meant to exclude the use of any surface water.

6. **Use of fresh water**. Section 4-1 of the project description states, "Fresh water will used for drilling the first 5,000 to 7,000 feet of each gas well" and then references other uses of fresh water, including in Section 4-4, Completions and Testing. The Operators have clarified that only fresh water can be used when drilling surface casing by regulation. However, other processes may not involve the use of fresh water but rather the re-use/recycling of water depending on the quality of that water and the planned use and regulatory requirements.

7. **Disposal of produced water from CBNG wells.** Section 5.4 of the project description describes the process for disposal of produced water from CBNG wells, water that could be produced in volumes of 500–1,000 barrels per day per well. The volume of water produced in CBNG development is normally much greater than the amounts produced with conventional gas production. CBNG-produced water might "be stored on-site in a lined pit or storage tank, or water-collection lines might be installed to transport water to a water-treatment facility, evaporation ponds, injection wells, subsurface drip areas and/or approved discharge points." The actual volumes produced and the methods by which the produced water would be managed are greatly dependent on the site-specific development proposals. For that reason, the BLM decided that although the project description for the CD-C project described the potential for surface discharge of CBNG-produced water, such disposal for any CBNG development within the CD-C project would be treated in a separate NEPA analysis. When the BLM receives site-specific CBNG proposals in the CD-C project area, the proposals, including the treatment of produced water, will be analyzed in a separate NEPA document at that time.

8. **Disposal of produced water from conventional wells.** Section 5.4 of the project description also describes the process for disposal of produced water from conventional wells, water that would be produced averaging 18 barrels per day per well. This water would be "disposed of via subsurface injection, surface evaporative pits, or will be used for potential beneficial use (i.e. drilling operations)." The project description does not mention the surface discharge of water produced from conventional drilling. Subsequent discussions with the Operators clarified that the statements in the project description were meant to indicate that the Operators had no plans for the surface discharge of produced water from conventional wells as a method of disposal.

9. **Water used for dust abatement.** The project description does not specifically describe the process of dust abatement, how much water might be used in the process, or where the dust abatement water would be sourced. Discussions with the Operators clarified that the 20,000 to 30,000 barrels of water per well for drilling operations described in Section 4-1 would include all water used for dust abatement. As described in Item 4 above, none of that water would come from surface sources.

1. General Project Description

1.1 PROJECT OVERVIEW

BP America Production Company and other operators (identified herein as the "Operators") propose to develop natural-gas resources within the existing Continental Divide and Creston Blue Gap natural gas fields, located in Carbon and Sweetwater counties, Wyoming. The project, known as the Continental Divide-Creston Natural-Gas Development Project, involves approximately 1.1 million acres in an area with a "checkerboard" pattern of surface ownership. The Bureau of Land Management (BLM), the State of Wyoming, and private owners issued the oil and gas leases covering these lands. The Rawlins Field Office (RFO) manages BLM surface lands and the federal mineral estate in the Project Area, which is shown on Figure 1.

Oil and gas extraction in the Project Area is guided by relevant programmatic NEPA actions including the Great Divide Resource Management Plan (1990), and the decisions made in applicable project-specific BLM NEPA documents, including the Continental Divide/Wamsutter II Natural Gas Project and the Creston/Blue Gap Natural Gas Project. The BLM operates in accordance with the Federal Land Policy and Management Act of 1976 (FLPMA), which mandates that the BLM consider multiple uses for the lands it administers. FLPMA specifies that the BLM consider the land's inherent natural resources as well as its mineral resources when making land management decisions. The BLM's responsibility extends to environmental protection, public health, and safety associated with oil and gas operations on public lands. Mineral leasing decisions made by the BLM result in a contractual commitment from the United States to allow for exploration, development, and operations by the Operators in accordance with stipulations and restrictions incorporated within its leases. Lease rights include the right to occupy and use as much of the surface as is reasonably necessary to explore, develop, operate, and produce the subsurface oil and gas resources. The Operators understand that the decision that will result from NEPA analysis of this proposed project will pertain only to those areas in the Project Area where there are federal surface and/or federal minerals. The Operators recognize that the State of Wyoming and other local governmental agencies also have authority over various aspects of oil and gas development in all or portions of the Project Area.

Collectively, the Operators propose to drill approximately 8,950 wells in addition to the wells that currently exist in the Project Area. Up to 500 of the proposed wells could be coalbed natural gas (CBNG) wells. The Operators anticipate drilling infill wells at potentially up to 40 acres per downhole well bore. The Project Area contains several units in addition to non-unitized lands. The total number of wells drilled will depend largely on factors outside of the Operators' control that affect the ability to adequately drain the reservoir, including geologic characteristics and reservoir quality, appropriate engineering technology, economic factors, commodity prices, availability of commodity markets, and lease stipulations and restrictions.

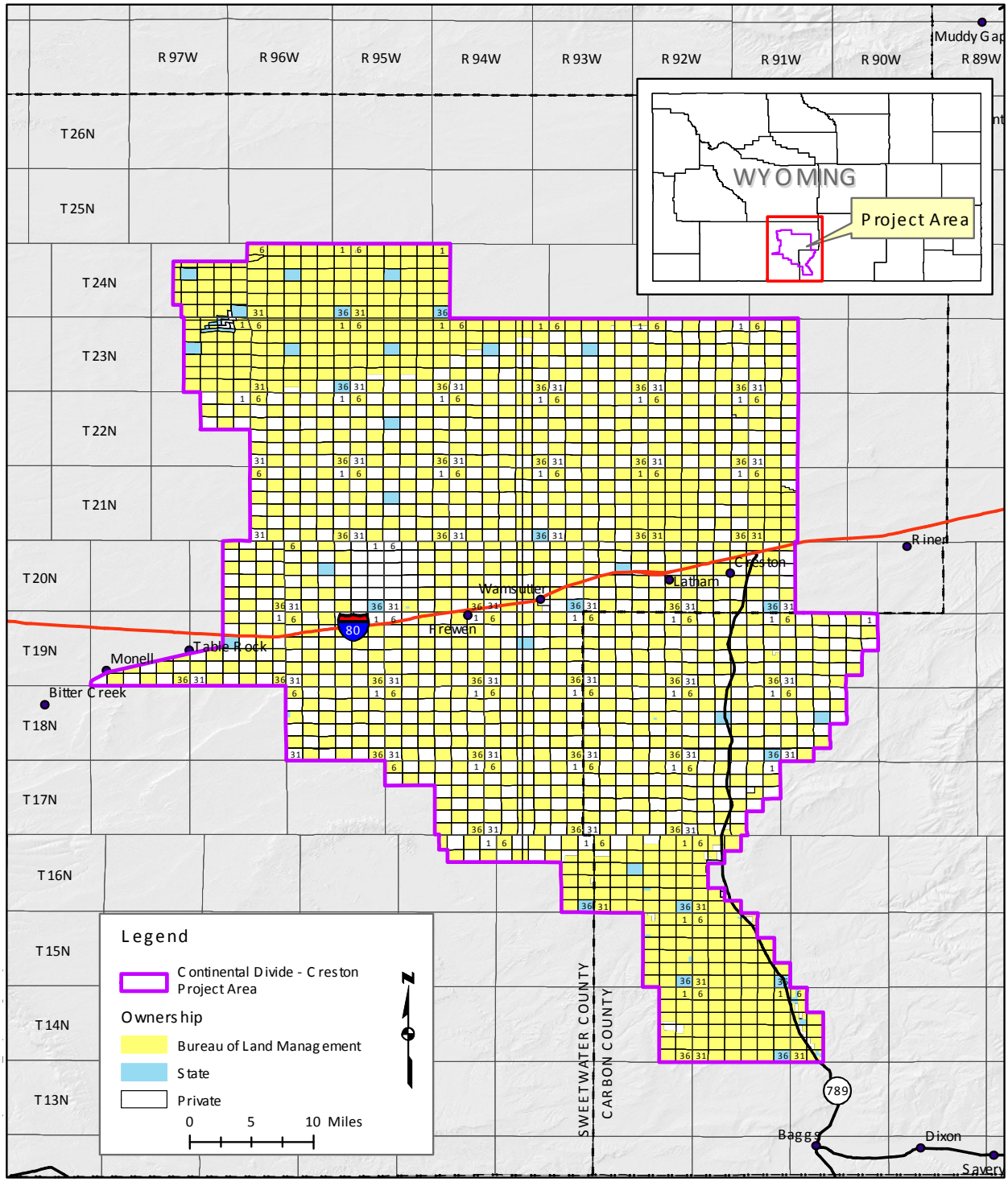
Based on current reservoir and well performance information, most gas wells will be completed in the Almond Formation (Mesa Verde Group); however, secondary reserves may be encountered in other formations (e.g. Lewis, etc.) for the natural gas wells. The CBNG development will primarily target formations such as the Fort Union (Big Red Coal) and secondary reserves may be encountered primarily in the Wasatch, Frontier, and Lance formations.

This proposal assumes that the gas wells may be drilled conventionally, i.e., with a vertical well bore on a single pad, or with multiple directional well bores from a single pad. The gas resource is primarily conventional natural gas, however, the project also includes development of CBNG. Directional drilling is not being proposed by the CBNG operators. All proposed wells are anticipated to be drilled during an approximate 10 to 15 year period after project approval. Although actual operations are subject to change as conditions warrant, the Operators' long-term plan of development is to drill additional wells at the rate of approximately 600 wells per year or until the resource base is fully developed. The average life of a well is expected to be 30 to 40 years for both the conventional gas and CBNG development.

The facilities required by the project may include roads, gas, water, and condensate gathering pipelines, overhead and buried powerlines, production facilities (separation, metering, treating, fluid storage, compression, artificial lift, etc.), disposal well and/or surface disposal facilities, equipment storage facilities, and other associated facilities. In general, gas will be transported via subsurface pipeline to centralized compression and treatment facilities although some well site compression may be included on an as-needed basis. Produced water will be transported by truck to water disposal wells or evaporation ponds, or by pipeline to treatment facilities and/or discharge points. CBNG development may require the use of various water management alternatives, which include but are not limited to; deep injection, evaporation ponds, water treatment (such as freeze thaw evaporation, reverse osmosis, ion exchange, etc), direct discharge, and sub-surface drip irrigation.

Project development will result in the use of new roads and roads previously constructed and currently used in the Project Area. New roads are expected to consist primarily of short access roads. Existing arterial roads will provide the main access to the Project Area. The project may also include the development of an overhead electrical system to provide commercial power to portions of the field, as well as lower voltage, buried power utilities to individual well pads. The overhead system is estimated to include approximately 36 miles of line. The construction disturbance width would be up to 25 feet. The overhead system would primarily follow existing road corridors and utility ROWs. The buried power utility to individual wells would be the responsibility of the Operators, and would be installed in the utility corridor adjacent to the well pad access road

The Project Area includes approximately 1.1 million acres of mixed federal, state, and private lands. The BLM manages approximately 626,355 acres (59%), the State of Wyoming owns approximately 21,600 acres (2%), and private landowners own approximately 421,360 acres (39%). The Project Area is generally located within Townships 14 through 24 North, Ranges 91 through 97 West, 6th Principal Meridian. The eastern boundary of the Project Area is about 25 air miles west of the city of Rawlins. Interstate 80 generally crosses through the center of the Project Area.



Map B-1. Continental Divide-Creston Natural Gas Development Project

1.2 SUMMARY OF SURFACE DISTURBANCE

The Operators estimated projected surface disturbance using assumptions based on past experience and anticipated activities. A summary of the estimated project-related disturbance is shown in Table 1.

Project development will result in disturbance to the federal, state, and private lands upon which the project wells will be drilled. Disturbance of the land will result from the construction and use of new roads, the construction of well pads, the installation of subsurface pipelines, and the construction or expansion of compressor facility sites or other associated facilities. Short-term disturbance refers to initial disturbance prior to interim reclamation of the reserve pits, unused portions of the location and roads, and reclamation of the pipeline route. Long-term disturbance refers to disturbance of the surface associated with the life of a well in addition to the running surface of access roads.

For analysis purposes, the following assumptions were made:

- Average access road length will be 0.25 mile.
- Road disturbance width will be 55 feet, reclaimed to a running surface of 32 feet. Permanent road right-of-way is typically 50 feet.
- Initial disturbance associated with each well will average approximately 6.3 acres for single well pads, and 2.45 acres per well bore for multiple well pads. This acreage includes the associated road disturbance. The actual acreage per well bore on multi-well pads will vary based on the number of wells bores on the pad.
- Long-term disturbance associated with each well pad will be approximately 2.6 acres for single wells and 1.2 acres per well bore for multiple well pads. This acreage also includes the associated road disturbance.
- Average gas gathering pipeline length will be 0.25 mile.
- An average width of 25 feet will be physically impacted by utility construction, including gas, water pipelines, and power, which will be totally reclaimed after construction. Utility ROWs will be built adjacent to roads wherever possible and practicable. Operators may utilize a construction corridor of up to 75' for utility installation dependent on the specifics of a given location. These corridors will be addressed in the ROW and/or APD filing procedure.
- The overhead electrical system would be approximately 36 miles long, and have a construction disturbance width of up to 25 feet.

CBNG well pads have a smaller footprint than conventional wells, however, the acres of disturbance shown in Table 1 was calculated using conventional well pad dimensions due to the relatively small percentage of CBNG wells, and because the potential number of CBNG wells cannot be well defined at this stage of project development. CBNG well pads average about 3.8 acres during initial disturbance and 1.25 acres during operations.

Average access road length was estimated by taking into account that the proposed wells will be infill wells in an area that has an existing road system. Operators will be using the Transportation Plan to minimize construction of new roads; therefore, it is reasonable to assume that most new access roads will be constructed as laterals off existing roads. Consequently, the average new access road length was estimated at 0.25 mile.

The Operators intend to construct and install pipelines adjacent to well access roads, however, it will be necessary to construct a pipeline route cross-country at some locations. Pipeline routes will be reclaimed after construction such that all surface disturbances resulting from pipeline construction will be short-term disturbance. Long-term disturbance associated with pipeline construction is expected to be very minimal after reclamation is complete.

The Operators will continue to limit long-term surface disturbance as much as possible through the implementation of a road network that minimizes the construction of new access roads and by reclaiming as much of the short term disturbance associated with roads and locations as is reasonable without limiting the requirements for ongoing and future production operations.

Table B-1. Preliminary Estimate of Surface Area Disturbance[1]
Continental Divide – Creston Natural Gas Project

Facility Type	Initial (Short Term) Disturbance Area[2] (acres)	Area of Operations[3] (Long Term Disturbance Area) (acres)
Well Pad Sites[4]	41889	17998
Utilities [5]	4897	44[9]
Water Management Facilities [6]	270	270
Compressor Facilities [7]	144	144
Total Disturbed Area	47200	18456
Percentage of the Total Project Area[8]	4.29%	1.68%

1) This table represents the total area estimated to be disturbed at the Continental Divide – Creston Development Project during its 15-year construction and 30 to 40 year operational life.
2) The initial disturbance represents the area disturbed as a result of drilling and associated construction of well pad sites, roads, gas, condensate, and water collection pipelines, compressor stations, and power supply systems.
3) Following drilling and associated construction, part of the initial disturbance will be reclaimed. The area not reclaimed will be used for operations. Once the gas resource is extracted, facilities will be removed and the area reclaimed entirely.
4) An estimated 8,950 natural gas well bores will be established in the project area.
   Initial (Short Term) Disturbance Area: The initial well pad site disturbance for a vertical well will average 6.30 acres per well pad site which includes 0.9 of an acre for an access road. The initial disturbance for a directional well will average 2.45 acres per well bore completed including 0.45 acres for an access road (assumed 50% of the directional wells will need a new access road).
   Area of Operations (Long Term Disturbance Area): Following drilling and well installation, reclamation will reduce the vertical well pad sites to approximately 2.6 acres which includes 0.9 of an acre for a road. Following reclamation, the long-term disturbance for directional wells is estimated at 1.2 acres per well bore which includes 0.45 acres for an access road (assumed 50% of the directional wells will need a new road).
5) Utilities include gas, condensate, and water collection pipelines, as well as buried powerline facilities. Generally, these utilities will parallel the access roads. An average width of 25 feet will be physically affected by the installation of utilities. Actual utility corridor construction width will vary by operator and site conditions. Assuming 0.25 miles of utility installation for a well pad site, an estimated 0.75 acres will be disturbed with utility installation for the well pad sites. Overhead power includes an estimated 36 miles of line, requiring a 25-foot wide construction corridor.
6) Water Management Facilities – water will be handled using a combination of evaporation ponds, enhanced evaporation, water treatment, and injection wells. An estimated 30 injection wells affecting an estimated 5 acre per well and an estimated 20 produced water handling facilities are planned affecting an estimated 3.5 acres per facility. An estimated 1-acre will be disturbed per site for access roads.
7) It is assumed that one central pipeline compression facility, estimated to affect approximately 10 acres, will be required for the project. It is assumed that 10 additional compressor stations will be required for the project. An estimated five acres will be physically affected at each compressor station site. Each compression site will require an access road assuming 32 feet width for ½ mile estimated disturbance of 2 acres per road per site.
   It is assumed that two or more central Gas Processing/Stabilization Plants will be needed within the Project Area. Each is estimated to affect approximately 30 acres. Each site will require a ½ mile access road estimated at 2 acres disturbance.
8) This percentage is based on the 1.1 million acres within the EIS analysis area.
9) Once buried utilities are constructed, the disturbed area will be reclaimed in its entirety. Overhead powerlines will require a 10-foot wide permanent corridor.

2. Pre-Construction and Site Layout

Activities associated with the development may include access roads, pipeline and well pad construction, drilling and well completion, and any other ancillary facilities needed to develop the particular phase. Prior to the start of any construction activities involving a federal action on BLM managed public land, Operators will submit a site specific APD/Notice of Staking (NOS)/ROW application to the BLM that will detail the development proposal. The application will include a map showing the specific location of the proposed activities and site-specific construction plans. A Plan of Development (project description) may be submitted for multiple wells within the same area for CBNG.

The proposed development sites will be staked in the field by the applicant and inspected by the BLM to ensure consistency with the application. The appropriate NEPA documentation will be conducted to ensure that the proposal will comply with guidelines contained in the BLM's Rawlins Resource Management Plan (RMP) 2008, specific requirements contained in the EIS/Record of Decision for the project, and current BLM policy regarding oil and gas development.

Applications may be revised as necessary per discussions with BLM. The BLM may approve or deny site-specific proposals, and will attach any terms or conditions of approval to the permit. Upon receipt of BLM approval, the applicant can commence with proposed activities.

3. Construction Activities

3.1 ROADS

Since the project is an infill development in an existing well field, new road construction is not expected to be extensive. The primary access to the project area is Interstate 80. Wyoming State Highway 789, several Sweetwater and Carbon county roads, and other smaller local roads provide access within the project area. New road construction will primarily be short sections of road from the existing road network to the individual new well sites and support facilities. Some existing access roads may need to have some improvements to accommodate the increase in traffic and heavy construction equipment such as widening or gravelling.

The exact locations of proposed roads are not known at this time. Specific locations for access roads will be included in APD and ROW applications, and will be evaluated by the BLM during the onsite inspections. Road construction will be in accordance with guidelines specified in the BLM Road Standards Manual, Section 9113, and with construction standards in its Surface Operating Standards for Oil and Gas Exploration and Development (BLM Gold Book, revised 2006).

The construction width for access roads will typically be 55 feet. Standard cut and fill construction techniques will be used. Roads are usually crowned and ditched except where an operator or the BLM determine that the road can safely be constructed using less disruptive techniques. The permanent running width will not exceed 32 feet. Existing roads that require upgrading will meet standards appropriate to the anticipated traffic flow and all-weather requirements. Upgrading may include ditching, drainage, graveling, crowning, and capping the roadbed as necessary to provide a safe roadway. Maintenance practices may include dust abatement, road surface grading, and maintaining proper drainage. New roads may be graveled to accommodate year-round use, to allow the transport of heavy loads, and to minimize dust generation. Two-track roads may be constructed or utilized in some instances for access to smaller facilities. Access roads are planned to be reclaimed when no longer needed, unless the landowner or the BLM requests otherwise.

3.2 WELL PADS

The project will include the construction of 8,950 well bores from both single well pads and well pads with multiple directional well bores. Construction of a typical single well pad will require approximately 6.3 acres which includes 0.9 acres for an access road. A typical multiple well pad will disturb approximately 2.45 acres per well bore, which includes 0.45 acres for an access road. Figures 2 through 6 show examples of typical single and multiple well pads. Well pad layouts will vary between operators, but all will be constructed within the approved disturbance area.

Operators will determine the location of a proposed well by the location of the subsurface reservoir, the topography of the area, and WOGCC spacing rules. Dimensions of a drill pad will depend on topography and specific well needs. Well pads will be constructed using the native sand/soil/rock materials present. Mineral materials will not be required. Topsoil and native vegetation will be removed and stockpiled for use in the reclamation process. Balancing cut and fill areas will level locations. Construction practices may include ripping to achieve a level pad. Cut-and-fill slopes will be designed to allow for retention of the topsoil during reclamation and subsequent re-establishment of vegetation.

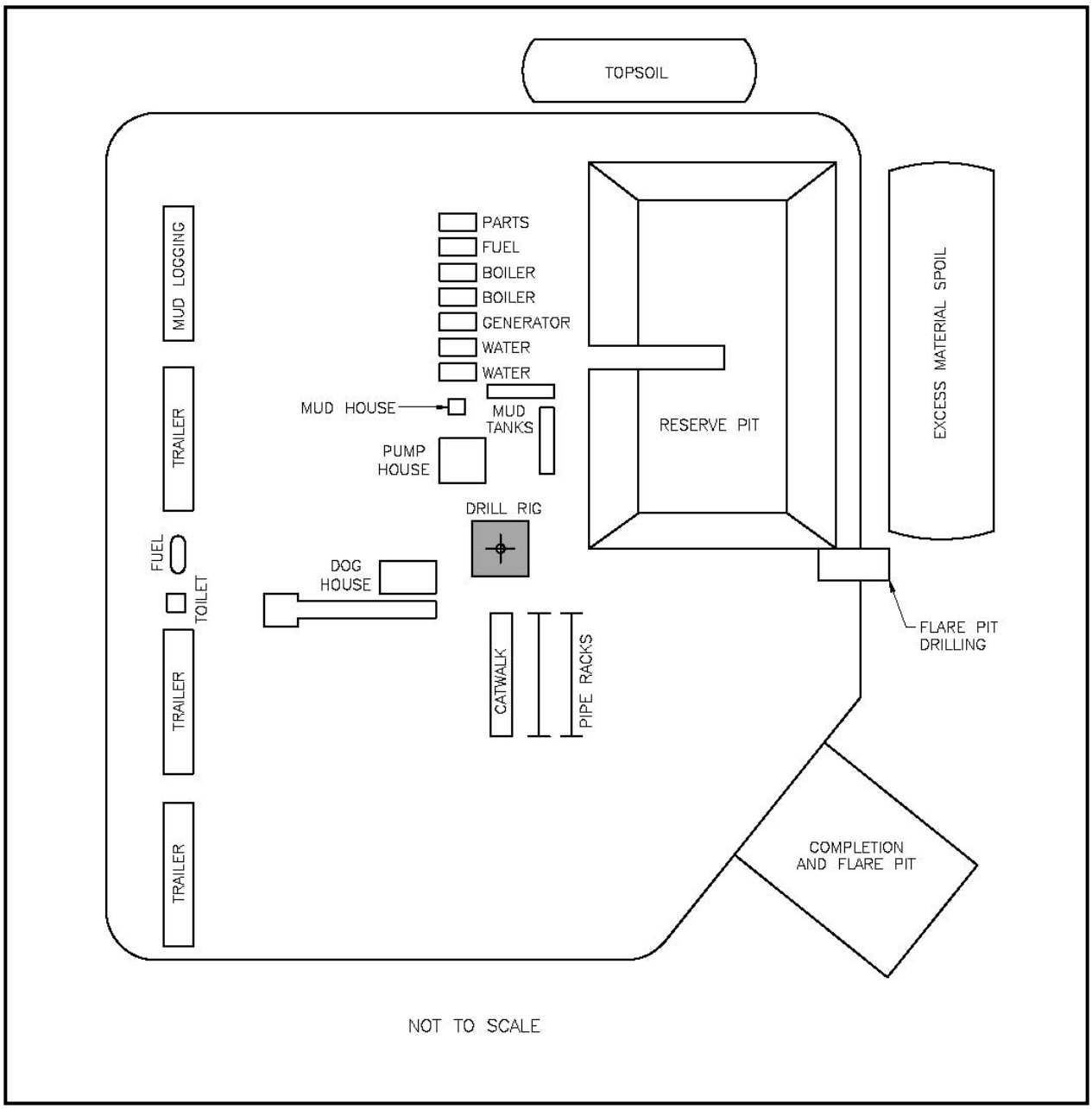


Figure B-1. Typical single well pad layout, example 1

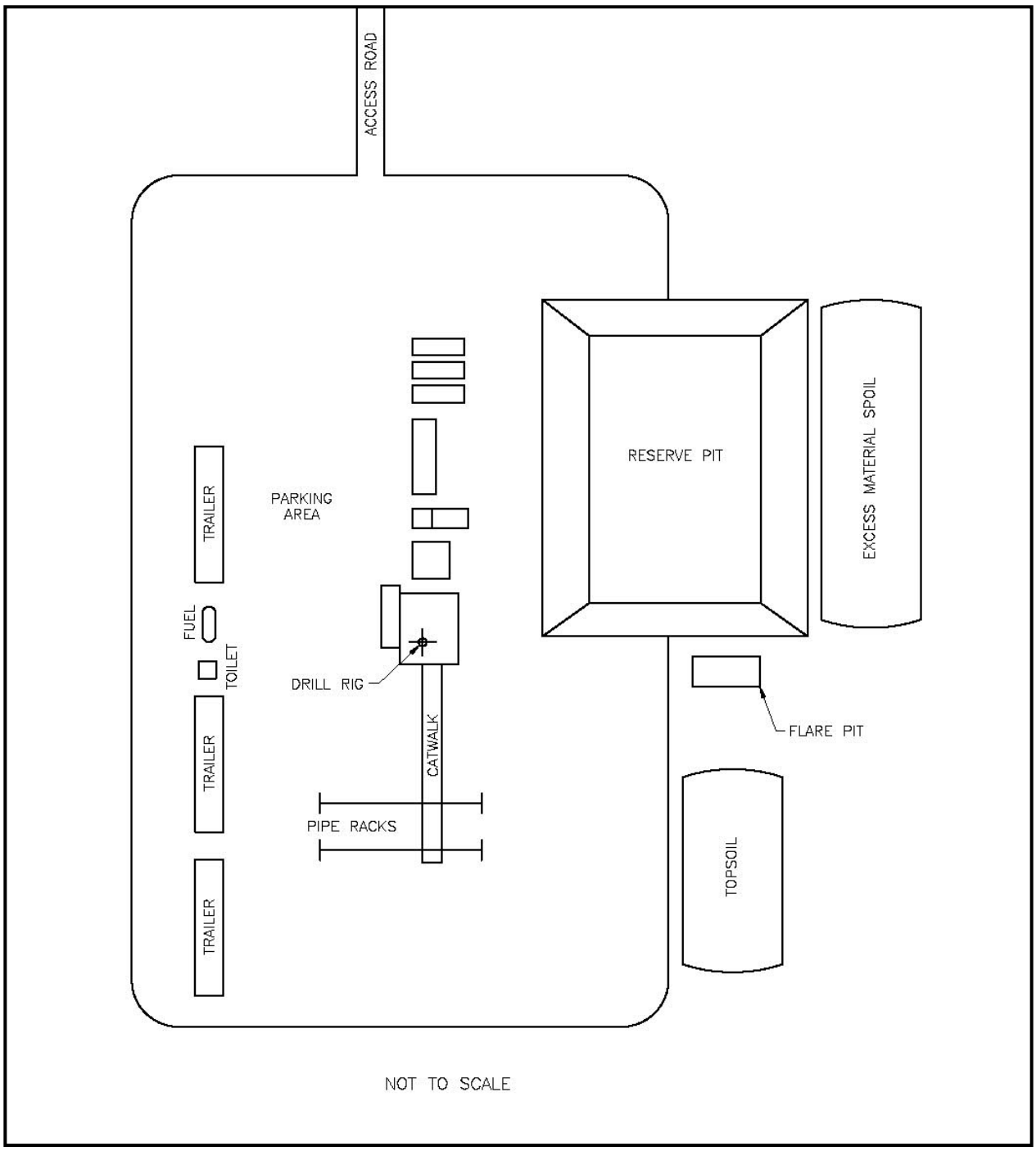


Figure B-2. Typical single well pad layout, example 2

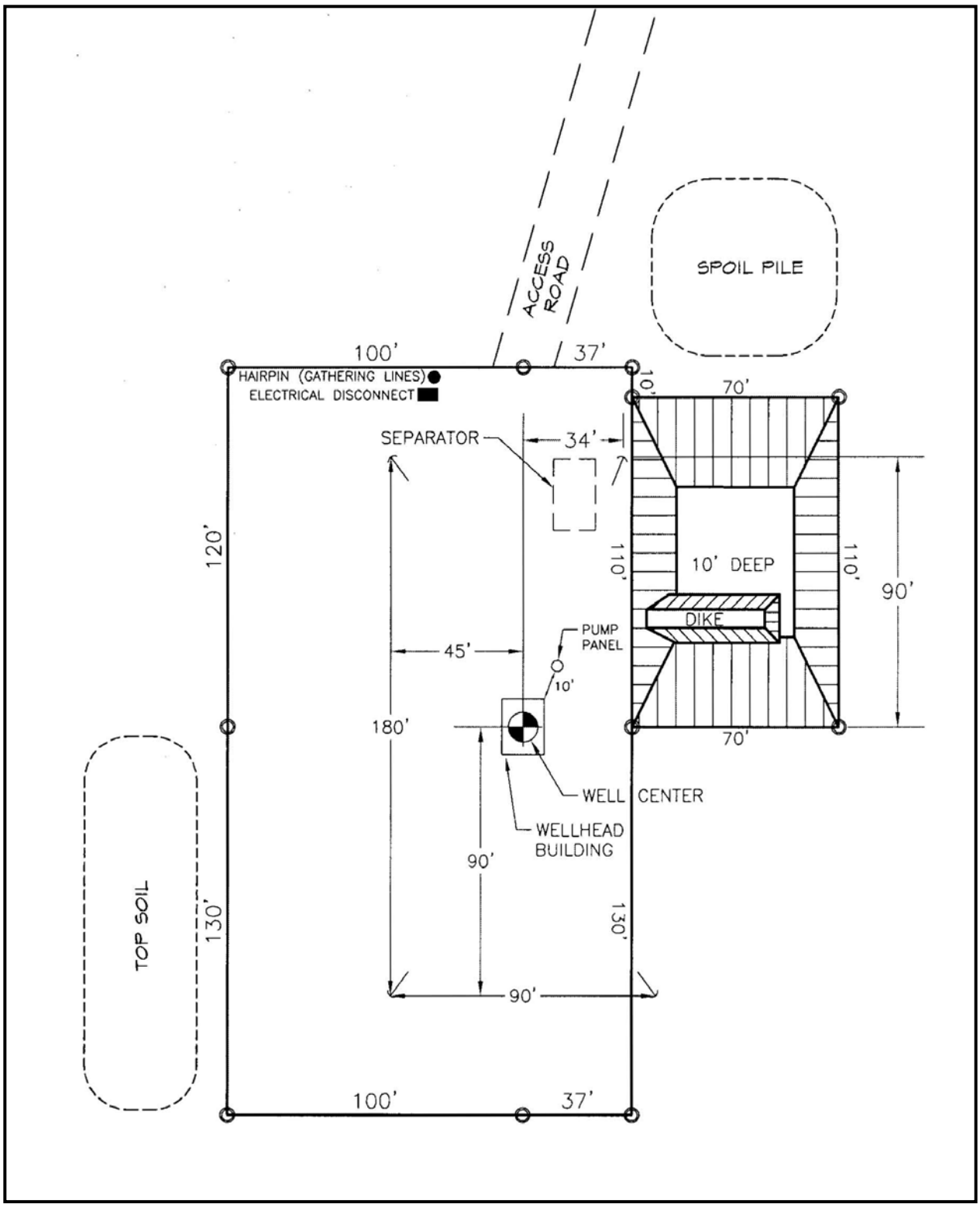


Figure B-3. Typical CBNG well site layout

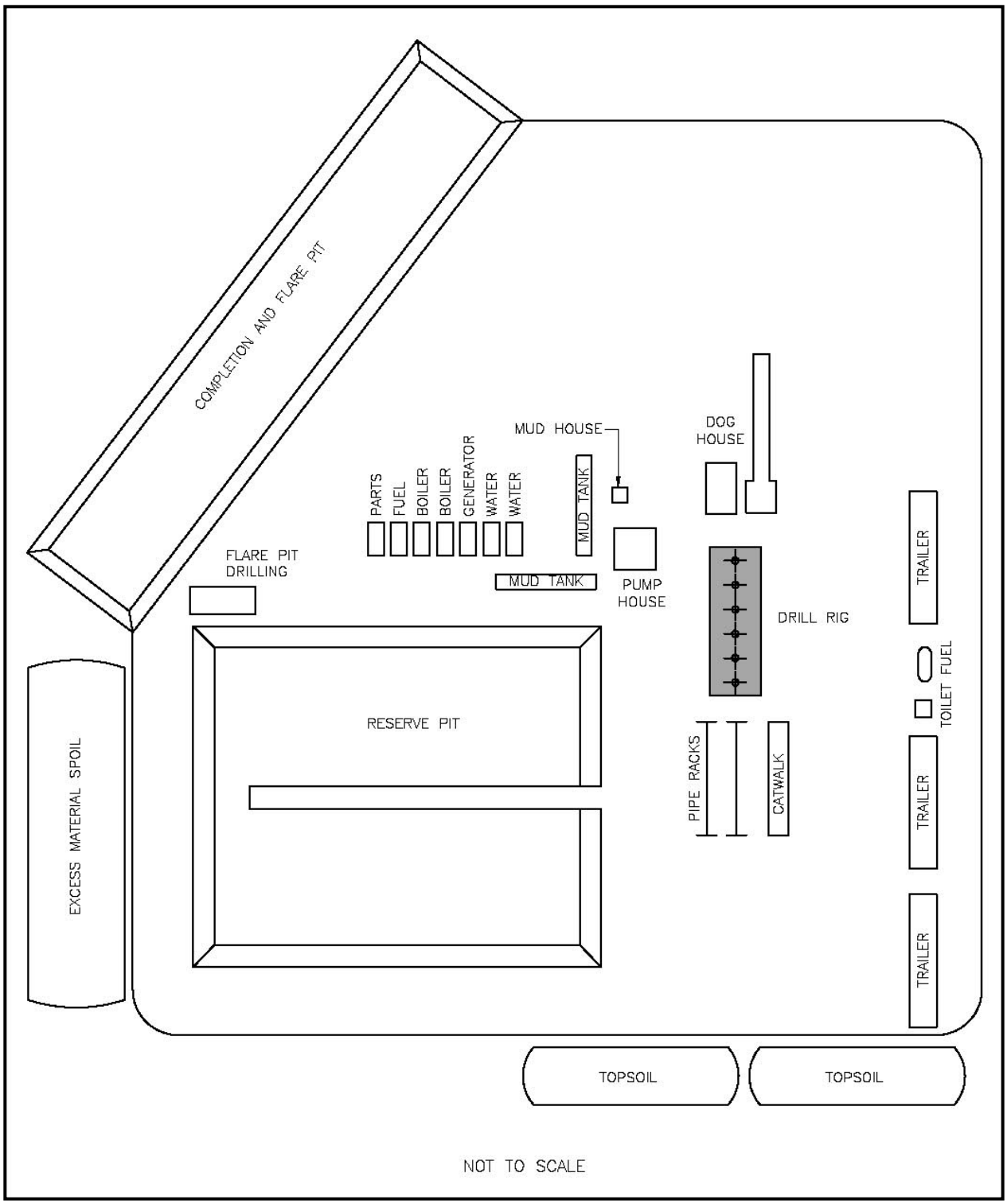


Figure B-4. Typical multiple well pad layout, example 1

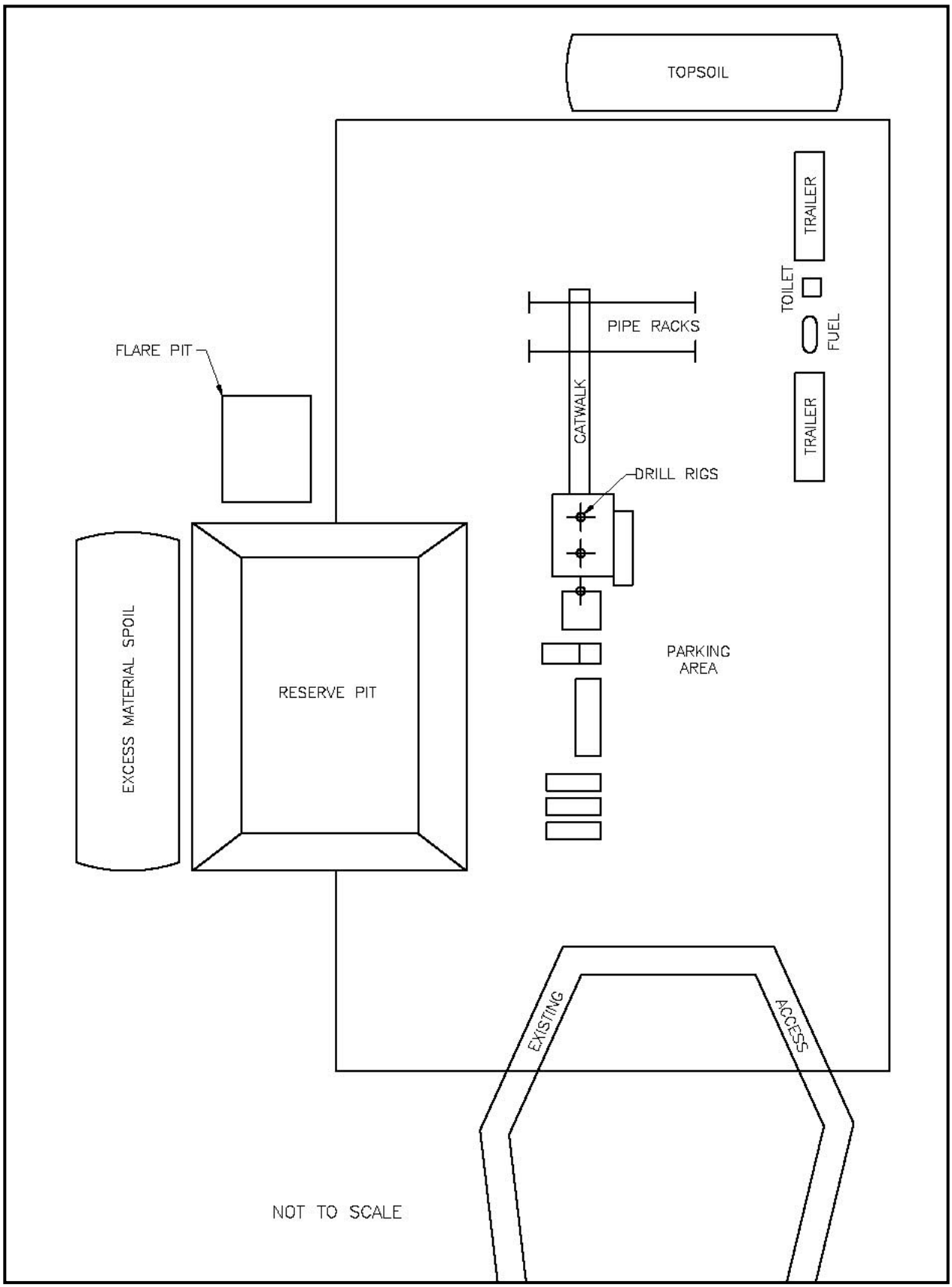


Figure B-5. Typical multiple well pad layout, example 2

Typically a well pad will include a six to eight-foot wide cellar to allow access to casing heads, mouse and rat holes adjacent to the well bore to accommodate drilling operations, a flare or completion pit, and a reserve pit. A fenced reserve pit, approximately 10 to 12 feet deep, will be excavated within the pad to temporarily store drilling fluids and cuttings. The dimensions of the pit vary according to well depth and size and shape of location. In non-environmentally sensitive areas and when a fresh water-based drilling mud is used, the reserve pit may be unlined pending evaluation of the distance to surface water, depth to useable ground water, soil type and permeability, and anticipated types of fluids that will be contained in the pit. A reserve pit will be lined if so specified in the APD after the onsite evaluation. It will also be constructed in a way that minimizes the accumulation of surface runoff into the pit through the use of strategically placed subsoil/topsoil storage areas and/or the construction of berms and diversion ditches.

Both the access road and well pad are typically constructed within three to seven days, depending on terrain and site limitations. Depending on availability of equipment and specific well construction requirements, from two to eight individuals may be present on location during construction activities at any given time. Personnel will access the location using an average of 3 to 5 light trucks each day during construction of the access and well pad. Construction equipment varies but can include bulldozers, motor graders, scrapers, backhoes, and trenchers.

During operations, interim reclamation will reduce the size of the well pads to approximately 2.6 acres for a single well pad and to 1.2 acres per well bore for multiple well pads.

4. Drilling and Completions

4.1 DRILLING

Drilling operations will be conducted in compliance with all Federal Oil and Gas Onshore Orders, all WOGCC rules and regulations, and all applicable local rules and regulations. The Operators anticipate that the drilling rig count within the Project Area will range from about 34 to 70 rigs at any particular time in order to achieve development objectives.

Following construction of the access road and well pad, a drilling rig will be transported to the well site and erected on the well pad. Wells will be drilled utilizing a conventional, mechanically powered mobile drilling rig. The rig will be erected at the drill site after the conductor pipe has been set. Drilling operations will consist of drilling surface hole, running and cementing surface casing, drilling production hole, and running and cementing production casing. The rig may then be dismantled and demobilized from the location.

Fresh water will used for drilling the first 5,000 to 7,000 feet of each gas well (500 to 1000 feet for each CBNG well), and water-based muds being used for the remainder of the drilling operation. Water will come from existing and new water supply wells within the project area, as well as from produced water sources which will conserve fresh-water aquifers. Operators will obtain all necessary permits for any water well drilling. Water from reserve pits may be transferred and used for drilling.

Drilling fluids will primarily consist of a fresh water/gel mixture with water being the main constituent. Reserve pits will be constructed so as minimize the potential to leak, break, or allow discharge and in accordance with APD Conditions of Approval (COAs). The reserve pit will be fenced on three sides during drilling operations and on the fourth side when the rig moves off the location. Fences will be constructed according to BLM requirements on Federal surface and/or Federal minerals.

During drilling operations, a blow out preventor (BOP) will be installed on the surface casing to provide protection against uncontrolled surface blowouts should reservoir pressures exceed the hydrostatic pressure of the well bore fluid. In addition, a flow control manifold consisting of manual and hydraulically operated valves will be installed below the rig floor.

Prior to setting production casing, open hole logs may be run to evaluate production potential. If deemed economically justified, steel production casing will be run and cemented in place in accordance with the well design and as specified in the APD and COAs. Evaluation logs may be run subsequent to setting and cementing production casing in some cases.

The types of casing used and the depths to which they are set will depend upon the physical characteristics of the formations that are drilled and the pressure requirements anticipated during completion and production operations. All casing will be new or inspected.

Operators propose to drill year-round within the CD-C project area, subject to environmental considerations. Well development will include single wells and directional wells. Drilling each gas well will take about 10 to 20 days, with additional time likely for directional wells, and wells deeper than 10,000 feet. CBNG wells typically take 6 to 14 days to drill. Drilling operations require approximately 8 to 10 personnel and six vehicles on location at any given time each day during normal operations. An additional 10 to 15 personnel and six vehicles will be required on location during the running and cementing of production casing. Approximately 20,000 to 30,000 barrels of water are needed to perform drilling operations for both gas and CBNG wells. Operators propose to utilize produced water as appropriate as a conservation tool.

4.2 MATERIALS MANAGEMENT

Potentially hazardous substances used in the development or operation of wells will be kept in limited quantities on well sites and at the production facilities as needed for operations. Materials will not be stockpiled at well locations. The transport, use, storage and handling of hazardous materials will follow the procedures specified by the Occupational Safety and Health Act and by the Department of Transportation (DOT) under 49 CFR, Parts 171–180. DOT regulations pertain to the packing, container handling, labeling, vehicle placards, and other safety aspects.

None of the chemicals that will be used meet the criteria for being an acutely hazardous material/substance or meet the quantities criteria per BLM Instruction Memorandum No. 93-344. Chemicals subject to reporting under Title III of the Superfund Amendments and Reauthorization Act in quantities of 10,000 pounds or more will not be used, produced, stored, transported, or disposed of annually during the drilling, completion, or operation of any well in the Project Area. In addition, no extremely hazardous substance, as defined in 40 CFR 355, in threshold planning quantities, will be used, produced, stored, transported, or disposed of while producing any well.

4.3 SOLID AND HAZARDOUS WASTE

Most wastes that will be generated at project locations are exempt from regulation by the Resource Conservation and Recovery Act under the oil and gas exploration and production exemption and are considered to be solid wastes. These wastes include those wastes generated at the wellhead and through the production stream and gas plant. Exempt wastes include produced water, drilling mud, well completion/workover fluids, and soils affected by these exempt wastes.

Spills and releases can result in soils that are contaminated by produced water, petroleum products, or chemicals. The Operators will develop and maintain Spill Prevention Control and Countermeasure Plans for each well in the Project Area.

4.4 COMPLETIONS AND TESTING

A typical cased well bore in the Project Area consists of conductor pipe, surface casing, and production casing. The surface and production casing/cementing programs will be designed to isolate and protect shallower formations and aquifers from the production stream and to minimize the potential for migration of fluids and pressure communication between formations.

A cementing plan is submitted with the drilling plan as part of the APD. This plan is reviewed by the BLM and/or the Wyoming Oil and Gas Conservation Commission. The BLM can request additional information or apply COAs relating to the cementing plan if necessary.

Once production casing has been cemented in place, the drilling rig may be released and completion operations will commence utilizing a well servicing rig or coiled tubing unit. In some cases completions can be performed by the drilling rig. Initial completion operations may also be conducted "rigless," utilizing cased hole wireline equipment rather than a well servicing unit or coiled tubing unit, until such time that production tubing is installed in the well or other operational requirements dictate the use of a well servicing rig. In general, the completion of the well will consist of perforating the production casing, productivity and/or formation pressure testing if deemed necessary, stimulation of the formation(s) utilizing hydraulic fracturing technology, flow back of fracturing fluids, flow testing to determine post fracture productivity, and installation of production equipment to facilitate hydrocarbon sales.

Hydrocarbons and water production rates are typically quantified and flared during testing operations, which are conducted on an as-needed basis. Flareless or reduced flaring technology may be utilized for well completions if appropriate. Hydraulic fracture stimulation is required on the majority of wells in the Project Area in order to enhance productivity. Numerous combinations of fluids and proppants have been

used historically in the Project Area in the effort to optimize stimulation results. Currently, the most common stimulation technique utilizes gelled fresh water (with CO_2 and/or N_2 frequently added for reservoir protection and enhanced flow back) and fracture proppants to provide the bridging and increased permeability necessary for productivity improvement. Sand, resin-coated sand, ceramics, or bauxite can be used as proppants in the stimulation process, depending on the design criteria of individual treatments. Gels and other chemical additives are utilized to provide the fluid viscosity necessary to ensure successful stimulation. The fracturing fluid is pumped down the well bore through the perforations in the casing, and into the formation. Sufficient rate and pressure are reached to induce a fracture in the target formation. The proppant carried in the fluid serves as a bridge to keep the created fracture open and to provide a flow path that allows reservoir fluids to move more readily into the well bore. Water used for stimulation purposes generally comes from water supply wells. Stimulation fluids recovered during flow back and subsequent production operations are temporarily contained in the completion, flare, or reserve pit.

Post stimulation flow tests allow for recovery of stimulation fluids and evaluation of well productivity. Duration of the tests will vary depending on individual well performance but typically are conducted only long enough for fluid rates to drop to a level that permanent production equipment can safely process. Gas is commonly flared during the flow back process and is measured using choke nipple calculations or through a temporary flow test separator and metering facility. Flaring takes place at the end of a horizontal flow line placed at a temporary pit designed for that specific purpose or at a vertical flare stack. Flaring occurs at a distance from the wellhead that ensures equipment and structure protection and personnel safety. Following the initial flow period, the well may be shut in until facilities are in place to allow the well to be placed on sales. In some cases, production facilities will be installed prior to completion in order to provide the capability of turning the well to sales immediately following testing. Alternatively, if flareless or reduced flaring completions technology is utilized, production facilities and flowlines will be installed prior to well completion. Special separation equipment is then needed to process the flowback to remove sand and fluids thereby allowing the gas to be turned to pipeline for sales rather than sent to flare. Fluids, primarily water, recovered during flow back operations are contained in the completion pit until they are disposed of at evaporation ponds, disposal wells, or evaporated on location.

Current technology allows for CBNG wells to be stimulated with high-pressure water and frac sands. After the well is completed, the well is either vented temporarily to atmosphere or directly tied into the gathering system. The water and CBNG will be separated downhole.

Completion and testing operations typically require approximately 10 to 20 (up to 30) days to perform, 2 to 30 personnel, and 1 to 20 vehicles on location. Approximately 4,000 to 12,000 barrels of water per well will be needed for completion and testing operations.

In the event a well proves to be uneconomic, the Operator will plug and abandon the well in accordance with federal and state regulations.

4.5 INTERIM RECLAMATION

On producing wells, the reserve pit will be reclaimed per the requirements specified in the approved APD. Reserve pits may be re-used for multiple wells being drilled from a single pad. Plastic liners, if used, will be buried onsite. The reserve pit, that portion of the location and access road not needed for production operations, and pipeline corridors will be reclaimed according to the requirements specified in the approved APD and COAs. Locations and roads will be reclaimed and reseeded back to the minimum size required as soon as possible after the well is put into production. CBNG well pads will also be reclaimed to a smaller size after the initial drilling phase, but roads typically stay at the construction dimension due to their initial minimum construction footprint. Each Operator may have a slightly different restored configuration based on original disturbance and the number of wells drilled on location. Figure 7 shows an example of a well pad layout after interim reclamation.

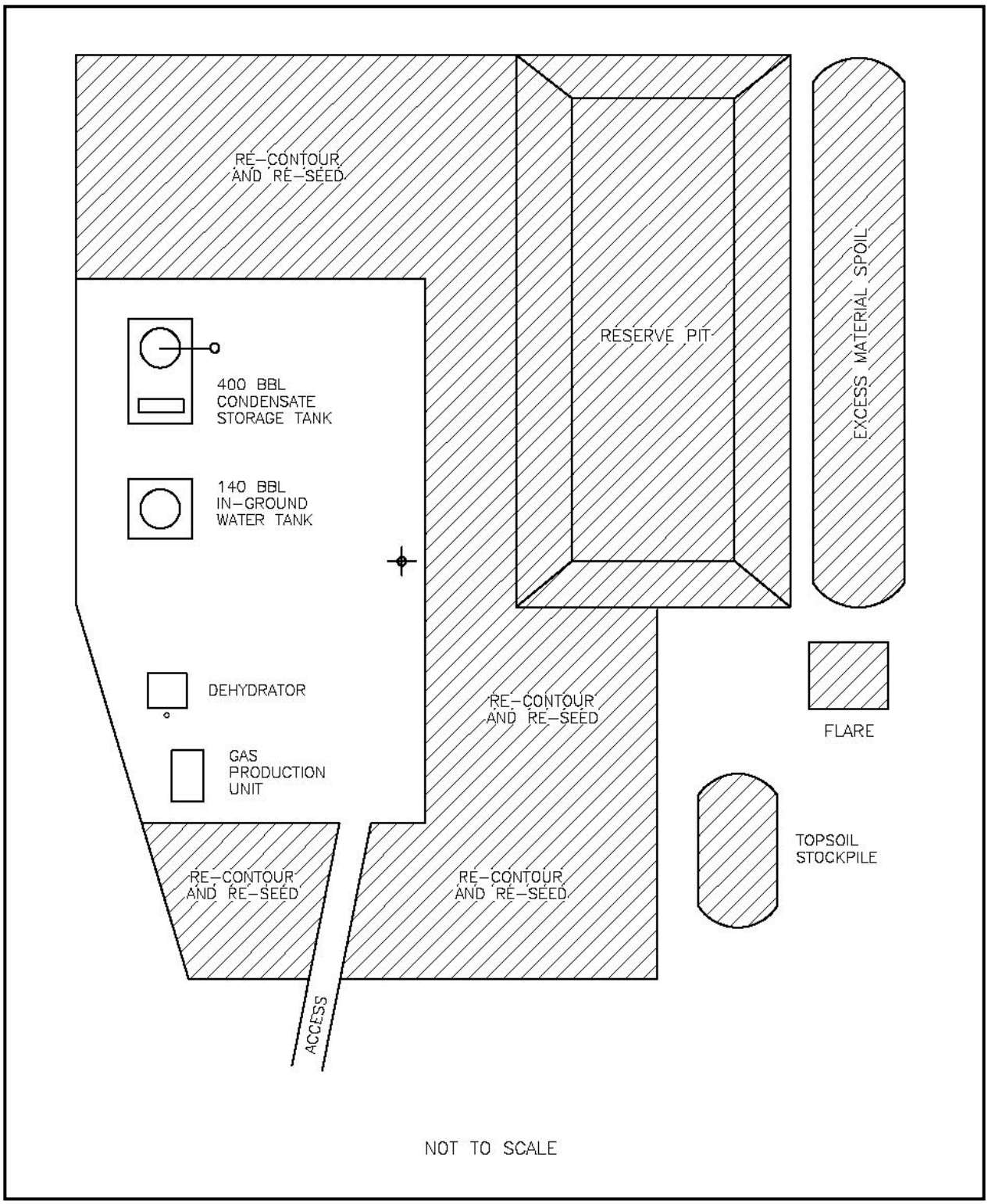


Figure B-6. Well pad after interim reclamation

5. Production and Maintenance

5.1 WELL PRODUCTION FACILITIES

Well production facilities will be installed as shown on the approved APD, with secondary containment structures built to conform to BLM, state, and federal requirements. Facilities on the well pad will typically include wellhead valves and piping, separation, dehydration, metering equipment, oil and water production tanks, a methanol storage tank and pump, and telemetry equipment. Production equipment will be fueled by natural gas or electricity. Telemetry equipment is currently used or planned for use by most Operators to improve well evaluation, operational efficiency, and to minimize well visits. Production pits will not be used. Well site compression may be utilized on an as-needed basis.

CBNG wellhead equipment may be run on diesel generators until an adequate flow of gas is present to run a gas-fired engine. Electricity may be provided to some CBNG sites in the future.

Artificial lift is equipment that is installed when production volumes drop to a level that prevents efficient removal of liquids from the well bore using reservoir energy alone. Artificial lift is presently limited to the use of plunger lift equipment , which is a passive hydraulic means of removing liquids from the well bore and does not require any increase in the disturbed surface area. Gas lift, downhole pumps, or other technology may also be employed.

All constructed or installed permanent structures (on site six months or longer) will be painted a flat, non-reflective earth-tone color as specified by the BLM. All new project facilities requiring painting will be painted within six months of installation.

5.2 PIPELINES

The Operators will continue to utilize the existing natural gas transmission lines that serve the Project Area. Operators are not responsible for the construction or operation of gas transmission lines, and new transmission lines are not included as a component of the Operators proposed project.

Gathering lines will be installed below the surface to transport the produced gas from the new wells to the gas gathering pipeline system. The gas production lines will be located adjacent and parallel to well access roads where possible to minimize surface disturbance. The exact location of a gathering line will be determined at the time of the onsite with the appropriate surface management agency. The new pipelines are expected to cross federal, state, and private surfaces in a route developed to minimize both resource conflicts and development costs within the Project Area. Approximately 45 miles of high-pressure gas lines may be installed to service multiple CBNG wells in the northwest portion of the project area. This pipeline will generally run in a north-south alignment from Wamsutter north to the Hay Reservoir area.

Pipeline construction consists of trenching, pipe stringing, bending, welding, coating, lowering pipeline sections into the trench, and backfilling. Construction operations will be confined to the ROW corridor approved in the ROW application which is variable between operators. In general, construction widths will be 50 to 75 feet when not adjacent to a road and 25 to 50 feet when adjacent to an existing or new road. Pipes installed adjacent to road ROWs are constructed outside of the borrow ditch to minimize safety concerns. The pipeline trench will be mechanically excavated with a backhoe or trencher to a minimum depth of 48 inches. The trench will be approximately 18 to 20 inches wide. Newly constructed pipelines will be hydrostatically tested to ensure structural integrity. As an example of water requirements, approximately 2,700 gallons of water will be required to test one mile of four-inch pipeline. Hydrostatic test water will be disposed of as approved by the BLM and/or the State. Pipeline corridors will be reclaimed as specified in the COA authorization. Pipelines installation will result in short term disturbance until reclamation is considered complete.

5.3 COMPRESSION, GAS TREATMENT, AND ANCILLARY FACILITIES

The existing compression infrastructure, however, will be unable to provide sufficient capacity to compress the additional gas volumes anticipated from the proposed wells. Additional compression will also be required if the Operators conclude that a reduction in gas gathering system pressure is needed at some point during the life of the project. Additional compression will be added to existing compression infrastructure where appropriate. Additionally, the Operators estimate that one large central pipeline compression facility, affecting approximately 10 acres, may be required for the project. Peak production is expected to occur in the 11th year after project approval. As many as ten additional compressor sites at 5 acres per site could be required to accommodate the maximum anticipated compression growth. Compression requirements and associated horsepower estimates will be developed in association with the air quality analysis.

Well site compression is utilized infrequently in the Project Area; however, individual well site compression could be needed on a limited basis. Well site compression will be installed on the existing well pad resulting in no additional disturbance. Well site compression typically uses 125 to 200 hp two-stage compressors. Gas fueled compression equivalent to 2500 HP per pilot will be required during the pilot phase for some of the CBNG development. Pilot testing will last for three years. Eight pilots can be expected within the EIS boundary area.

It is anticipated that two or more central gas processing/stabilization facilities will be needed within the Project Area. It is estimated that each of these facilities could affect 30 acres.

The Operators will utilize the existing facility infrastructure within the Project Area to the extent possible, including power lines and gas gathering and transmission pipelines.

5.4 PRODUCED WATER DISPOSAL

Produced water from conventional production may be stored in tanks at the well site prior to transport by water hauling trucks or transported in flowlines to collection facilities for disposal. Produced water will be disposed of via subsurface injection, surface evaporative pits, or will be used for potential beneficial use (i.e. drilling operations). Conventional wells average 18 bbls/day or produced water. Produced water, condensate and gas will be separated at the well site or at central facilities. The proposed development includes a percentage of CBNG wells. CBNG wells can produce from 500 to 1000 bbls/day of produced water. Produced water and gas will be separated at the well site. Water may be stored on-site in a lined pit or storage tank, or water collection lines may be installed to transport water to a water treatment facility, evaporation ponds, injection wells, subsurface drip areas and/or approved discharge points. Water gathering lines of various sizes will be installed adjacent to roads/gas pipelines. Any surface discharge of produced water from CBNG wells is regulated under a National Pollutant Discharge Elimination System (NPDES) permit issued by the Wyoming Department of Environmental Quality (WDEQ). Produced water quality will be monitored in accordance with State and Federal regulations.

5.5 MAINTENANCE

New wells will typically be visited daily but possibly less frequently after well performance has stabilized and telemetry equipment is installed.

Road travel will be restricted to the width of the running surface of the road. Maintenance on project roads during drilling and construction will be the responsibility of the Operators and will be consistent with the Transportation Plan, annual road plan, well-specific project plan, and BLM specifications. During the duration of the proposed project, the Operators will monitor the project roads and perform appropriate repairs. Repairs may be necessary to correct excessive soil movement, rutting, braiding around problem areas, and/or damage to cattle guards or gates.

5.6 WORKOVERS

Periodically, a workover on a well may be required. A well servicing rig is generally utilized during workover operations to perform various tasks such as well bore or surface equipment repairs, reservoir evaluation, or stimulation treatments to restore or enhance well performance. Workover operations are typically performed during daylight hours and are of short duration; however, depending on the scope of the work to be performed, workover operations can sometimes take from several days to several weeks to be completed. Unless fracture stimulation is necessary, workover operations typically require from five to 10 workers on location at any given time. During fracture treatments, an additional 10 to 20 individuals could be present on location. Additional surface disturbance is rarely necessary to conduct workover operations. Approval from the BLM Authorized Officer (AO) will be requested should the need for new surface disturbance arise.

5.7 GEOPHYSICAL OPERATIONS

Seismic surveys have been conducted on some portions of the CD-C Project Area in the past. Additional seismic surveys are currently being planned and are needed to further define the subsurface to facilitate the extraction of leased oil and gas resources. Proposed seismic surveys are currently under analysis in a separate BLM NEPA review, and are not included in this proposal.

6. Reclamation and Abandonment

Abandonment of the well and its facilities will be performed in compliance with applicable federal and state regulations as well as the COAs to the APDs. Seed mixtures applied during rehabilitation operations will comply with the specifications of the appropriate surface management agency. The Operators will cut off the casing at the base of the cellar or three feet below the final graded ground level, whichever is deeper, and cap the casing with a minimum of 0.25 inch thick metal plate. The cap will be welded in place with the well name and location engraved on the top. The cap will be constructed with a weep hole.

All surface equipment will be removed from the site. The surface will be recontoured to its original appearance, to the extent possible. Topsoil will be distributed above the former location to blend the site in with its natural surroundings. All surface disturbance will then be planted with a seed mixture as specified by the appropriate surface management agency. Reclaimed sites will be monitored to ensure erosion is prevented and the desired plant species are being re-established. Monitoring will continue until the reclamation is deemed successful, which will be defined in the project reclamation plan.

7. Operator-Committed Practices

The Operators will adhere to all lease and APD conditions in addition to all federal and state laws, regulations, and policies implemented through statute and/or resource management planning decisions implemented through NEPA. According to BLM IM No. 2004-194, best management practices to be considered in nearly all circumstances include the following:

- Interim reclamation of well locations and access roads soon after the well is put into production;
- Painting of all new facilities a color which best allows the facility to blend with the background, typically a vegetated background;
- Design and construction of all new roads to a safe and appropriate standard, "no higher than necessary" to accommodate their intended use; and
- Final reclamation recontouring of all disturbed areas, including access roads, to the original contour or a contour that blends with the surrounding topography.

The Operators commit to performing these environmental protection measures during the implementation of their proposed project.

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APPENDIX C: CONSERVATION AND MITIGATION MEASURES

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INTRODUCTION

Included in Appendix C are a variety of measures that may be implemented by the BLM in the Rawlins Field Office to conserve natural resources and to mitigate the effects of actions on federal lands. The measures described here are Best Management Practices (BMPs), Conditions of Approval (COAs), Terms and Conditions (T&C), and Required Design Features (RDFs).

BMPs are "state-of-the-art mitigation measures designed to provide for safe and efficient operations while minimizing undesirable impacts to the environment" (BLM 2007c). The objective of BMPs is to reduce impacts to wildlife, air quality, landscapes, and other natural resources as activities on federal lands are pursued. Although the use of BMPs is recommended, they are not regulatory requirements and are voluntarily implemented as conditions warrant.

COAs are restrictions, or conditions, placed on the approval of a federal permit. In the case of oil and gas development, they are attached to an approved Application for Permit to Drill (APD) to ensure environmental protection, safety, and/or conservation of mineral and natural resources. Many COAs are in fact BMPs that have been made a requirement of the permit to drill to federal fluid minerals.

T&C are similar to COAs except that they are placed on federal right-of-way (ROW) grants. Like COAs, many T&C are BMPs that have been made a requirement of right to construct a road or other facility on federal surface.

RDFs are measures that may appear elsewhere as BMPs, COAs, or T&C, but that have been formulated or revised specifically to protect Greater Sage-Grouse or its Priority Habitat Management Areas (PHMAs) or to mitigate impacts to Greater Sage-Grouse populations or PHMAs. The RDFs included here are from the Wyoming Approved Resource Management Plan for Greater Sage-Grouse, Appendix D (BLM 2015).

BEST MANAGEMENT PRACTICES

BMPs for oil and gas development are intended to reduce impacts to wildlife, air quality, landscapes, and other natural resources as energy resources are developed. Although the use of BMPs is highly recommended, they are not regulatory requirements. The BLM's policy is that all "[f]ield [o]ffices consider BMPs in National Environmental Policy Act (NEPA) documents to mitigate anticipated impacts to surface and subsurface resources, and also to encourage Operators to actively consider BMPs during the application process." (Instruction Memorandum No. 2004-194; June 22, 2004) More information on BMPs suggested by the BLM can be found on the BLM's national website at: http://www.blm.gov/wo/st/en/prog/energy/oil_and_gas/best_management_practices.html.

Another important source of information on BMPs is the publication Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development (commonly referred to as The Gold Book), which was developed to educate Operators on the requirements for obtaining permit approval and conducting environmentally responsible oil and gas operations on Federal lands. It is available online at: http://www.blm.gov/wo/st/en/prog/energy/oil_and_gas/best_management_practices/gold_book.html.

BMPs that may have particular application to the Rawlins Field Office can be found in the following parts of the Rawlins Resource Management Plan (RMP) (BLM 2008):

- Appendix 1—Wyoming Bureau of Land Management Mitigation Guidelines for Surface Disturbing and Disruptive Activities
- Appendix 13—Reducing Nonpoint Source Pollution with Best Management Practices
- Appendix 15—Best Management Practices for Reducing Surface Disturbance and Disruptive Activities
- Appendix 16—Mountain Plover Management Guidelines: Occupied Habitat Protection Measures
- Appendix 24—Mitigation Guidelines for Special Status Plants

These appendices and the entire Rawlins RMP Record of Decision can be found at:

http://www.blm.gov/wy/st/en/programs/Planning/rmps/rawlins/rod_armp.html.

CONDITIONS OF APPROVAL

In the process of acquiring permission to drill to a federal oil and gas lease, leaseholders submit an APD to the BLM Field Office that manages the public lands where their lease is located. Included with the APD are:

- a drilling plan that contains a description of the leaseholder's drilling program, geologic data, expected hazards and proposed mitigation measures to address such hazards;
- a surface use plan of operations that describes the locations of the drillpad and the access road, details of pad construction, and methods for containment and disposal of waste material; and
- a reclamation plan, which includes a weed management plan.

When the BLM has completed the necessary environmental and technical review of the proposal contained in the APD, the BLM may approve the APD as submitted or, more typically, approve the APD subject to COAs.

COAs are attached to an approved APD to ensure environmental protection, safety, and/or conservation of mineral and natural resources. They arise from a variety of controlling authorities such as the Federal Land Policy and Management Act (FLPMA), the National Environmental Policy Act (NEPA), the Endangered Species Act (ESA) and the National Historic Preservation Act (NHPA). The COAs attached to an APD can be general in nature or site-specific, and thus will vary from one BLM Field Office to another. Typically, a Field Office develops COAs over a number of years of active management of oil and gas development. Often the Field Office RMP provides either a listing of potential COAs or the BMPs that might guide development of site-specific COAs in that area. They can address topics as wide-ranging as protection of wildlife habitat or archeological and paleontological sites, noise reduction, wildfire suppression, or management of invasive species. A BLM study of a number of Field Offices that manage oil and gas development identified 175 different COAs that are used to mitigate surface-disturbing activities (BLM 2006c). Included in this Appendix is a list of COAs that are typically used in the Rawlins Field Office when approving APDs. The list is often adapted as needed for site-specific use. If specific resource concerns are identified that require additional COAs that are not on the list, additional COAs may be added. The list is presented in the standard format used for attachment to an approved APD.

GENERAL

1. Approval of this Application for Permit to Drill (APD) does not warrant that any party holds equitable or legal title.
2. All lease exploration, development, construction, production, operations, and reclamation activity shall be conducted in a manner which conforms to all applicable federal, state, and local laws and regulations.
3. All lease operations are subject to the terms of the lease and its stipulations, the regulations of 43 CFR Part 3 100, Onshore Oil and Gas Orders, Notices to Lessees (NTL's), the approved APD, and any written instructions or Orders of the Bureau of Land Management (BLM) Authorized Officer (AO).
4. The approval of this APD does not grant authority to use off-lease federal lands. Facilities approved by this APD and/or Sundry Notices that are no longer included within the lease, due to a change in the lease or unit boundary, will be authorized with a right-of-way. Similarly, should unit or lease boundaries change during the life of the project, the Operator will be responsible for acquiring necessary rights-of-way for affected facilities. Failure to do so may cause the operation to be shut-in.

5. This permit is valid for a period of two years from the date of APD approval or until lease expiration or termination, whichever is sooner. APD extensions may be requested and granted for up to two additional years, but not to exceed a total sum of four years from the initial APD approval date. Should a permit extension be requested, it must be submitted prior to the permit expiration date via a Sundry Notice (Form 3160-5) to the AO for approval. If the permit terminates, any surface disturbance created under the application shall be reclaimed in accordance with the approved reclamation plan found herein.
6. The Operator shall submit a Sundry Notice (Form 3160-5) to the AO for approval prior to beginning any new surface-disturbing activities or operations that are not specifically addressed and approved by this APD.
7. The Operator may submit to the AO's Representative written requests (including documentation, supporting analysis and an acceptable plan for mitigation of anticipated impacts) for exception, waiver, or modification to this approved APD, associated Conditions of Approval (COA), or other requirements. Such written approval shall be obtained prior to commencement of operations that cause any deviation from the approved APD and associated limitations. Emergency approval may be obtained orally, but such approval does not waive the written reporting requirement.
8. At **least 48 hours prior to** beginning any APD-related construction (e.g. access road, well pad, pipeline) and/or reclamation activities (e.g. dirt-work, seeding) the Operator shall notify the BLM via internet notice.
9. All construction of the well pad, flare pit, reserve pit, roads, flow lines, production facilities, and all associated infrastructure on federal lands shall be monitored onsite by a licensed professional engineer OR designated qualified inspector (to be named at the time of construction notification) who will serve as the Operator's Compliance Coordinator to ensure construction meets the BLM-approved plans.
10. Within **24 hours** of spudding the well, the spud date shall be submitted to the BLM via internet notice. A follow-up report on Form 3 160-5 confirming the date and time of the actual spud shall be submitted to this office within 5 working days from date of spud.
11. At **least 24 hours in advance** of all BOP tests, running and cementing all casing strings (other than conductor casing), pluggings, DST's and/or other formation tests, and drilling over lease expiration dates, notification shall be submitted to the BLM via internet notice.
12. Prior to construction, the Operator shall submit a production facility layout for approval (Onshore Order 1, Section 111. D.4.d. and D.4.i., or Section VIII. A.) that includes permitted location boundaries, production facility placement, access road inlet, and cut/fill slopes.
13. A site facility diagram (Onshore Order 3, Section 111. I. and 43 CFR 3 162.7-5(d)) for the purpose of a site security plan (Onshore Order 3, Section 111. H. and 43 CFR 3 162.7-5(c)) shall be filed no later than 60 calendar days following first production.
14. Use of any tank heater/burners in production storage tanks must be approved by the AO prior to installation and/or use. Failure to obtain approval for installation/use of tank heater/burners in any production storage tanks may result in a Written Order (WO), Incidence of Non-compliance (INC), assessments and/or potentially a Shut-In Order.
15. No below or partially below ground fluid storage/containment tanks or vessels are to be used without prior approval of the AO. Below or partially below ground fluid storage/containment tanks or vessels shall require systems for the prevention, containment, detection, and monitoring of any below ground leakage (e.g. secondary containment and leak detection/monitoring systems, etc.). A production facility layout depicting the proposed vessel construction and installation/location must be submitted for prior approval via APD or Sundry. As applicable, all subsurface vessels must comply with the

Wyoming Storage Tank Act of 2007 (W.S. 35-1 1-14-29) and/or the Wyoming DEQ Underground Injection Control (UIC) Program.

16. No pipelines or flow-lines or related rights-of-way are approved with the APD. Well pipelines or flow-lines and related rights-of-way, including plans of development, must be submitted for approval via Sundry Notice or Right-of-Way Application (SF-299) as applicable, prior to construction.
17. The BLM AO may request and schedule a meeting with the Operator or Operator's representative to discuss the APD and terms and COAs. Such meeting would be held in the BLM offices, within 30 days of the APD approval.
18. The BLM AO may request to schedule a meeting with the Operator or Operator's representative (dirt contractor, construction contractor, surveyors, etc.) to discuss construction and related requirements. Such meetings would be held in the BLM office and in the field within 60-90 days prior to surface disturbance and construction. The BLM AO may require surveys and re-stacking of all project construction and disturbance prior to field inspection.

OPERATIONS

1. Upon request, Operator must be prepared to provide copies of applications for, and approved copies of, federal, state, and local operating permits.
2. All survey monuments found in the area of operations shall be protected. Survey monuments include, but are not limited to: General Land Office and BLM Cadastral Survey Comers, reference corners, witness points, U.S. Coastal and Geodetic benchmarks and triangulation stations, military control monuments, and recognizable civil (both public and private) survey monuments. In the event of obliteration or disturbance of any of the above, the Operator shall immediately report the incident, in writing, to the AO and the respective installing authority if known. Where General Land Office or BLM right-of-way monuments or references are obliterated during operations, the Operator shall secure the services of a registered land surveyor or a BLM cadastral surveyor to restore the disturbed monuments and references using surveying procedures found in the "Manual of Surveying Instructions for the Survey of the Public Lands in the United States," latest edition. The Operator shall record such survey in the appropriate county and send a copy to the AO. If the Bureau cadastral surveyors or other federal surveyors are used to restore the disturbed survey monument, the Operator shall be responsible for the survey cost.
3. If any cultural values (sites, artifacts, human remains) are observed during operation of this lease/permit/right-of-way, they will be left intact and the AO notified. The AO will conduct an evaluation of the cultural values to establish appropriate mitigation, salvage or treatment. The Operator is responsible for informing all persons in the area who are associated with this project that they will be subject to prosecution for knowingly disturbing historic or archaeological sites, or for collecting artifacts. If historic or archaeological materials are uncovered during construction, the Operator is to immediately stop work that might further disturb such materials, and contact the AO. Within seven (7) days after the Operator contacted the BLM, the AO will inform the Operator as to: whether the materials appear eligible for the National Register of Historic Places; the mitigation measures the Operator will likely have to undertake before the site can be used (assuming in situ preservation is not necessary); and a time-frame for the AO to complete an expedited review under 36 CFR 800.11 to confirm, through the State Historic Preservation Officer, that the findings of the AO are correct and that mitigation is appropriate. The AO will provide technical and procedural guidelines for the conduct of mitigation. Upon verification from the AO that the required mitigation has been completed, the Operator will then be allowed to resume construction.
4. The Operator will be responsible for the cost of any mitigation required by the AO. The AO will provide technical and procedural guidelines for the conduct of mitigation. Upon verification from the

AO that the required mitigation has been completed, the Operator will be allowed to resume operations.

5. If paleontological resources, either large or conspicuous, and/or of a significant scientific value are discovered during construction, the find will be reported to the AO immediately. Construction will be suspended within 250 feet of said find. An evaluation of the paleontological discovery will be made by a BLM-approved professional paleontologist within five (5) working days, weather permitting, to determine the appropriate action(s) to prevent the potential loss of any significant paleontological values. Operations within 250 feet of such a discovery will not be resumed until written authorization to proceed is issued by the AO. The Operator will bear the cost of any required paleontological appraisals, surface collection of fossils, or salvage of any large conspicuous fossils of significant scientific interest discovered during the operation.
6. The Operator will be responsible for informing all persons associated with this project that they will be subject to prosecution for damaging, altering, excavating or removing any archaeological, historical, or vertebrate fossil objects or site. If archaeological, historical, or vertebrate fossil materials are discovered, the Operator shall suspend all operations that further disturb such materials and immediately contact the AO. Operations shall not resume until written authorization to proceed is issued by the AO.
7. Within five (5) working days, the AO will evaluate the discovery and inform the Operator of actions that will be necessary to prevent loss of significant cultural or scientific values.
8. The Operator shall be responsible for the cost of any mitigation required by the AO. The AO will provide technical and procedural guidelines for the conduct of mitigation. Upon verification from the AO that the required mitigation has been completed, the Operator shall be allowed to resume operations.
9. If any dead or injured threatened, endangered, proposed, or candidate animal species is located during construction or operation, the U.S. Fish and Wildlife Service's Wyoming Field Office (307-772-2374), its law enforcement office (307-261 -6365), and the BLM Rawlins Field Office (307-328-4200) shall be notified within 24 hours. If any dead or injured sensitive species is located during construction or operation, the Rawlins Field Office shall also be notified within 24 hours.
10. If dead or injured raptors, big game, migratory birds, or unusual wildlife are observed on the project area, Operator personnel will contact the appropriate BLM and WGFD offices. Under no circumstances will dead or injured wildlife be approached or handled by Operator personnel.
11. Operators shall notify the BLM immediately if raptors are found nesting on or within 1,200 feet of project facilities and assist the BLM as necessary in erecting artificial nesting structures (ANSs) as appropriate. The use of ANSs will be considered as a last resort for raptor protection. If nest manipulation or a situation requiring a "taking" of a raptor nest becomes necessary, a special permit will be obtained from the Denver USDI-FWS Office, Permit Section and will be initiated with sufficient lead time to allow for development of mitigation. Required corresponding permits will be obtained from the WGFD in Cheyenne. Consultation and coordination with the USDI-FWS and WGFD will be conducted for all protection activities relating to raptors.
12. Operator and Operator’s sub-contracted personnel shall not intentionally harm or harass wild horses, other wildlife, or domestic livestock.
13. Right-of-way, mineral lease, mining claim, and permit holders shall monitor and control noxious and invasive weeds, according to an approved weed management plan, on project-disturbed areas and native areas infested as a direct result of the project. The control methods shall be in accordance with guidelines established by the EPA, BLM, state and local authorities. Prior to the use of pesticides, the Operator will obtain written approval from the AO—meaning an approved Pesticide Use Proposal

form—showing the type and quantity of material(s) to be used, pest(s) to be controlled, method of application, etc.

14. Pesticide Use Proposals shall be submitted to and approved by the BLM AO-Weed Coordinator, prior to any application of any herbicide on the BLM lands. Pesticide Use Proposals will be tiered to the approved Reclamation Plan/Weed Management Plan.
15. Copies of daily Pesticide Application Records (required by the State of Wyoming) and Summary Herbicide Use Reports are due monthly to the BLM AO-Weed Coordinator.
16. The Operator shall be responsible for the prevention and suppression of fires on public lands caused by its employees, contractors, or its subcontractors. During conditions of extreme fire danger, surface use operations may be either limited or suspended in specific areas, or additional measures may be required by the AO. Should a fire occur, it shall be immediately reported to this office by calling 307-328-4200 and notifying the Fluid Minerals staff.
17. Emissions of particulate matter from well pad, road, and other facility construction, operation, and reclamation activities will be minimized by application of water or other dust suppressants. Dust inhibitors (surfacing materials, dust suppressants, and water) will be used as necessary on locations that present a fugitive dust problem. The use of chemical dust suppressants on public surface will require prior approval from the AO.
18. If groundwater or permeable/porous subsoil or bedrock is encountered upon construction of the pad or pits, or upon drilling and completing shallow holes for surface conductor, rat/mouse holes, or water supply well, the Operator must immediately notify the AO's Representative before proceeding.
19. The Operator shall comply with the Hazardous Materials Management Plan/Summary in the RMP ROD (Appendix 32) and/or the appropriate EIS ROD, including requirements to transport, store, utilize, and dispose of hazardous substances. The Operator shall maintain a hazardous substances release contingency plan that shall include, among other things, provision to notify the AO in the event of any release of hazardous substances associated with project operations. Treatment chemicals may require additional storage and containment measures and facilities depending on chemical classification and hazard.
20. If a portable sewage treatment facility is moved onto location, the well/lease Operator shall provide the BLM AO a copy of the facility Operator's notification letter to the Wyoming Department of Environmental Quality. Facility operations shall comply with BLM requirements, including unauthorized discharge notification and reclamation of disturbed surfaces.
21. Only those hazardous wastes that qualify as **exempt,** under the Resource Conservation and Recovery Act (RCRA), Oil and Gas Exemption, may be disposed of in the reserve pit. Generally, oil or gas wastes are exempt if they:
22. have been sent down hole and then returned to the surface during oil/gas operations involving exploration, development, or production, or
23. have been generated during the removal of produced water or other contaminants from the oil/gas production stream. The term hazardous waste, as referred to above, is defined as a **listed** (40 CFR 261 -31 -33) or **characteristic** (40 CFR 261.20-24) hazardous waste under RCRA.
24. Any spilled or leaked oil, produced water or treatment chemicals must be reported in accordance with NTL- 3A and immediately cleaned up in accordance with BLM requirements. This includes clean-up and proper disposition of soils contaminated as a result of such spills/leaks. The Operator shall segregate, treat, and/or bio-remediate contaminated soil materials as authorized via Sundry Notice (Form 3 160-5) or dispose of contaminated soils at a permitted waste facility. Treatment chemicals may require additional storage and containment measures and facilities depending on chemical classification and hazard.

25. The Operator shall install an identification sign consistent with the requirements of 43 CFR 3 162.6 immediately upon completion of the well pad/location construction operations.
26. The Operator shall contain and remove all debris, unused equipment, and other waste materials not needed for production. Waste materials shall be disposed of at an approved disposal facility.
27. Upon APD expiration, it is the responsibility of the Applicant/Operator to see that all stakes, flagging, posts or other materials placed on the locations and/or access roads, pipelines and associated rights-of-way are removed. Operator must immediately cease all operations associated with preparing to drill the well and begin final reclamation activities of all APD related disturbance, pursuant to the approved APD Conditions of Approval and to be completed within 6 months of the APD expiration date.
28. Employee and contractor education will be conducted regarding wildlife laws. If violations are discovered on the project area, Operators will immediately notify the appropriate agency. Operators will implement policies designed to control off-site activities of personnel, that may result in littering or resource damage.
29. Company and contractor employees operating motorized equipment will undergo training describing the types of wildlife in the area, the circumstances under which collisions are likely to occur and the measures that can be employed to minimize collisions.

CONSTRUCTION

1. All facilities on location that have the potential to leak/spill oil, glycol, methanol, produced water, condensate, or other fluids which may constitute a hazard to the environment, public health or safety (including, but not limited to, drain sumps, sludge holdings, and chemical containers), shall be within secondary containment, impervious to those fluids, exclusive of wildlife and livestock, with animal/bird escape capability, and able to contain a minimum of 110% of the volume of the largest storage vessel, respective to content, or 100% with at least one foot of freeboard, whichever is greater, so that any spill or leakage would not drain, infiltrate, or otherwise escape to ground water, surface water, or navigable waters before cleanup can be completed (within 72 hours).
2. Construction over and/or immediately adjacent to existing pipelines shall be coordinated, and in accordance with, the relevant pipeline companies' policy.
3. Fencing shall be installed around produced water, oil, and condensate tank batteries in order to help maintain the integrity of the surrounding containment structure and to prevent livestock and wildlife from entering the area in case of a leak or spill.
4. All open vent stack equipment shall be designed and constructed to prevent entry by birds and bats and to discourage perching.
5. The immediate repair/replacement (to BLM standards) of any range infrastructure breached, altered, or damaged by construction, drilling, or operation activities related to this APD shall be the responsibility of the Operator. All fence relocations will be in accordance with BLM approval.
6. Construction, maintenance, and reclamation operations with frozen material or during periods when the soil material is saturated is expressly prohibited. If equipment, including licensed highway vehicles, creates ruts in excess of four (4) inches deep, the soil shall be deemed too wet to adequately support maintenance and/or heavy equipment.
7. Accumulated snow present on the ground at the outset of construction, maintenance, or reclamation activities shall be removed before the soil is disturbed and piled downhill and/or downwind from the disturbed area. Equipment used for any non-construction snow removal operations will be equipped with 6" shoes to ensure blades do not remove topsoil or vegetation. Written approval must be

obtained before snow removal related to a federal action but outside of designated disturbance areas is undertaken.

8. When blading/removing snow, drifts/berms shall be constructed with a gap of 35 yards every 1/4 mile, to allow unobstructed movement of wildlife, livestock and human activities.
9. If right-of-way fencing is required, it will be kept to a minimum and the fences will meet the BLM/WGFD approval for facilitating wildlife movement. Wildlife-proof fencing will be used only to enclose areas that are potentially hazardous to wildlife species or reclaimed areas where it is determined that wildlife species are impeding successful vegetation establishment.
10. Snow fences, if used, will be limited to segments of one-quarter mile or less. In addition, escape openings will be provided along roads in big game crucial winter ranges, as designated by the BLM, to facilitate exit of big game animals from snowplowed roads.
11. Clearly remove, segregate, and delineate from all other spoils, all available topsoil from constructed locations and surface disturbances including areas of cut and fill. Stockpile and clearly identify topsoils at the site for use in reclamation on all areas of surface disturbance (well pads/locations, roads, pipelines, etc.).
12. Plugs or embankments providing wildlife with access out of and across open pipeline trenches shall be installed, at minimum, every 1,320 linear feet along open pipeline trenches.
13. No construction and/or reclamation shall block or change the natural course of any drainage, nor shall topsoil, waste, or fill material be deposited below high water lines in riparian areas, flood plains, or in natural drainage ways. The lower edge of soil or other material stockpiles will be located outside active floodplains. All spoils will be placed where they can be retrieved without creating additional surface disturbance and where they do not impede and/or contribute sediment to watershed and drainage flows. The Operator shall also reconstruct and stabilize stream channels, drainages, and ephemeral draws to exhibit similar hydrologic characteristics that were found in stable, naturally occurring and functioning systems.
14. Drainage and run-on/runoff shall be diverted away from all new construction naturally or through the use of diversion ditches/berms and/or soil berms or stockpiles. All drainage structures shall approximate topographic contour lines, have a grade no greater than 0.5 to 1 percent, and shall release water onto natural undisturbed ground without causing additional and/or accelerated erosion. Drainage structures shall not discharge directly into/onto natural drainages/channels, and/or use riprap or other armoring to protect from erosion (BLM Manual 9113). Water-bars, waddles, hay bales, and/or silt fences shall be used as needed to reduce surface runoff velocity and promote upland sediment deposition, thus reducing drainage/channel sedimentation and erosion.
15. Silt fences, if needed, would be installed after topsoil removal and before pad leveling begins and must remain in place until interim reclamation is complete and there is adequate vegetation present to stabilize the soil. Silt fences would be constructed in locations where surface erosion is evident or potential for surface erosion exists such as areas of steep slopes or highly erosive soils. Fences would be installed at the inside edge of disturbance.
16. Silt fences would be constructed using metal posts that are at least 5 feet long with at least 2 feet in the ground (3 feet above ground) with 8 feet spacing if a wire re-enforcement backing is used or 6 feet spacing if no wire backing is used. The fabric is to be toed into the ground at the base of the fence a minimum of 8 inches deep and an 18 inch overlap is required when splicing two fences together. The fabric is to be installed on the uphill side of the metal posts and attached to the posts at least every 6 inches along the length of the post. Silt fences are to be inspected at least once a month or 48 hours after a rain storm event. If holes in the fence or undercutting of the fence are found, repair is

required within 48 hours of discovery. When silt accumulates to a height equal to two-thirds the height of the fabric, the silt is to be cleaned out and deposited on the excess spoils pile.

17. Sediment fences, straw wattles, erosion mats and/or hay bales should be used to minimize erosion and sediment transport on disturbance area.
18. If temporary surface pipelines, as authorized by the AO, are used to transport water, they shall be placed/removed when the ground surface is dry. Surface blading prior to line placement is prohibited. The pipelines must be removed within 30 days after well completion (or determination of inactivity).
19. Construction control stakes shall be placed as necessary to ensure construction of the well pad, topsoil stockpile, spoil pile, and outer limits of the area to be disturbed in accordance with the specifications outlined in the APD. The Operator shall assume full responsibility for protecting all stakes and offsetting any additional stakes or grades which may be necessary.
20. All production facilities including but not limited to tanks, separators, dehydrators, meters, etc. would be co-located on nearby producing well locations, in accordance with an approved Sundry Notice of Intent for construction. All wells, above-ground structures, production equipment, tanks, transformers and insulators not subject to coloring requirements for safety would be painted the color of "non reflective Shale Green".
21. To protect the identified ferruginous hawk nests, Greater Sage-grouse leks and wintering big game habitat, the project proponent will install housing and/or muffler(s) around equipment that exceeds 55 dBA (ES-7, 4-69, 4-157 AR EIS)
22. Cathodic protection wells would be drilled on the existing well pad, placed so as not to interfere with re-contouring of cut-and-fill slopes during interim reclamation, designed and constructed to prevent commingling and contamination of water aquifers. The AO would be notified of any water flows at surface and the problem would be resolved promptly.
23. All stacks, exhauster, or vent pipes shall have anti perch cones and vent covers to prevent bat or small bird entry and entrapment.

ROADS

1. All access roads and drainage control structures, whether existing or newly constructed, shall be both constructed to resource road standards and regularly maintained in a safe and usable condition as outlined in BLM Manual, Section 9113. A regular maintenance program may include, but is not limited to, blading, ditching, culvert installation, dust control, and gravel surfacing or other activities as specified by the AO. The Lessee and/or Operator shall enter into a maintenance agreement with all other "authorized users" of the common access road(s) to the well site. The costs of road maintenance in dollars, equipment, materials, labor, and other related expenses shall be shared proportionally among the "authorized users." Upon request, the AO shall be provided copies of any maintenance agreement or agreements.
2. Access roads would be constructed to the BLM Road Standards in such manner as to minimize cuts and fills and minimize erosion and sedimentation and maximize reclamation, as determined during the onsite.
3. **Engineered Roads** and/or **culverts** shall be designed in accordance with the Engineered Road Requirements, with four copies of the following information submitted to the BLM project NRS for approval, prior to construction.
    a. Plan, profile, and typical cross-section.
    b. Centerline stakes shall be placed in the field, with culvert locations marked on the centerline, for the BLM review before final design approval. In addition, slope stakes shall be placed at the top

of the cut and the bottom of the fill for those portions of the road that are engineered. All roadways cuts and fills shall be designed to balance from earthwork within the ROW, or an approved borrow source.

c. Perform a "hydrologic analysis" to design culverts sized to pass a 25-year precipitation event with no head developed at the culvert inlet.

d. The submitted plans must be signed/certified by a professional engineer and will include any special notes for construction and cut/fill balance notes.

4. All Operator and Operator's representative vehicles are restricted to authorized travel routes only and shall not use any other access route, e.g.; two-track roads, trails, and pipeline rights-of-way to access the drill/ell pad and any ancillary facilities.

5. Two-track roads shall not be cut off as a direct result of construction, maintenance, or reclamation of the well access road or associated well facilities, unless authorized by the BLM.

6. Prior to construction, road(s) shall be surveyed and staked with construction control stakes set continuously along the centerline at maximum 100-foot intervals (less where needed to be inter-visible) and at all tangent and curve control points, fence or utility crossings, and culverts. In addition to centerline stakes, slope stakes shall be placed at the top of the cut and the bottom of the fill for those portions of the road that are engineered.

7. Before proposed road construction activities begin, the topsoil must be bladed to the side of the road and stockpiled. The topsoil stockpile shall be contoured so as to prevent water ponding or flow concentration. Once the borrow ditch and the cut slopes are constructed, cleared vegetative material and topsoil that is windrowed shall be spread back onto the cut/fill slopes of the road, removing any windrows or berms remaining at the edge of the road.

8. The minimum travel-way width of the immediate access road will be 14 feet with turnouts at least 10 feet in width. No structure will be allowed to narrow the road top. The inside slope will be 4: 1. The bottom of the ditch will be a smooth V with no vertical cut in the bottom. The outside slope will be 2:1 or flatter. After the road is crowned and ditched with a .03-.05 ft/ft crown, the topsoil and windrowed vegetative material shall be pulled back down on the cut slope so there is no berm left at the top of the cut slope. Turnouts will be spaced at a maximum distance of 1,000 feet and will be intervisible. If the access road crosses a floodplain, the ditch shall be flat-bottomed so as to provide material to raise the road, unless otherwise approved by the AO.

9. If soils along the access road route are dry during road construction, use, and/or maintenance, fresh water shall be applied to the road surface to facilitate soil compaction and minimize soil loss as a result of wind erosion.

10. Construction and surfacing of the new access road shall be complete prior to moving drilling equipment onto the well pad and the presence of heavy vehicular traffic. Compact the top foot of sub-grade in even 6 to 8-inch lifts to established standards, adding water as needed for compaction. Surface with an appropriate grade of gravel to a minimum depth of four (compacted) inches.

11. All cattle guards shall be designed and maintained consistent with BLM standards and shall be a minimum of 16 feet wide and 8 feet long; set on either timber, pre-cast concrete, or cast-in-place concrete bases at right angles to the roadway. They shall have drop-down wings and an adjacent 16-foot-wide tubular bypass gate; not narrow the road surface; and have fence and end panels on either side constructed using 3 posts with "H" braces.

12. All culverts shall be a minimum of 18 inches in diameter. Culverts shall have a minimum of 12 inches of fill or 1/2 the pipe diameter, whichever is greater, placed on top of the culvert, and shall be of length sufficient to allow at least 12 inches of culvert to extend beyond the toe of any slope. The

inlet and outlet shall be set on grade. No rocks shall be used in the bed material and no rocks greater than 2 inches in diameter will be immediately adjacent to the culvert. The entire length of pipe shall be bedded on native material before backfilling, which shall be completed using unfrozen material and rocks no larger than two inches in diameter; compact the backfill evenly in 6-inch lifts on both sides of the culvert. A permanent marker shall be installed at both ends of the culvert to help prevent traffic from damaging the culvert. Additional culverts will be placed in the new access road as the need arises or as directed by the AO.

13. Wing-ditches shall be staked and constructed at a slope of .5 to 1.0 percent downslope unless otherwise approved by the AO. All wing/drainage ditches and culverts shall be kept clear and free flowing, and shall also be maintained in accordance with the original construction standards. Drainage structures shall not discharge directly into/onto natural drainages/channels, and/or use riprap or other armoring to protect from erosion (BLM Manual 9113).
14. Low water crossings shall be constructed perpendicular to the channel and at original channel elevation in a manner that will not block or restrict existing channel flow. Excavated material shall be stockpiled for use in reclamation of the crossings.

PITS

1. All oil and gas pits that could contain fracture/stimulation fluids, recycled pit fluids, or produced water, except those only containing fresh-water based constituents, are required to be lined with an impermeable (12 mil minimum with a permeability less than or equal to 1 X 10-7 cm/sec) liner. The liners shall be physically and chemically compatible with all substances which it may contact and shall be of sufficient strength and thickness to withstand normal installation and use, and installed so that it will not leak. The liner shall be installed over a smooth sub-grade, matting, or fill materials (e.g. sifted dirt, sand, or bentonite) free of pockets, loose rocks, and other objects that could damage the liner.
2. The only fluids/waste materials which are authorized to go into reserve pits are RCRA-exempt exploration and production wastes. Any evidence of RCRA non-exempt wastes being put into the reserve pit may result in the BLM AO requiring specific testing and closure requirements.
3. All pits are required to maintain a minimum of 2 feet of freeboard between the liquid level and the top of the liner. If operations cause fluid levels in pits to rise above the required freeboard, immediate notification shall be provided to the AO with concurrent steps taken to cease the introduction of additional fluids, until alternative containment methods can be approved.
4. Flaring of gas into the reserve or completion pits will not be allowed without prior approval from the AO. Flaring into lined pits is prohibited.
5. All pits shall be kept free of trash, debris, solid wastes, and other unauthorized waste materials including oil and liquid hydrocarbons.
6. For the protection of livestock and wildlife, all pits and open cellars shall be fenced on all sides, with corner bracing, immediately upon construction. Reserve, flare, completion, and production pits shall be adequately fenced during and after drilling operations until pits are reclaimed so as to effectively keep out wildlife and livestock. Operator shall, within ten (10) days of discovery, remove any floating hydrocarbons from pit surface. Approved netting (mesh diameter no larger than one inch) is required over any pit that contains or is identified as containing hydrocarbons or hazardous substances (per RCRA 40 CFR Part 26 1 or CERCLA Section 10l (14) (E)).
7. Pits shall be dried, backfilled, and closed within six (6) months from well completion (total depth) or well plugging. Pits must be void of all free fluids prior to backfilling. Pit trenching or squeezing is prohibited. Pits may be dewatered/dried in the following manner: natural evaporation, mechanical

aeration, chemical and mechanical solidification (e.g. with fly ash, cement kiln dust, etc.) and/or hauled to an approved DEQ disposal site. The installation/operation of any sprinklers, misters, aerators, pumps, hoses, and related equipment shall ensure that water spray or mist does not drift outside of the pit. All other dewatering/drying, removal or disposal methods not listed in the APD and or COAs shall have prior written approval from the AO.

8. Pits, once dry, shall be backfilled and compacted with a minimum cover of five (5) feet of soil, void of any topsoil, vegetation, large stones, rocks or foreign objects. The pit area shall be mounded to allow for settling and to promote positive surface drainage away from the pit. Before backfilling synthetically lined reserve pits, those liner portions remaining above the "mud line" shall be cut off as close to the top of the mud surface as possible and disposed of at an approved solid waste disposal facility. The pit bottom and remaining liner shall not be trenched, cut, punctured, or perforated.

FLUIDS

1. All storage, removal and disposal of produced water must be in accordance with and comply with Onshore Oil and Gas Order No. 7. Produced water must be disposed of at a permitted off-site commercial disposal facility, unless approved otherwise by the BLM AO. The onsite storage/disposal of produced water, in open pits, tinhorns, sumps, etc., is not authorized except as follows: 1) produced water from the well subsequent to drilling may be disposed of in the approved well site reserve pit (for up to 90 days), and/or 2) used for well drilling or completion, upon prior written approval from the AO via approved APD or Sundry. Produced water may be transported and used for drilling/completion operations from approved fee, state, or federal wells/leases to federal wells/leases within the developed field/unit and/or EIS area, subject to WOGCC and BLM approval.
2. Pit drilling fluids may be transferred from a reserve pit at an approved federal well location to a lined reserve pit at another approved federal well location, for the purpose of drilling the well. Transfer/reuse shall only be permitted when transfer is by a lease Operator from one or more pits to another pit or pits on the Operator's federal lease/unit or adjacent federal lease. Unless approved by this APD, the transfer and reuse of pit drilling fluids shall require prior written approval from the AO, via a Sundry Notice (Form 3160-5).
3. The AO may authorize the use of produced water or reuse of pit drilling fluids for drilling when: 1) surface casing has been set with fresh water through **any** and all possible fresh water zones, 2) use is for drilling/completion only, and 3) the receiving pit is lined.
4. Pit fluids may be transferred by a lease Operator from one or more pits to another (lined) pit or pits on the Operator's federal lease/unit or adjacent federal lease, for the purpose of fluid consolidation and mechanical/chemical drying and disposal. The 6-month pit closure requirement shall apply. Unless approved by this APD, the transfer of pit fluids for consolidation/disposal shall require prior written approval from the AO, via a Sundry Notice (Form 3160-5).
5. Initial Operator requests for the transport and use/reuse of produced water or pit drilling fluids or the transfer/consolidation of pit fluids shall include: 1) the potential locations/leases in which fluids are to be transferred to and from, and 2) the potential quantity to be moved. Requests shall be submitted for prior written approval from the AO via APD or Sundry Notice. Upon completion of transport, use/reuse or consolidation, the specific information on leases, units or locations and quantities transferred shall be submitted to the AO, via Sundry Subsequent Report. Transportation of fluids shall be along approved haul routes and authorized right-of-ways. Temporary surface pipelines may be authorized by the AO for the transfer of fresh water only, and NOT for produced water or pit fluids.
6. Drilling water sources/supplies or any changes to drilling water sources/supplies, the fate of drilling/completion fluids, routes and means of fluid transportation/disposal, and location or method of produced water disposal requires prior written approval from the AO via approved APD, Sundry

Notice or Right-of-way (ROW) as applicable. The drilling of water wells on federal lands shall require prior BLM approval via APD, Sundry, or ROW as applicable, in addition to State Engineer Office (SEO) approval.

RECLAMATION

1. A reclamation plan shall be submitted with each APD. The reclamation plan will address short-term stabilization to facilitate long-term reclamation. The reclamation plan is considered complete when all the reclamation requirements described in the BLM Reclamation Policy and the Rawlins RMP have been addressed, the techniques to meet the reclamation requirements are described in detail, and the BLM concurs with the reclamation plan. Surface disturbance will not be allowed until the reclamation plan is submitted, complete and approved by the BLM Authorized Officer.
2. The Reclamation Plan shall include:
   a. Prior to any surface-disturbing activities, vegetation inventories shall be conducted on each ecological site and they shall be mapped. At a minimum, vegetation inventories shall be conducted for basal cover and vegetative life form type and frequency (including individual invasive and noxious weed species) and include at least one photograph of each transect. An inventory of 100 to 400 points (depending on the amount and type of vegetative cover) using transects is highly recommended. The inventory method shall be included within the Reclamation Plan for approval.
   b. Prior to the completion of interim and final reclamation, the Operator shall sample and test soils for suitable surface and subsurface physical and chemical properties. At a minimum the soil shall be tested for texture, electrical conductivity, reactivity, pH and photographed. At least one photograph at each soil pit is required which also shows the vegetation community. These tests are to be used by the Operator to evaluate the suitability of the soils or seedbed for seed germination and potential for vegetative success under the approved reclamation plan.
   c. Prior to the completion of interim and final reclamation and seeding, the Operator shall submit to the BLM AO, via Sundry Subsequent Report (Form 3160-5), the results of all vegetative and soils surveys and tests. Should pre-disturbance and interim/final reclamation test results differ to the extent that the soil requires amendment(s) or the proposed seed mix requires modification to achieve the desired ecological and plant community, the Operator shall submit a revised reclamation plan via Sundry Notice of Intent (NOI) (Form 3160-5). The Sundry NOI shall outline any proposed soil amendments, treatments, additives or modifications, seed mix changes and other necessary revisions to the reclamation plan.
   d. Provisions to meet Standards and Guidelines for Healthy Rangelands (43 CFR 4180.1) and obtaining desired plant communities: http://www.blm.gov/wy/st/en/field_offices/Rawlins/range.html
   e. Mitigation for direct, indirect and cumulative livestock forage losses and impacts to livestock grazing (including impacts to livestock operations and production performance). This could include reclamation that would replace forage losses from surface disturbing activities, avoiding trailing routes and livestock gathering areas and seasonal restrictions (such as during lambing and calving in specific areas).
3. The annual monitoring report shall be submitted by April 1 of each year. This report shall include reclamation and restoration efforts, including seeding/revegetation, invasive plant treatment/control, and soil stabilization and erosion prevention. The report shall be in accordance and consistent with the BLM and/or RFO Reclamation Policy, RMP (ROD) and Appendix 36, and the field/project level EA/EIS, as applicable. The yearly Operator report would include surface disturbance and reclamation data for the previous calendar year, utilizing the BLM RFO Disturbance (As-Built) Reclamation

Database. The RFO surface disturbance and reclamation database, as well as information on the database and submission of the data, will be available at: http://www.blm.gov/wy/st/en/field_offices/Rawlins/oil_and_gas.html, or by contacting the RFO, Minerals and Lands, Supervisory Natural Resource Specialist/Physical Scientist at 307-328-4200 for further information.

4. Reclamation plans and procedures, including those for seeding/revegetation and weed control, shall be modified and revised as necessary in order to achieve desired results and requirements. .

5. Reclamation earthwork for interim and/or final reclamation shall be completed within six months of well completion or well plugging (weather permitting) and shall be consistent with the approved reclamation plan. Reclamation earthwork consists of:

   a. Backfilling pits,

   b. Re-contouring and stabilizing the well site, access road, cut/fill slopes, drainage channels, utility and pipeline corridors and all other disturbed areas, to approximately the original contour, shape, function and configuration that existed before construction (any compacted backfilling activities would ensure proper spoils placement, settling and stabilization,

   c. Surface ripping, prior to topsoil placement, to a depth of 18-24 inches deep on 18-24 inch centers to reduce compaction,

   d. Final grading and replacement of topsoil,

   e. Surface-roughening and other techniques such as snow fencing to increase soil moisture retention and reduce compaction. Surface soil material can be pitted or roughened (not exceeding the applied topsoil depth) such that the entire reclamation area shall be uniformly covered with depressions constructed perpendicular to the natural flow of water and/or prevailing wind, and

   f. Seeding.

6. Interim or final reclamation of all surface disturbed areas shall commence and be completed within one year of initial disturbance unless needed for well production operations, or otherwise approved by the AO. Interim reclamation for those areas not needed for production operations, including unnecessary access roads and pipeline right(s)-of-way, shall commence and be completed within six months of well completion. Stockpiled soils shall be distributed on disturbed areas and the production pad shall be as small as possible to allow for safe and prudent production operations. Some topsoil may be reserved for final reclamation.

7. Any topsoil to be stockpiled for longer than one year shall be spread in layers not to exceed two feet maximum thickness, including topsoil underneath the pile and appropriately identified/signed as topsoil. These soil stockpiles shall be seeded with a prescribed seed mixture or sterile cover crop (included within the approved reclamation plan) and covered with mulch to reduce erosion and discourage weed invasion.

8. Temporary fencing of the reclaimed well/facilities locations for the first two growing seasons after either interim or final seeding may be required to exclude livestock and wildlife and to help ensure better re-vegetation success.

9. Any subsequent re-disturbance of reclamation shall be reclaimed within six months by the same means described in the approved reclamation plan.

10. A Notice of Intent to Abandon (Form 3160-5) must be submitted and approved prior to any well abandonment activities. A joint inspection of the disturbed areas may be required and attended by the BLM and the Operator (or Operator's Designee), the primary purpose of which is to review and agree to the existing (or a new) abandonment and/or final reclamation plan. Earthwork must commence and be completed within six months from the date of plugging and abandonment and seeding no later than

the next immediate growing season upon the completion of earthwork. All reclamation should be accomplished as soon as possible after the disturbance occurs, with efforts continuing until a satisfactory revegetation cover is established and the site is stabilized (three to five years) (RMP ROD Appendix 13-8).

11. The Operator shall submit a Final Abandonment Notice (FAN), using Form 3160-5, to the AO when adequate reclamation of surface-disturbed areas has been completed. This FAN indicates that the Operator believes the location is considered ready for final inspection, with adequate vegetation cover and species diversity. Upon receipt of the FAN, the BLM will conduct a field inspection prior to releasing the bond liability for this location.
12. Re-vegetation shall consist of species occurring in the surrounding natural vegetation and/or included in the approved seed mix as deemed desirable by the BLM or private surface owner in review and approval of the reclamation plan. Inter-seeding, secondary seeding, or staggered seeding may be required to accomplish re-vegetation objectives. The seed mixture(s) shall be planted in the amounts specified in pounds of pure live seed (PLS)/acre. There shall be no primary or secondary noxious weed seed in the seed mixture. Seed should be tested and the viability testing of seed would be done in accordance with State law(s) and within nine months prior to purchase. Commercial seed would be either certified or registered seed. The seed mixture container would be tagged in accordance with State law(s) and available for inspection by the AO. Since seeds are of different sizes and require different planting depths, the Operator would use the appropriate equipment to ensure that the seed mixture is correctly and uniformly planted over the disturbed area. Seed would be broadcast if drilling is not possible. When broadcasting the seed, the pounds per acre are to be doubled. The seeding would be repeated until a satisfactory stand is established as determined by the AO
13. All practicable measures would be utilized to minimize erosion and stabilize disturbed soils on or adjacent to the disturbed and reclaimed area. There would be no evidence of mass-wasting, head-cutting, large rills, gullies, down cutting or overall slope instability. Should the use or storage of hay, straw, or mulch be necessary, the Operator is required to use certified weed-free hay, straw and mulch on the BLM lands.
14. Evaluation of growth and success shall be conducted as per RMP ROD (Appendix 36). If the treatment area is found, through Operator site-specific monitoring data, to be successfully reclaimed, Operator monitoring to confirm reclamation success shall continue for at least five growing seasons. The site shall also comply with additional management needs, including control of weed infestations. Success criteria as defined by the RMP is: criteria based on pre-disturbance surveys or surveys of adjacent undisturbed natural ground cover and species composition (which the Operator will do prior to disturbance) or eighty percent of pre-disturbance ground cover, ninety percent dominant species, no noxious weeds, and erosion features equal to or less than surrounding area.

DRILLING

No production from the wells drilled on this well pad location should start production UNTIL Sundry Notices granting variances from Onshore Orders 4 and 5 as related to commingling and allocations are approved.

The drilling operations for this well shall be conducted in accordance with the Onshore Oil and Gas Order No. 2 as provided for in 43 CFR 3164.1. This includes the well control equipment and its testing, the mud system and associated equipment, and the casing and cementing. Any deviation from this approved drill plan pursuant to these conditions of approval requires prior approval of the petroleum engineer of the Rawlins Field Office.

BOPE (Blowout Preventer and Related Equipment)

1. All BOPE shall meet or exceed the requirements of a 5M system as set forth in Onshore Oil and Gas Order No. 2.
2. All choke lines from the drilling spool forward, shall be straight steel lines flanged at both ends, unless turns use tee blocks or are targeted with running tees and shall be anchored to prevent whip and reduce vibration. All choke lines shall have the same pressure rating as the BOP stack and choke manifold. The diameter of this line shall be a minimum of 2 inches for a 2M BOP system and a minimum of 3 inches for a 3M and greater BOP system.
3. When an Operator chooses to use flexible lines for choke operations equipment they must:
   a. Make a request for approval in advance of its use. The request must provide documentation showing the flexible hose was design specifically for the purposes of choke operations.
   b. The request for approval must include the Manufacturer's technical specifications for the flexible hose(s) under consideration. Specifications must include as a minimum:
      1) The smallest internal diameter of any section or part of the flexible hose assembly.
      2) The rated working pressure and temperature of the flexible hose assembly.
      3) The Minimum Bend Radius (MBR) at rated working pressure.
   c. Manufacturer's technical specification must be kept on site and available for inspection at all times. Flexible hoses once approved and installed must match the original manufacturer's technical specifications regarding all stated dimensions and ratings. Flexible hoses which have been altered, repaired, or remanufactured in any way from their original specification without approval or certification from the original manufacturer will not be allowed. If **the specifications are not available on site or the hose does not match the specifications, operations may be shut down until correction is accomplished.**
   d. Each flexible hose must be marked/stamped by the manufacturer with the following information clearly legible and accessible on the steel sections of each end of the flexible hose (end fittings, couplers, flanges, stiffeners, etc.):
      1) Name or identification of the manufacturer.
      2) Serial number.
      3) The internal diameter of the flexible hose assembly.
      4) The rated working pressure of the flexible hose assembly.
   e. Flexible hoses must be firmly anchored to prevent excessive whip or vibration. Anchors must be constructed in a manner capable of withstanding whip and vibration given the rated working pressure and flow rates of the well control equipment.
      1) Anchors must be attached to the flexible portion of the hose and not to the "metal end assemblies" (e.g. hubs, flanges, stiffeners, etc.)
      2) Flexible hoses of twenty (20) feet or more in total length must be supported in order to keep the hose fairly level and secure from excessive movement. Leveling support locations must also be anchored adequately to withstand whip and vibration under rated working pressures and rated flowing conditions.
      3) Each and every bend in the flexible hoses exceeding 45' must be anchored.
   f. Use, operation, and maintenance of flexible hoses will comply fully with the manufacturer's specifications unless otherwise specified by the AO.
   g. Minimum diameters for choke lines will comply with the requirements of Onshore Order No. 2, III.A.2.a.

h. Flexible hose end connections will meet all minimum requirements of Onshore Order No. 2. For example 3M systems and above require "All BOPE connections subjected to well pressure shall be flanged, welded, or clamped".

i. Flexible hoses used in Hydrogen Sulfide (H2S) operations must provide proof the hose is approved by the manufacturer for use in this type of environment.

j. Flexible hoses which are deformed (kinks, flattened areas, dents, significant surface abrasions or wear, permanent bends, etc) from the manufacturer's design and operational specification will be replaced upon discovery.

k. It is the intent of the BLM in Wyoming to implement the Reaffirmed 2001 API publication (SPEC 16C) standard for Flexible choke hoses as a uniform requirement within the next three years. Operators during routine maintenance or replacement of these hoses may want to consider hoses which can meet the **API** (SPEC 16C) standard.

4. A Form 3160-5 (subsequent Report Sundry Notice) shall be submitted to the AO's representative within five (5) working days following the test reporting the test results. The results reported will be a copy of the third party BOP test report including time and pressure charts, accumulator tests, notes/results made while performing the test, and recordation of any repair of BOP equipment made.

Casing and Cementing

1. For all **5M** BOPE systems or greater, a pressure integrity test of each casing shoe shall be performed. The formation at the casing shoe shall be tested to a minimum of the mud weight equivalent anticipated to control the formation pressure to the next casing depth or at total depth of the well. This test shall be performed before drilling more than 20 feet of new hole.

2. Pea Gravel or other material shall not be used to fill up around the surface casing in the event cement fall back occurs.

3. A Form 3160-5 (Subsequent Report Sundry Notice), along with a copy of the service company's materials ticket and job log shall be submitted to this office within 5 working days following the running and cementing of all casing strings.

4. Any change in the casing and cement design will be approved by the AO prior to the running of the casing string and/or cementing.

5. No freshly hard-banded rough carbide pipe/collars will be rotated in the surface casing.

Mud Program

1. Drilling of the surface casing will occur with fresh water only.

2. If a temporary surface pipeline is used to transport drilling water, the pipeline shall be laid and removed when the ground surface is dry so as to minimize surface disturbance. No blading or other alteration of the ground surface shall be allowed.

Directional Drilling

1. Per 43 CFR 3160.0-9 and 3162.4-2 for all wells drilled directionally, as Operator, you will be required to file with the Well Completion Report, Form 3160-4, a Certified Directional Survey.

2. This Certified Directional Survey, required by 1) above, will include a Directional Survey Certification Form as certified by the directional contractor and the Operator Bottom Hole Location Certification Form **as** specified in the Wyoming Oil & Gas Conservation Commission (WOGCC) letter to All Wyoming Oil and Gas Operators dated October 15,2009, as may be amended from time to time.

3. The requirements for a complete Certified Directional Survey are the same **as** found in the attachment to WOGCC letter to All Wyoming Oil and Gas Operators dated October 15, 2009, as may be amended from time to time.

Other

1. In the event down hole operations threaten to or cause fluid levels in the reserve pit to encroach on the required 2-foot freeboard, immediate notification shall be provided to the AO with concurrent steps taken to minimize the introduction of additional fluids until alternative containment methods can be approved.
2. Rat and mouse holes (or any sub-grade excavations for drilling operations) shall be filled and compacted, with appropriate native materials, immediately upon release of the drilling rig from the location.
3. Any permanent plug placed in the well during drilling and/or completion operations must have **prior approval** of the AO.
4. As provided in NTL4A, gas produced from this well may not be vent**ed or flared beyond an** initial test period, 30 days or 50 MMcf, whichever first occurs, without approval of the AO.
5. Drill Stem Tests shall meet or exceed the requirements set forth in Onshore Oil and Gas Order No. 2.
6. All usable water, hydrocarbon and other mineral zones must be protected.
7. Pursuant to Onshore Oil and Gas Order No. 2.III.B.l **.e.** and the Rules and Regulations of the Wyoming Oil and Gas Conservation Commission (Chapter 3, Section 22.(a) (i)), the **Operator shall report all fresh water flows encountered while drilling to the AO (Petroleum Engineer) prior to the running the next string of casing. The** reported information shall include a) well name, number and location, b) the date the water flow was encountered, c) depth at which the water flow was encountered and d) estimated water flow rate into the well bore. The Operator shall file a Form 3 160-5 (Subsequent Report Sundry Notice) of this same information within 30 days of releasing the drilling rig.
8. Open hole logs consisting of deep, medium and shallow resistivity curves, a porosity log and gamma-ray and SP curves shall be run at TD to at least 50' above any zone which may be considered to be productive of hydrocarbons.
9. **Completion Report:** In accordance with 43 CFR 3160, Form 3160-4 (Well Completion or Recompletion Report and Log) must be submitted to the AO within 30 days after completion of the well or after completion of operations being performed, whether the well is completed as a dry hole or as a producer. Copies of all open hole and cased hole logs, core descriptions, core analyses, well test data, geologic summaries, sample descriptions, daily drilling reports, daily completion reports, formation test reports, stimulation reports, directional survey (if applicable), and all other surveys or data obtained and compiled during the drilling, completion, and/or work over operations, shall be included with Form 3160-4. **Copies of all logs, as noted above, shall be submitted to this office on a compact disc in a ".las" digital file format and shall have a precision readout increment of 0.5 feet. Any Mud Log copy submitted to this office shall be in a ".tif" format.**
10. **Well Abandonment:** In the event abandonment of the hole is desired, oral approval may be granted by the AO (Petroleum Engineer), but must be followed within 5 days with a Form 3160-5 **(Sundry Notice of Intent to Abandon)** which will give the complete plan of operation that will be utilized in the plugging. Unless the plugging is to take place immediately upon receipt of the oral approval, the AO (Petroleum Engineer) must be notified at least 24 hours in advance of the plugging of the well in order that this office can witness the plugging operation. Failure to obtain approval prior to commencement of abandonment operations shall result in immediate assessment under 43 CFR 3163.1 (b)(3). The following will occur if the well is abandoned:

a. In order to reduce the visual impact of the reclaimed well site, the casing shall be cut-off at the base of the cellar or 3 feet below the final restored ground level (whichever is deeper). The well bore shall then be covered with a metal plate at least 1/4 inch thick and welded in place. On the metal plate shall the following information be permanently inscribed: i) company/Operator name, ii) lease number, iii) well name/number, and iv) well location description to the nearest quarter-quarter section (40 acres).

b. A GPS re-verification and certification of the abandoned well location shall be made for coordinates of degrees latitude and longitude with accuracy to the sixth decimal place. This well location re-verification shall be noted on the Subsequent Report Sundry Notice of Abandonment.

c. A temporary steel fence post with an attached placard indicating the well name/number and location shall be placed adjacent to the well bore until final well site reclamation has been performed and the Final Abandonment Notice (FAN) is approved.

d. Within 30 days following completion of the well abandonment, you shall file with this office, subsequent Report of Abandonment (Form 3 160-5). To be included with this report is where the plugs were placed, volumes of cement used, well bore schematic as plugged, along with copies of all service company job log and service tickets.

The Operator shall promptly plug and abandon each newly completed, re-completed or producing well which is not capable of producing in paying quantities. No well may be temporarily abandoned for more than 30 days without prior approval of the AO. When justified by the Operator, the AO may authorize additional delays, no one of which may exceed an additional 12 months. Upon removal of drilling or producing equipment from the site of a well which is to be permanently abandoned, the surface of the lands disturbed shall be reclaimed in accordance with a plan first approved or prescribed by the AO or per the reclamation conditions of approval stated herein.

SITE-SPECIFIC

Additional COAs are usually included with the above to reflect requirements that apply to local conditions, such as seasonal wildlife restrictions, special surveys, specific constraints on road or well pad location or construction, and/or additional reclamation requirements.

RIGHT-OF-WAY TERMS AND CONDITIONS

In the process of acquiring permission to obtain a right-of-way, users submit a Form SF-299 to the BLM Field Office that manages the public lands where their proposed project is located. Included with the Form SF-299 are:

- a Plan of Development that contains a description of the proposed project (map, location, details of construction, and methods for containment and disposal of waste material), geologic data, expected hazards, and proposed mitigation measures to address such hazards; and
- a reclamation plan, which includes a weed management plan.

When the BLM has completed the necessary environmental and technical review of the proposal, the BLM may approve the right-of-way as submitted or, more typically, approve the right-of-way subject to terms and conditions (T&C) on a grant.

T&C are attached to an approved grant to ensure environmental protection, safety, and/or conservation of the mineral resource. They arise from a variety of controlling authorities such as Title V of the Federal Land Policy and Management Act of October 21, 1976 (FLPMA), Section 28 of the Mineral Leasing Act of 1920 (MLA), the National Environmental Policy Act (NEPA), the Endangered Species Act (ESA), and the National Historic Preservation Act (NHPA). The T&C attached to a grant can be general in nature or site-specific, and thus will vary from one BLM Field Office to another. Often the Field Office RMP provides either a listing of potential T&C or the BMPs that might guide development of site-specific T&C in that area. They can address topics as wide-ranging as protection of wildlife habitat or archeological and paleontological sites, noise reduction, wildfire suppression, or management of invasive species. Following is a master list of T&C that are used in the Rawlins Field Office when considering a right-of-way. The list is adapted as needed for site-specific use. Many of the items listed will not be used on a specific grant if not warranted. If, on the other hand, conditions call for requirements that are not on the list, BLM specialists can add new T&C. The list is presented in the standard format used for attachment to an approved grant.

1. Terms and Conditions:

    a. This grant or permit is issued subject to the holder's compliance with all applicable regulations contained in Title 43 Code of Federal Regulations parts 2800 and 2880.

    b. Upon grant termination by the AO, all improvements shall be removed from the public lands within 90 days, or otherwise disposed of as provided in paragraph (4)(d) or as directed by the AO.

    c. Each grant issued pursuant to the authority of paragraph (1)(a) for a term of 20 years or more shall, at a minimum, be reviewed by the AO at the end of the 20th year and at regular intervals thereafter not to exceed 10 years. Provided, however, that a right-of-way or permit granted herein may be reviewed at any time deemed necessary by the AO.

    d. The attached stipulations, plans, maps, or designs set forth in Exhibits A (Additional and Site Specific Terms & Conditions), B (Plan of Development), C (map) and D (Site Specific Reclamation Plan) are incorporated into and made a part of this grant instrument as fully and effectively as if they were set forth herein in their entirety.

    e. Failure of the holder to comply with applicable law or any provision of this right-of-way grant or permit shall constitute grounds for suspension or termination thereof.

    f. The holder shall perform all operations in a good and workmanlike manner so as to ensure protection of the environment and the health and safety of the public.

    g. The holder shall comply with all Federal, State, and local regulations whether or not specifically mentioned within this grant.

h. The holder shall construct, operate, and maintain the facilities, improvements, and structures within this right-of-way in strict conformity with the plan of development which was approved and made part of the grant. Any relocation, additional construction, or use that is not in accord with the approved plan of development, shall not be initiated without the prior written approval of the BLM authorized officer (AO). A copy of the complete right-of-way grant, including all stipulations and approved plan of development, shall be made available on the right-of-way area during construction, operation, and termination to the AO. Noncompliance with the above will be grounds for an immediate temporary suspension of activities if it constitutes a threat to public health and safety or the environment.

i. The holder of this right-of-way grant or the holder's successor in interest shall comply with Title VI of the Civil Rights Act of 1964 (42 U.S.C. 2000d et seq.) and the regulations of the Secretary of the Interior issued pursuant thereto.

j. The holder shall have, on-site, a qualified individual (not the dirt contractor) to serve as Compliance Coordinator. This individual will be responsible for assuring that all requirements of the Plan of Development and appropriate Additional Terms and Conditions are applied. The holder must provide the name of the Compliance Coordinator to the AO prior to any surface disturbance

k. The holder shall conduct all activities associated with the construction, operation, and termination of the right-of-way within the authorized limits of the right-of-way.

l. The holder shall inform the AO within 48 hours of any accidents on federal lands that require reporting to the Department of Transportation as required by 49 CFR Part 195.

m. The ROW holder agrees to indemnify the United States against any liability arising from the release of any hazardous substance or hazardous waste (as these terms are defined in the Comprehensive Environmental Response, Compensation and Liability Act of 1980, 42 U.S.C. 9601, et seq. or the Resource Conservation and Recovery Act of 1976, 42 U.S.C. 6901 et seq.) on the right-of-way (unless the release or threatened release is wholly unrelated to the right-of-way holder's activity on the right-of-way. This agreement applies without regard to whether a release is caused by the holder, its agent, or unrelated third parties.

n. The holder shall contact the AO at least 48 hours (two days) prior to the anticipated start of construction and/or any surface disturbing activities. This can be done by logging into: http://www.blm.gov/wy/st/en/field_offices/Rawlins/oil_and_gas.html. Then click on Right-of-Way Construction Notice and fill in the form and submit it. Or, you may call the authorized officer. The AO may require and schedule a preconstruction conference with the holder prior to the holder’s commencing construction and/or surface disturbing activities on the right-of-way. The holder and/or his representative shall attend this conference. The holder’s contractor, or agents involved with construction and/or any surface disturbing activities associated with the right-of-way, shall also attend this conference to review the stipulations of the grant including the plan of development.

o. The holder shall immediately notify the BLM AO of any paleontological resources discovered as a result of operations under this authorization. Appropriate measures to mitigate adverse effects to significant paleontological resources will be determined by the AO after consulting with project proponent. The project proponent is responsible for the cost of any investigation necessary for the evaluation and for any mitigation measures. The operator may not be required to suspend operations if activities can be adjusted to avoid further impacts to a discovered site or be continued elsewhere, however, the discovery shall be brought to the attention of the AO as soon as possible and protected from damage or looting. (modified from 43CFR3809.420(b)(8), and BLM IM 2009-011).

p. The holder shall protect all survey monuments found within the right-of-way. Survey monuments include, but are not limited to, General Land Office and Bureau of Land Management Cadastral Survey Corners, reference corners, witness points, U.S. Coastal and Geodetic benchmarks and triangulation stations, military control monuments, and recognizable civil (both public and private) survey monuments. In the event of obliteration or disturbance of any of the above, the holder shall immediately report the incident, in writing, to the authorized officer and the respective installing authority if known. Where General Land Office or Bureau of Land Management right-of-way monuments or references are obliterated during operations, the holder shall secure the services of a registered land surveyor or a Bureau cadastral surveyor to restore the disturbed monuments and references using surveying procedures found in the Manual of Surveying Instructions for the Survey of the Public Lands in the United States, latest edition. The holder shall record such survey in the appropriate county and send a copy to the authorized officer. If the Bureau cadastral surveyors or other Federal surveyors are used to restore the disturbed survey monument, the holder shall be responsible for the survey cost.

q. In the event that the public land underlying the right-of-way (ROW) encompassed in this grant, or a portion thereof, is conveyed out of Federal ownership and administration of the ROW or the land underlying the ROW is not being reserved to the United States in the patent/deed and/or the ROW is not within a ROW corridor being reserved to the United States in the patent/deed, the United States waives any right it has to administer the right-of-way, or portion thereof, within the conveyed land under Federal laws, statutes, and regulations, including the regulations at 43 CFR 2800 including any rights to have the holder apply to BLM for amendments, modifications, or assignments and for BLM to approve or recognize such amendments, modifications, or assignments. At the time of conveyance, the patentee/grantee, and their successors and assigns, shall succeed to the interests of the United States in all matters relating to the right-of-way, or portion thereof, within the conveyed land and shall be subject to applicable State and local government laws, statutes, and ordinances. After conveyance, any disputes concerning compliance with the use and the terms and conditions of the ROW shall be considered a civil matter between the patentee/grantee and the ROW Holder.

r. A litter policing program shall be implemented by the holder, and approved of in writing by the AO, which covers all roads and sites associated with the right-of-way.

s. Specific sites as identified by the AO (e.g., archaeological sites, areas with threatened and endangered species, or fragile watersheds) where construction equipment and vehicles shall not be allowed, shall be clearly marked onsite by the holder before any construction or surface disturbing activities begin. The holder shall be responsible for assuring that construction personnel are well trained to recognize these markers and understand the equipment movement restrictions involved.

t. The holder shall permit free and unrestricted public access to and upon the right-of-way for all lawful purposes except for those specific areas designated as restricted by the AO to protect the public, wildlife, livestock or facilities constructed within the right-of-way.

u. Emissions of particulate matter from well pad, road, and other facility construction, operation, and reclamation activities will be minimized by application of water or other dust suppressants. Dust inhibitors (surfacing materials, dust suppressants, and water) will be used as necessary on locations that present a fugitive dust problem. The use of chemical dust suppressants on public surface will require prior approval from the BLM AO.

v. The holder shall comply with the Hazardous Materials Management Plan/Summary in the RMP ROD (Appendix 32) and /or the appropriate EIS ROD, including requirements to transport, store, utilize, and dispose of hazardous substances. The holder shall maintain a hazardous substances

release contingency plan that shall include, among other things, provision to notify the BLM AO in the event of any release of hazardous substances associated with project operations.

w. The Operator shall be responsible for the prevention and suppression of fires on public lands caused by its employees, contractors, or its subcontractors. During conditions of extreme fire danger, surface use operations may be either limited or suspended in specific areas, or additional measures may be required by the AO. Should a fire occur, it shall be immediately reported to this office by calling 307-328-4200, and notifying the Fluid Minerals staff.

x. Noise reduction techniques and designs will be considered as a mitigation measure to help reduce impacts to wildlife. The operator shall demonstrate that all reasonable attempts have been made to reduce project related noise that may negatively impact wildlife and functionality of habitats. Noise reduction techniques and designs used by the operator will be evaluated periodically by the AO to determine effectiveness. If the AO determines that existing measures are not effective, he/she may at any time require new or additional measures and techniques to alleviate the adverse effects of noise on wildlife.

y. For the purpose of determining joint maintenance responsibilities, the holder shall make road use plans known to all other authorized users of the road. Holder shall provide the authorized officer, within 30 days from the date of the grant, with the names and addresses of all parties notified, dates of notification, and method of notification. Failure of the holder to share proportionate maintenance costs on the common use access road in dollars, equipment, materials, or manpower with other authorized users may be adequate grounds to terminate the right-of-way grant. The determination as to whether this has occurred and the decision to terminate shall rest with the authorized officer. Upon request, the authorized officer shall be provided with copies of any maintenance agreement entered into.

z. Prior to termination of the right-of-way, the holder shall contact the AO to arrange a pre-termination conference. This conference will be held to review the existing reclamation plan and termination provisions of the grant or agree to a new updated reclamation plan.

SITE-SPECIFIC TERMS AND CONDITIONS:

Wildlife Resources:

1. Surface disturbing and disruptive activities potentially disruptive to nesting raptors are prohibited from February 1 to July 15. (Golden eagle, barn owl, red-tailed hawk, great-horned owl, other raptors)
2. Surface disturbing and disruptive activities potentially disruptive to nesting raptors are prohibited April 1 to July 31. (Osprey, merlin, sharp-shinned hawk, kestrel, prairie falcon, northern harrier, Swainson's hawk, Cooper's hawk)
3. Surface disturbing and disruptive activities potentially disruptive to nesting raptors are prohibited April 1 to July 31. (Short-eared owl, long-eared owl, ferruginous hawk, peregrine falcon, screech owl)
4. Surface disturbing and disruptive activities potentially disruptive to nesting raptors are prohibited April 15 to September 15. (Burrowing owl)
5. Surface disturbing and disruptive activities potentially disruptive to nesting raptors are prohibited April 1 to August 31. (Goshawk)
6. Please note the above raptor stipulation(s) may differ from past raptor stipulations as a result of the signing of the Record of Decision for the new Rawlins Resource Management Plan on December 24, 2008.

7. Surface disturbing and disruptive activities potentially disruptive to Western yellow-billed cuckoos are prohibited within one-half mile of identified habitat from April 15 to August 15 for the protection of nesting Western yellow-billed cuckoos.
8. Surface disturbing and disruptive activities within big game crucial winter range are prohibited during the period of November 15 to April 30.
9. Surface disturbing activities or occupancy are prohibited on and within one-quarter mile of the perimeter of an occupied Greater Sage-Grouse or sharp-tailed grouse lek. Disruptive activities are prohibited between 6pm-9am, April 1-May20 on and within one-quarter mile of lek perimeter.
10. Surface disturbing and disruptive activities potentially disruptive to delineated Greater Sage-Grouse/sharp-tailed grouse winter concentration areas are prohibited during the period of November 15-April 14.
11. Avoid surface disturbing and disruptive activities, geophysical surveys, and organized recreational activities (events) that require a special use permit within 2 miles of the perimeter of an occupied Greater Sage-Grouse lek, within 1 mile of the perimeter of a sharp-tailed grouse lek, or in Greater Sage-Grouse and sharp-tailed grouse nesting and early brood rearing habitat from April 1 to July 15.
12. Surface disturbing and disruptive activities are prohibited during the period of May 1 to June 30 for the protection of elk calving areas.
13. Surface disturbing and disruptive activities located in potential mountain plover habitat are prohibited during the reproductive period of April 10 to July 10 for the protection of nesting plover. Additional protection measures may be applied if this area is later determined to be within occupied habitat.
14. The project is located within an area where mountain plover broods and/or adults have been found. Additional protection measures that will be applied are attached.
15. [add other wildlife stips – amphibian, etc.]
16. Any exceptions to this/these requirements must have prior written approval from the AO.
17. *Please be advised that due to limits on the available time of qualified personnel, the unpredictability of wildlife, and future weather conditions, requests for exceptions to impending wildlife stipulations will only be considered in the event of extraordinary and unavoidable occurrences over which the company has little or no control. Additionally, construction of the pipeline needs to be started in a time frame which would allow for reasonably normal completion prior to the beginning date of wildlife protection stipulations.
18. If any dead or injured threatened, endangered, proposed, or candidate animal species is located during construction or operation, the U.S. Fish and Wildlife Service's Wyoming Field Office (307-772-2374), their law enforcement office (307-261-6365), and the BLM Rawlins Field Office (307-328-4200) shall be notified within 24 hours. If any dead or injured sensitive species is located during construction or operation, the BLM Rawlins Field Office shall also be notified within 24 hours.
19. The holder and holder's sub-contracted personnel shall not intentionally harm or harass wild horses, other wildlife, or domestic livestock.

Cultural Resources:

1. All surface disturbances, including the pipeline trench, shall be monitored by a BLM permitted Archaeologist. An open trench inspection shall be completed by a BLM permitted archaeologist for the entire length of the pipeline.
2. Any cultural and/or paleontological resource (historic or prehistoric site or object) discovered by the holder, or any person working on his behalf, on public or Federal land shall be immediately reported to the AO. Holder shall suspend all operations in the immediate area of such discovery until written

authorization to proceed is issued by the AO. An evaluation of the discovery will be made by the AO to determine appropriate actions to prevent the loss of significant cultural or scientific values. The holder will be responsible for the cost of evaluation and any decision as to proper mitigation measures will be made by the AO after consulting with the holder.

Recreation:

Minimize conflicts between project vehicles and equipment and recreation traffic by posting appropriate warning signs and speed limits, conducting operator safety training, and requiring project vehicles to adhere to low speed limits, refrain from littering and drive only on approved project roads. Operators will inform their employees, contractors, and subcontractors that long term camping (greater than 14 days) on federal lands or at federal recreation sites is prohibited. Operators will direct their employees, contractors, and subcontractors to abide by state and federal laws and regulations regarding hunting and artifact collecting.

Weeds*:*

1. Weeds shall be controlled on project disturbed areas and native areas infested as a direct result of the project. The control methods shall be in accordance with the approved weed management plan (to be submitted by the Holder), and guidelines established by the EPA, BLM, state and local authorities. Prior to the use of pesticides, the holder will obtain written approval from the BLM Authorized Officer—Weed Coordinator (meaning an approved Pesticide Use Proposal form).
2. To further reduce the spread of invasive and noxious weeds following construction activities, inspections for noxious weeds will be conducted each year along with revegetation monitoring, during the first five years following construction. Thereafter, weed surveys would be conducted at least once every three years at appropriate times as directed by the AO, for the life of the project. Information from these surveys will be included in the annual report on reclamation status.

Hydrology:

1. No construction and/or reclamation shall block or change the natural course of any drainage, nor shall topsoil, waste, or fill material be deposited below high water lines in riparian areas, flood plains, or in natural drainage ways. The lower edge of soil or other material stockpiles will be located outside active floodplains. All topsoil piles will be placed where they can be retrieved without creating additional surface disturbance and where they do not impede and/or contribute sediment to watershed and drainage flows. The Operator shall also reconstruct and stabilize stream channels, drainages, and ephemeral draws to exhibit similar hydrologic characteristics that were found in stable, naturally occurring and functioning systems.
2. The holder shall construct waterbars on disturbed slopes as needed and/or prescribed by BLM hydrologist or engineer. Waterbars are to be constructed to: (1) simulate the imaginary contour lines of the slope (ideally with a grade of one or two percent); (2) drain away from the disturbed area; and (3) begin and end in vegetation or rock whenever possible.

Construction:

1. All design, material, and construction, operation, maintenance, and termination practices shall be in accordance with safe and proven engineering practices.
2. The holder shall provide for the safety of the public entering the right-of-way. This includes, but is not limited to barricades for open trenches, flagmen/women with communication systems for single-lane roads without intervisible turnouts, and attended gates for blasting operations.
3. The holder shall survey and clearly mark the centerline and/or exterior limits of the right-of-way.
4. Construction sites shall be maintained in a sanitary condition at all times; waste materials at those sites shall be disposed of promptly at an appropriate waste disposal site. "Waste" means all discarded

matter including, but not limited to, human waste, trash, garbage, refuse, oil drums, petroleum products, ashes, and equipment.

5. Construction over and/or immediately adjacent to existing pipelines shall be coordinated, and in accordance with, the relevant pipeline companies' policy.
6. No construction or routine maintenance activities shall be performed during periods when the soil is too wet to adequately support construction equipment. If such equipment creates ruts in excess of **four (4)** inches deep, the soil shall be deemed too wet to adequately support construction equipment.
7. Construction-related traffic shall be restricted to routes approved by the AO. New access roads or cross-country vehicle travel will not be permitted unless prior written approval is given by the AO. Authorized roads used by the holder shall be rehabilitated or maintained when construction activities are complete as approved by the AO.
8. Existing roads and trails on public lands that are blocked as the result of the construction project shall be rerouted or rebuilt as directed by the AO.
9. Fences, gates, and brace panels shall be reconstructed to appropriate Bureau standards and/or specifications as determined by the AO.
10. When construction activity in connection with the right-of-way breaks or destroys a natural barrier used for livestock control, the gap, thus opened, shall be fenced to prevent the drift of livestock. The subject natural barrier shall be identified by the AO and fenced by the holder as per instruction of the AO.
11. Accumulated snow present on the ground at the outset of construction, maintenance, or reclamation activities shall be removed before the soil is disturbed and piled downhill from the disturbed area. Equipment used for any non-construction snow removal operations will be equipped with 6" shoes to ensure blades do not remove topsoil or vegetation and written approval must be obtained before snow removal related to a federal action but outside of designated areas is undertaken. When blading/removing snow, drifts/berms shall be constructed with a gap of 35 yards every ¼ mile, to allow unobstructed movement of wildlife, livestock and human activities.
12. In accordance with the RMP, construction and other surface disturbing activities will be prohibited with frozen material unless the holder receives an approved exception. When there is a potential for frozen material, the holder is required to request in writing an exception to this limitation. This exception may be approved in writing by the Authorized Officer.
13. Prior to fill construction, the existing surface shall be sloped to avoid sharp banks and allow equipment operations. No fills shall be made with frozen or water saturated soils. Construction equipment shall be routed evenly over the entire width of the fill to obtain a thorough compaction.
14. Construction holes left open overnight shall be covered. Covers shall be secured in place and shall be strong enough to prevent livestock or wildlife from falling through and into a hole.
15. Holder shall limit excavation to the areas of construction. No borrow areas for fill material will be permitted on the site. All off-site borrow areas must be approved in writing by the AO in advance of excavation. All waste material resulting from construction or use of the site by holder shall be removed from the site. All waste disposal sites on public land must be approved in writing by the AO in advance of use.
16. Remove, and clearly segregate from all other spoil, all available topsoil from constructed locations, including areas of cut and fill, and stockpile at the site for use in reclamation on all other areas of surface disturbance (roads, pipelines, etc.).
17. Drainage and run-on/runoff shall be diverted away from all new construction naturally or through the use of diversion ditches/berms and or soil berms or stockpiles. All drainage structures shall

approximate topographic contour lines, have a grade no greater than 0.5 - 1 percent, and shall release water onto natural undisturbed ground without causing additional and/or accelerated erosion. Drainage structures shall not discharge directly into/onto natural drainages/channels, and/or use riprap or other armoring to protect from erosion (BLM Manual 9113). Water-bars, waddles, hay bales, and/or silt fences shall be used as needed to reduce surface runoff velocity and promote upland sediment deposition, thus reducing drainage/channel sedimentation and erosion.

18. The holder shall recontour disturbed areas, or designated sections of the right-of-way, by grading to restore the site to approximately the original contour of the ground as determined by the AO.

Operations:

1. Except rights-of-way expressly authorizing a road after construction of the facility is completed, the holder shall not use the right-of-way as a road for purposes other than routine maintenance as determined necessary by the AO in consultation with the holder.
2. The holder shall meet Federal, State, and local emission standards for air quality.
3. Holder shall maintain the right-of-way in a safe, usable condition, as directed by the AO.
4. The holder must be prepared to provide BLM copies of applications for and approved federal, state, and local operating permits.

Reclamation:

1. The annual monitoring report will be submitted to the BLM Reclamation Specialist by April 1 of each year. This report shall include reclamation and restoration efforts, including seeding/re-vegetation, invasive plant treatment/control, and soil stabilization and erosion prevention. The report shall be in accordance and consistent with the BLM and Wyoming Reclamation Policy, RMP (ROD) and Appendix 36, and the Continental Divide-Creston EIS. The yearly operator report would include surface disturbance and reclamation data for the previous calendar year, utilizing the BLM RFO Disturbance (As-Built) Reclamation Database. The RFO surface disturbance and reclamation database, as well as information on the database and submission of the data, will be available at: http://www.blm.gov/wy/st/en/field_offices/Rawlins/oil_and_gas.html or by contacting the RFO, Minerals and Lands, Supervisory Realty Specialist at 307-328-4200 for further information.
2. Reclamation earthwork for final reclamation would be completed within six months of project completion (weather permitting) or project re-disturbance, and would be consistent with the approved reclamation plan.

   Reclamation earthwork may include, but not be limited to:

   a. Re-contouring and stabilizing the well site, access road, cut/fill slopes, drainage channels, utility and pipeline corridors, and all other disturbed areas, to approximately the original contour, shape, function, and configuration that existed before construction (any compacted backfilling activities would ensure proper spoils placement, settling, and stabilization.
   b. Final grading and replacement of topsoil.
3. All practicable measures would be utilized to minimize erosion and stabilize disturbed soils on or adjacent to the disturbed and reclaimed area. There would be no evidence of mass-wasting, head-cutting, large rills, gullies, down cutting or overall slope instability. Should the use or storage of hay, straw, or mulch be necessary, the holder is required to use certified weed-free hay, straw, and mulch on the BLM lands.
4. The holder shall restore drainages, to the greatest extent possible, to the original bank configuration, stream bottom width, and channel gradient. Loose soil, fill, and culverts shall be removed from drainage channels as directed by the AO.

5. Revegetation would consist of species occurring in the surrounding natural vegetation and/or included in the approved seed mix, as approved by the BLM. Inter-seeding, secondary seeding, or staggered seeding may be required to accomplish re-vegetation objectives. The seed mixture(s) would be planted in the amounts specified in pounds of pure live seed (PLS)/acre. There would be no primary or secondary noxious weed seed in the seed mixture. Seed would be tested and the viability testing of seed would be done in accordance with State law(s) and within nine months prior to purchase. Commercial seed would be either certified or registered seed. The seed mixture container would be tagged in accordance with State law(s) and available for inspection by the AO. Seed would be broadcast if drilling is not possible. When broadcasting the seed, the pounds per acre are to be doubled. The seeding would be repeated until a satisfactory stand is established as determined by the AO.

Bonding:

The holder shall furnish a report to the BLM AO estimating all costs for the BLM to fulfill the terms and conditions of the grant in the event the holder was not able to do so. This estimate shall be prepared by an independent State certified engineer, and shall include such information including, but not limited to, Davis-Bacon wages potentially incurred by the BLM. The report shall detail the estimated costs and shall be accompanied by the engineer's seal if appropriate. All costs of preparing and submitting this report shall be borne solely by the holder. This report, along with BLM administration costs and inflationary estimates, shall be the basis of a performance bond after review and approval by the BLM, and shall remain in effect until such time the AO determines that conditions warrant a review of the bond. The AO may require the holder to submit a new estimate at any time during the term of the ROW. The performance bond, in a form acceptable to the AO, shall be furnished by the holder prior to any surface disturbing activities. The amount of the bond may be periodically adjusted by the AO when, in his/her sole determination, conditions warrant such a change. Should the bond furnished under the authorization become unsatisfactory to the AO, the holder shall within 45 days of demand, furnish a new bond satisfactory to the AO.

Terms and Conditions Attached to Pipeline Grant:

1. Plugs or embankments providing wildlife with access out of and across open pipeline trenches shall be installed, at minimum, every 1320 feet along open pipeline trenches.
2. The holder shall design and construct adequate water-control structures in each drainage crossing to prevent excessive erosion along the pipeline and protect the pipeline from the natural erosion process within the drainage.
3. No surface disturbing activities shall take place on the subject right-of-way until the associated APD is approved. The holder will adhere to special stipulations in the Surface Use Plan of the approved APD, relevant to any right-of-way facilities.
4. Prior to any discharge, hydrostatic testing water will be tested and processed, if necessary, to ensure that the water meets local, State or Federal water quality standards. Prior to discharge of hydrostatic testing water from the pipeline, the holder shall design and install a suitable energy dissipater at the outlets, and design and install suitable channel protection structures necessary to ensure that there will be no erosion or scouring of natural channels within the affected watershed as a result of such discharge. The holder will be held responsible for any erosion or scouring resulting from such discharge. Sandbags, rock, or other materials or objects installed shall be removed from the site upon completion of hydrostatic testing.
5. If during any phase of the construction, operation, or termination of the pipeline or related facilities any oil or other pollutant should be discharged from the pipeline system, or from containers or vehicles impacting Federal lands, the control and total removal, disposal, and cleanup of such oil or other pollutant, wherever found, shall be the responsibility of the holder, regardless of fault. Upon

failure of holder to control, cleanup, or dispose of such discharge on or affecting Federal lands, or to repair all damages to Federal lands resulting there from, the AO may take such measures deemed necessary to control, clean up the discharge, and restore the area, including, where appropriate, the aquatic environment and fish and wildlife habitats, at the full expense of the holder. Such action by the AO shall not relieve the holder of any liability or responsibility.

6. The holder is prohibited from discharging oil or other pollutants into or upon the navigable waters of the United States, adjoining shorelines, or the waters of the contiguous zone in violation of Section 311 of the Clean Water Act as amended, 33 U.S.C. 1321, and the regulations issued there under, or applicable laws of the State(s) of Wyoming and regulations issued there under. Holder shall give immediate notice of any such discharge to the AO and such other Federal and State officials as are required by law to be given such notice.
7. All above-ground structures not subject to safety requirements shall be painted by the holder to blend with the natural color of the landscape. The paint used shall be a color which simulates "Standard Environmental Colors" designated by the Rocky Mountain Five-State Interagency Committee. The color selected for this pipeline is Covert Green (Pantone 18-0617 TPX).
8. All cathodic protection facilities shall have approval from the Department of Environmental Quality (DEQ) UIC Division and have an approved Class V, Type 5F1 permit.

Terms and Conditions Attached to Road Grant:

1. All access roads and drainage control structures, whether existing or newly-constructed, shall be both constructed to resource road standards and regularly maintained in a safe and usable condition as outlined in BLM Manual, Section 9113. A regular maintenance program may include, but is not limited to, blading, ditching, culvert installation, dust control, and gravel surfacing or other activities as specified by the AO. The Lessee and/or Operator shall enter into a maintenance agreement with all other "authorized users" of the common access road(s). The costs of road maintenance in dollars, equipment, materials, labor, and other related expenses shall be shared proportionally among the "authorized users." Upon request, the AO shall be provided copies of any maintenance agreement or agreements.
2. Prior to construction, road(s) shall be surveyed and staked with construction control stakes set continuously along the centerline at maximum 100-foot intervals (less where needed to be inter-visible) and at all tangent and curve control points, fence or utility crossings, and culverts. In addition to centerline stakes, slope stakes shall be placed at the top of the cut and the bottom of the fill for those portions of the road that are engineered.
3. Before proposed road construction activities begin, the topsoil must be bladed to the side of the road and stockpiled. The topsoil stockpile shall be contoured so as to prevent water ponding or flow concentration. Once the borrow ditch and the cut slopes are constructed, cleared vegetative material and topsoil that is windrowed shall be spread back onto the cut/fill slopes of the road, removing any windrows or berms remaining at the edge of the road.
4. The minimum travel-way width of the immediate access road will be 14 feet with turnouts at least 10 feet in width. No structure will be allowed to narrow the road top. The inside slope will be 4:1. The bottom of the ditch will be a smooth V with no vertical cut in the bottom. The outside slope will be 2:1 or flatter. After the road is crowned and ditched with a .03 - .05 ft/ft crown the topsoil and windrowed vegetative material shall be pulled back down on the cut slope so there is no berm left at the top of the cut slope. Turnouts will be spaced at a maximum distance of 1000 feet and will be intervisible. If the access road crosses a floodplain, the ditch shall be flat-bottomed so as to provide material to raise the road, unless otherwise approved by the AO.

5. If snow removal from the road is undertaken, equipment used for snow removal operations shall be equipped with shoes to keep the blade six-inches off the road surface. Holder shall take special precautions where the surface of the ground is uneven and at drainage crossings to ensure that equipment blades do not destroy vegetation.
6. Low water crossings shall be constructed perpendicular to the channel and at original channel elevation in a manner that will not block or restrict existing channel flow. Excavated material shall be stockpiled for use in reclamation of the crossings.
7. All roads and public areas shall be constructed to provide drainage and minimize erosion. Culverts shall be installed if necessary to maintain drainage.
8. All cattle guards will be designed and maintained consistent with BLM standards and shall be a minimum of 16 feet wide and 8 feet long; set on either timber, pre-cast concrete, or cast-in-place concrete bases at right angles to the roadway; have an adjacent 16 foot wide bypass gate; not narrow the road surface; and have fence and end panels on either side constructed using 3 posts with braces.
9. All culverts shall be a minimum of 18 inches in diameter. Culverts shall have a minimum of 12" of fill or 1/2 the pipe diameter, whichever is greater, placed on top of the culvert, and shall be of length sufficient to allow at least 12” of culvert to extend beyond the toe of any slope. The inlet and outlet shall be set on grade. No rocks shall be used in the bed material and no rocks greater than 2" in diameter will be immediately adjacent to the culvert. The entire length of pipe shall be bedded on native material before backfilling, which shall be completed using unfrozen material and rocks no larger than two inches in diameter; compact the backfill evenly in 6" lifts on both sides of the culvert. A permanent marker shall be installed at both ends of the culvert to help prevent traffic from damaging the culvert. Additional culverts will be placed in the new access road as the need arises or as directed by the AO.
10. Wing-ditches shall be staked and constructed at a slope of .5 to 1.0 percent down slope unless otherwise approved by the AO. In no case shall wing-ditches discharge adjacent to a channel bank.
11. All drainage ditches and culverts shall be kept clear and free-flowing, and shall also be maintained in accordance with the original construction standards.

GREATER SAGE-GROUSE REQUIRED DESIGN FEATURES

(From the Wyoming Approved Resource Management Plan for Greater Sage-Grouse, Appendix D)

INTRODUCTION

The following conservation measures have typically been referred to as Best Management Practices (BMPs) or recommended management practices. These conservation measures are treated in the Resource Management Plan (RMP) as required design features (RDFs) to ensure regulatory certainty and the conservation of Greater Sage-Grouse. The source of these conservation measures is Washington Office Instruction Memorandum No. 2012-044, (12/27/2011) BLM National Greater Sage-Grouse Land Use Planning Strategy (IM No. WO-2012-044).

RDFs are required for certain activities in Greater Sage-Grouse habitat. RDFs establish the minimum specifications for certain activities to help mitigate adverse impacts. However, the applicability and overall effectiveness of each RDF cannot be fully assessed until the project level when the project location and design are known. Because of site-specific circumstances, some RDFs may not apply to some projects (e.g., a resource is not present on a given site) and/or may require slight variations (e.g., a larger or smaller protective area). All variations in RDFs would require that at least one of the following be demonstrated in the National Environmental Policy Act of 1969 (NEPA) analysis associated with the project/activity:

- A specific RDF is documented to not be applicable to the site-specific conditions of the project/activity (e.g., due to site limitations or engineering considerations). Economic considerations, such as increased costs, do not necessarily require that an RDF be varied or rendered inapplicable.
- An alternative RDF, a state-implemented conservation measure, or plan-level protection is determined to provide equal or better protection for Greater Sage-Grouse or its habitat. A specific RDF provides no additional protection to Greater Sage-Grouse or its habitat.
- Through the coal planning process it will be determined if areas are suitable for further coal leasing consideration. Sage-grouse will be protected from leasing using the coal screening process (unsuitability criteria #15 or multiple use conflict analysis [screen 3]). The coal planning process (see 43 CFR 3420.1-4 and 43 CFR 3461) will identify areas where coal leasing is not suitable or acceptable and those areas will be removed from further consideration for coal leasing and development (i.e., they will not be leased, so no development and no further protection needed).

Mines (particularly large surface coal mines) do not have the flexibility to move operations, so it is assumed that if a lease is ultimately offered, sold, and issued, the federal coal lessee can use the entire coal lease for mining operations once they receive their federal permit. The following measures would be applied as RDFs for all solid minerals. The measures would also apply to locatable minerals subject to valid existing rights and consistent with applicable law.

PRIORITY HABITAT MANAGEMENT AREAS

The RDFs described here are to be applied to activities in the following BLM program areas: lands and realty, range management, fluid minerals, coal exploration, wild horses, travel management, wildfire and fuels management, noise, and West Nile virus. RDFs/BMPs are continuously improving as new science and technology become available and therefore are subject to change. Include from the following RDFs/BMPs those that are appropriate to mitigate effects from the approved action.

1. Evaluate and take advantage of opportunities to remove or modify existing power lines within priority sage- grouse habitat areas. When possible, require perch deterrents on existing or new overhead facilities. Encourage installation of perch deterrents on existing facilities.
2. Where existing leases or rights-of-way (ROW) have had some level of development (road, fence, well, etc.) and are no longer in use, reclaim the site by removing these features and restoring the habitat.
3. Locate man camps outside priority sage-grouse habitats.
4. Work cooperatively with permittees, lessees, and other landowners to develop grazing management strategies that integrate both public and private lands into single management units.
5. Coordinate RDFs/BMPs and vegetative objectives with the Natural Resources Conservation Service (NRCS) for consistent application across jurisdictions where the BLM and NRCS have the greatest opportunities to benefit GRSG, particularly as it applies to the NRCS's National Sage-Grouse Initiative (http://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/national/programs/farmbill/initiatives/andcid=steldevb1027671).
6. Evaluate the role of existing seedings that are currently composed of primarily introduced perennial grasses in and adjacent to priority sage-grouse habitats to determine if they should be restored to sagebrush or habitat of higher quality for sage-grouse. If these seedings are part of an Allotment Management Plan/Conservation Plan, or if they provide value in conserving or enhancing the rest of the priority habitats, then no restoration would be necessary. Assess the compatibility of these seedings for sage-grouse habitat or as a component of a grazing system during land health assessments (Davies et al. 2011). For example, some introduced grass seedings are an integral part of a livestock management plan and reduce grazing pressure in important sagebrush habitats, or serve as a strategic fuels management area.
7. Where the federal government owns the surface, and the mineral estate is in non-federal ownership, apply appropriate BMPs to surface development.

<u>Roads:</u>

1. Design roads to an appropriate standard no higher than necessary to accommodate their intended purpose.
2. Locate roads to avoid important areas and habitats.
3. Coordinate road construction and use among federal fluid mineral lessees and ROW or special use authorization (SUA) holders.
4. Construct road crossings of ephemeral, intermittent, and perennial streams to minimize impacts to the riparian habitat, such as by crossing at right angles to ephemeral drainages and stream crossings.
5. Establish slow speed limits on BLM-administered roads or design roads for slower vehicle speeds to reduce sage-grouse mortality.
6. Establish trip restrictions (Lyon and Anderson 2003) or minimization through use of telemetry and remote well control (e.g., Supervisory Control and Data Acquisition).

7. Do not issue ROWs or SUAs to counties on energy development roads, unless for a temporary use consistent with all other terms and conditions including this document.
8. Designate all newly constructed routes for authorized use only (using signage, gates, etc.).
9. Apply dust abatement on roads, well pads, and other surface disturbances.
10. Close and rehabilitate duplicate roads by restoring original landform and establishing desirable habitat conditions.

Operations:

1. Conduct reclamation on unused roads as soon as possible using appropriate sage-grouse seed mixes.
2. Reclaim the permitted ROWs used in the construction of the running surface immediately.
3. Site and/or minimize linear ROWs or SUAs to reduce disturbance and fragmentation of sagebrush habitats.
4. Place new utility developments (power lines, pipelines, etc.) and transportation routes in existing utility or transportation corridors.
5. Bury distribution power lines to the extent technically feasible.
6. Cover all fluid-containing pits and open tanks with netting (maximum 1.5-inch mesh size) regardless of size to reduce sage-grouse mortality.
7. Equip tanks and other above-ground facilities with structures or devices that discourage nesting and perching of raptors and corvids.
8. Control the spread and effects of invasive non-native plant species (Evangelista et al. 2011), including treating weeds prior to surface disturbance and washing vehicles and equipment at designated wash stations when constructing in areas with weed infestations.
9. Require sage-grouse-safe fences (Christiansen, T. 2009; Stevens, B.S. 2011).
10. Clean up refuse (Bui et al. 2010).
11. Eliminate sumps; if the sump is absolutely necessary, then construct sage-grouse-safe fences around the sump. (Christiansen, T. 2009; Stevens, B.S. 2011).
12. Cluster disturbances, operations (hydraulic fracture stimulation, liquids gathering, etc.), and facilities. If the geology is exploratory and there is the potential that subsequent wells may not be drilled, do not disturb additional habitat until geology has proven additional wells can go on the pad and it is necessary to do so.
13. Use directional and horizontal drilling to the extent feasible as a means to reduce surface disturbance in relation to the number of wells.
14. Place infrastructure in already disturbed locations where the habitat has not been fully restored.
15. Apply a phased development approach with concurrent reclamation.
16. Place liquid gathering facilities outside priority areas. To reduce truck traffic and perching and nesting sites for ravens and raptors, do not place tanks at well locations within priority habitat areas.
17. Pipelines must be under or immediately adjacent to the road (Bui et al. 2010).
18. Use remote monitoring techniques for production facilities and develop a plan to reduce the frequency of vehicle use (Lyon and Anderson 2003).

19. Restrict the construction of tall facilities, distribution power lines, and fences to the minimum number and amount needed.
20. Design or site permanent structures to minimize impacts to sage-grouse, with emphasis on locating and operating facilities that create movement (e.g., pump jacks) or attract frequent human use and vehicular traffic (e.g., fluid storage tanks) in a manner that will minimize disturbance of sage-grouse or interference with habitat use.
21. Use only closed-loop systems for drilling operations, with no reserve pits.
22. Consider using oak (or other material) mats for drilling activities where topography permits to reduce vegetation disturbance and for temporary roads between closely spaced wells to reduce soil compaction and maintain soil structure to increase likelihood of vegetation reestablishment following drilling.

West Nile Virus:

1. Artificial water impoundments will be managed for the prevention and/or spread of West Nile virus where the virus poses a threat to sage-grouse. This may include but is not limited to: (a) the use of larvicides and adulticides to treat waterbodies; (b) overbuilding ponds to create non-vegetated, muddy shorelines; (c) building steep shorelines to reduce shallow water and emergent aquatic vegetation; (d) maintaining the water level below rooted vegetation; (e) avoiding flooding terrestrial vegetation in flat terrain or low-lying areas; (f) constructing dams or impoundments that restrict seepage or overflow; (g) lining the channel where discharge water flows into the pond with crushed rock, or use a horizontal pipe to discharge inflow directly into existing open water; (h) lining the overflow spillway with crushed rock and construct the spillway with steep sides to preclude the accumulation of shallow water and vegetation; and (i) restricting access of ponds to livestock and wildlife (Doherty 2007). This does not apply to naturally occurring waters.
2. Field offices should consider alternative means to manage produced waters that could present additional vectors for West Nile virus. Such remedies may include re-injection under an approved Underground Injection Control permit, transfer to single/centralized facility, etc.
3. Water impoundments will be managed to prevent the spread of West Nile virus where analysis shows the virus poses a threat to sage-grouse and in consideration of potential negative impact to other species of concern.
4. Restrict pit and impoundment construction to reduce or eliminate threats from West Nile virus (Doherty 2007).

Noise:

1. Limit noise to less than 10 decibels above ambient measures (20-24 dBA) at sunrise at the perimeter of a lek during active lek season (Patricelli et al. 2010, Blickley et al. 2012).
2. Require noise shields when drilling during the lek, nesting, brood-rearing, or wintering season.
3. Locate new compressor stations outside priority habitats and design them to reduce noise that may be directed towards priority habitat.

Reclamation:

1. Include objectives for ensuring habitat restoration to meet sage-grouse habitat needs in reclamation practices/sites (Pyke 2011). Address post-reclamation management in reclamation plan such that goals and objectives are to protect and improve sage-grouse habitat needs.

2. Maximize the area of interim reclamation on long-term access roads and well pads, including reshaping, topsoiling, and revegetating cut-and-fill slopes where practicable; material used for irrigation must be removed thereafter.
3. Restore disturbed areas at final reclamation to the pre-disturbance landforms and desired plant community. Implement irrigation during interim or final reclamation for sites where establishment of seedlings has been shown or is expected to be difficult due to dry conditions.
4. Use mulching, soil amendments, and/or erosion blankets to expedite reclamation and to protect soils.
5. Identify and work with partners to increase native seed availability and work with plant material centers to develop new plant materials, especially the forbs needed to restore sage-grouse habitat.
6. Consider potential changes in climate (Miller at al. 2011) when proposing seedings using native plants. Consider seed collections from the warmer component within a species' current range for selection of native seed (Kramer and Havens 2009).
7. Use Ecological Site Descriptions (ESD) or other protocols (e.g., Terrestrial Ecological Unit Inventory or Lands System Inventory) to identify the understory species and sagebrush subspecies needed to restore desirable habitat conditions.

Vegetation Treatments/Fire and Fuels Management:

1. During vegetation management project design, consider the utility of using livestock to strategically reduce fine fuels (Diamond et al. 2009), and implement grazing management that will accomplish this objective (Davies et al. 2011, Launchbaugh et al. 2007). Consult with ecologists to minimize impacts to native perennial grasses.
2. Provide planning vegetation treatments information to personnel on sage-grouse biology, habitat requirements, and identification of areas utilized locally.
3. Use vegetation treatment prescriptions that minimize undesirable effects on vegetation or soils (e.g., minimize mortality of desirable plant species and reduce risk of hydrophobicity).
4. Ensure that treatments are configured in a manner (e.g., strips) that promotes use by sage-grouse (See Connelly et al. 2000).
5. Design vegetation treatments in areas of high fire frequency which facilitate firefighter safety, reduce the potential acres burned and the fire risk to sage-grouse habitat. Additionally, develop maps for sage-grouse habitat which spatially display existing fuels treatments that can be used to assist suppression activities.
6. Restore prior perennial grass/shrub plant communities infested with invasive species to a species composition characterized by perennial grasses, forbs, and shrubs as outlined in ESDs.
7. Emphasize the use of native plant species, recognizing that non-native species may be necessary depending on the availability of native seed and prevailing site conditions.
8. Reduce the risk of vehicle or human-caused wildfires and the spread of invasive species into sage-grouse habitats. This could be minimized by planting perennial vegetation (e.g., green-strips) paralleling road ROWs. (This RDF could be applied to BLM linear ROW authorizations.)
9. Strategically place and maintain pre-treated strips/areas (e.g., mowing, herbicide application, and strictly managed grazed strips) to aid in controlling wildfire, should wildfire occur near key habitats or important restoration areas (such as where investments in restoration have already been made).
10. As appropriate, utilize existing fuel breaks, such as roads or discrete changes in fuel type, as control lines to minimize fire spread.

11. Design vegetation treatments in sage-grouse habitats to strategically reduce wildfire threats in the greatest area. This may involve spatially arranging new vegetation treatments with past treatments, vegetation with fire- resistant serial stages, natural barriers, and roads in order to constrain fire spread and growth. This may require vegetation treatments to be implemented in a more linear versus block design (Launchbaugh et al. 2007).
12. Design post-Emergency Stabilization and Rehabilitation (ES&R) and Burn Area Emergency Rehabilitation (BAER) management to ensure long-term persistence of seeded or pre-burn native plants. This may require temporary or long-term changes in livestock grazing, wild horses, travel management, etc., to achieve and maintain the desired condition of ES&R and BAER projects to benefit sage-grouse (Eiswerth and Shonkwiler 2006). Include sage-grouse habitat parameters as defined by Connelly et al. (2000), Hagen et al. (2007) or if available, state sage-grouse conservation plans and appropriate local information in habitat restoration objectives. Maintain these objectives, within priority sage-grouse habitat areas, as a high restoration priority.
13. Make reestablishment of sagebrush and desirable understory plant cover (relative to ecological site potential) a high priority for restoration efforts. Write specific vegetation objectives to reestablish sagebrush cover and desirable understory cover.
14. Where applicable, design fuels treatment objective to protect existing sagebrush ecosystems, modify fire behavior, restore native plants, and create landscape patterns which most benefit sage-grouse habitat.
15. Provide training to fuels treatment personnel on sage-grouse biology, habitat requirements, and identification of areas utilized locally.
16. Use burning prescriptions which minimize undesirable effects on vegetation or soils (e.g., minimize mortality of desirable perennial plant species and reduce risk of annual grass invasion).
17. Ensure proposed sagebrush treatments are planned with full interdisciplinary input from the BLM (pursuant to NEPA) and coordination with state fish and wildlife agencies, and that treatment acreage is conservative in the context of surrounding sage-grouse seasonal habitats and landscape.
18. Power-wash all vehicles and equipment involved in vegetation treatment and fuels management activities prior to entering the area to minimize the introduction of undesirable and/or invasive plant species.
19. Give priority for implementing specific sage-grouse habitat restoration projects in annual grasslands, first to sites which are adjacent to or surrounded by priority/core habitat or that reestablish continuity between priority habitats. Annual grasslands are a second priority for restoration when the sites are not adjacent to priority/core habitat but within two miles of priority/core habitat. The third priority for annual grassland habitat restoration projects is sites beyond two miles of priority/core habitat. The intent is to focus restoration outward from existing, intact habitat.
20. As funding and logistics permit, restore annual grasslands to a species composition characterized by perennial grasses, forbs, and shrubs or one of those referenced in land use planning documentation.
21. Emphasize the use of native plant species, recognizing that non-native species may be necessary depending on the availability of native seed and prevailing site conditions.
22. Remove standing and encroaching trees within at least 110 yards of occupied sage-grouse leks and other habitats (e.g., nesting, wintering, and brood rearing) to reduce the availability of perch sites for avian predators, as resources permit.
23. Design fuel treatments that would increase fire suppression efficiencies to protect wildland areas from wildfire originating on private lands, infrastructure corridors, and recreational areas. Where applicable, incorporate roads and natural fuel breaks into fuel break design.

24. Develop state-specific sage-grouse reference information and resource materials containing maps, a list of resource advisors, contact information, local guidance, and other information relevant to agency administrators and fire suppression resources.
25. During periods of multiple fires, ensure line officers are involved in setting priorities.
26. Provide localized maps to dispatch offices and extended attack incident commanders for use in prioritizing wildfire suppression resources and designing suppression tactics.
27. Assign a resource advisor with sage-grouse expertise or who has access to sage-grouse expertise to all extended attack fires in or near sage-grouse habitat. Prior to the fire season, provide training to sage-grouse resource advisors on wildfire suppression organization, objectives, tactics, and procedures to develop a cadre of qualified individuals. Involve state wildlife agency expertise in fire operations through the following:
    a. Instructing resource advisors during preseason trainings
    b. Qualification as resource advisors
    c. Coordination with resource advisors during fire incidents
    d. Contributing to incident planning with information such as habitat features or other key data useful in fire decisionmaking.
28. On critical fire weather days, pre-position additional fire suppression resources to optimize a quick and efficient response in sage-grouse habitat areas.
29. Locate wildfire suppression facilities (i.e., base camps, spike camps, drop points, staging areas and heli-bases) in areas where physical disturbance to sage-grouse habitat can be minimized. These include disturbed areas, grasslands, near roads/trails, or other areas where there is existing disturbance or minimal sagebrush cover.
30. Minimize unnecessary cross-country vehicle travel during fire operations in sage-grouse habitat.
31. Minimize burnout operations in key sage-grouse habitat areas by constructing a direct fire line whenever safe and practical to do so.
32. Utilize retardant, mechanized equipment, and other available resources to minimize burned acreage during initial attack.
33. As safety allows, conduct mop-up where the black adjoins unburned islands, dog legs, or other habitat features to minimize sagebrush loss.
34. Adequately document the fire operation activities in sage-grouse habitat for potential follow-up coordination activities.
35. Compile the District-level information into state-wide sage-grouse tool boxes. Tool boxes will contain maps, listing of resource advisors, contact information, local guidance, and other relevant information for each District, which will be aggregated into a state-wide document.

GENERAL HABITAT MANAGEMENT AREAS

Best Management Practices

Make applicable BMPs mandatory as Conditions of Approval within general sage-grouse habitat. BMPs are continuously improving as new science and technology become available and therefore are subject to change. At a minimum include the following BMPs:

Roads:

1. Design roads to an appropriate standard, no higher than necessary, to accommodate their intended purpose.
2. Do not issue ROWs to counties on energy development roads, unless for a temporary use consistent with all other terms and conditions included in this document.
3. Establish speed limits to reduce vehicle/wildlife collisions or design roads to be driven at slower speeds.
4. Coordinate road construction and use among ROW holders.
5. Construct road crossing at right angles to ephemeral drainages and stream crossings.
6. Use dust abatement practices on roads and pads.
7. Close and reclaim duplicate roads by restoring original landform and establishing desired vegetation.

Operations:

1. Cluster disturbances, operations (fracture stimulation, liquids gathering, etc.), and facilities.
2. Use directional and horizontal drilling to reduce surface disturbance.
3. Clean up refuse (Bui et al. 2010).
4. Restrict the construction of tall facilities and fences to the minimum number needed.
5. Cover (e.g., fine mesh netting or use other effective techniques) all drilling and production pits and tanks regardless of size to reduce sage-grouse mortality.
6. Equip tanks and other above ground facilities with structures or devices that discourage nesting of raptors and corvids.
7. Use remote monitoring techniques for production facilities and develop a plan to reduce the frequency of vehicle use.
8. Control the spread and effects from non−native plant species. (e.g., by washing vehicles and equipment).
9. Restrict pit and impoundment construction to reduce or eliminate augmenting threats from West Nile virus (Dougherty 2007).

Reclamation:

Include restoration objectives to meet Sage-Grouse habitat needs in reclamation practices/sites (Pyke 2011). Address post-reclamation management in reclamation plan such that goals and objectives are to enhance or restore Sage-Grouse habitat.

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APPENDIX D: PALEONTOLOGICAL RESOURCES PROGRAM GUIDANCE

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INSTRUCTION MEMORANDUM NO. 2008-009

UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
Washington, D.C. 20240

October 15, 2007

In Reply Refer To:
1610, 8270 (240) P

EMS TRANSMISSION 10/18/2007

Expires: 09/30/2009

To: All State Directors

From: Assistant Director, Renewable Resources and Planning

Subject: **Potential Fossil Yield Classification (PFYC) System for Paleontological Resources on Public Lands**

Program Areas: Paleontological Resources Management, Resource Management Planning, Lands and Realty Management, Minerals Management, Range

Purpose: This Instruction Memorandum (IM) transmits the Bureau of Land Management (BLM) classification system for paleontological resources on public lands. The classification system is based on the potential for the occurrence of significant paleontological resources in a geologic unit, and the associated risk for impacts to the resource based on Federal management actions. Copies of the classification system and implementation guidance are attached.

Policy/Action: The Potential Fossil Yield Classification (PFYC) system will be used to classify paleontological resource potential on public lands in order to assess possible resource impacts and mitigation needs for Federal actions involving surface disturbance, land tenure adjustments, and land-use planning. Implementation of the PFYC system will not mandate changes to existing land use plans, project plans, or other completed efforts. Integration into plans presently being developed is discretionary. All efforts subsequent to issuance of this IM should incorporate the PFYC system. This system will replace the current Condition Classification in the Handbook (H-8270-1) for Paleontological Resource Management.

Timeframe: This guidance is effective immediately for all BLM offices.

Background: This classification system for paleontological resources is intended to provide a more uniform tool to assess potential occurrences of paleontological resources and evaluate possible impacts. It uses geologic units as base data, which is more readily available to all users. It is intended to be applied in broad approach for planning efforts, and as an intermediate step in evaluating specific projects. This is part of a larger effort to update the Handbook H-8270-1 (General Procedural Guidance for Paleontological Resource Management) Chapter III (Assessment & Mitigation) and Chapter II.A.2 and will be incorporated into that Handbook update.

Impact on Budget: Costs for the initial classification of geologic units for those States that have not already determined the classification will be borne by each Office. Implementation of the PFYC system will have no additional costs.

Manual/Handbook Affected: Supersedes H-8270-1 (General Procedural Guidance for Paleontological Resource Management) Chapter II.A.2.

Coordination: The classification system is the product of the BLM's regional paleontologists, other BLM employees, and outside reviewers. This system is very similar to the Forest Service's Fossil Yield Potential Classification and will enable closer coordination of paleontological resource management between the agencies.

Contact: For questions regarding application of this policy and guidance, please contact Lucia Kuizon, National Paleontologist, at (202) 452-5107 or lkuizon@blm.gov.

Signed by: Todd S. Chirstensen
Acting, Deputy Assistant Director
Renewable Resources and Planning

Authenticated by: Robert M. Williams
Division of IRM Governance

2 Attachments:

1 – The Potential Fossil Yield Classification (PFYC) System (4 pp)
2 – Guidance for Implementing the PFYC System (5 pp)

Attachment 1.
Potential Fossil Yield Classification (PFYC) System

Occurrences of paleontological resources are closely tied to the geologic units (i.e., formations, members, or beds) that contain them. The probability for finding paleontological resources can be broadly predicted from the geologic units present at or near the surface. Therefore, geologic mapping can be used for assessing the potential for the occurrence of paleontological resources.

Using the Potential Fossil Yield Classification (PFYC) system, geologic units are classified based on the relative abundance of vertebrate fossils or scientifically significant invertebrate or plant fossils and their sensitivity to adverse impacts, with a higher class number indicating a higher potential. This classification is applied to the geologic formation, member, or other distinguishable unit, preferably at the most detailed mappable level. It is not intended to be applied to specific paleontological localities or small areas within units. Although significant localities may occasionally occur in a geologic unit, a few widely scattered important fossils or localities do not necessarily indicate a higher class; instead, the relative abundance of significant localities is intended to be the major determinant for the class assignment.

The PFYC system is meant to provide baseline guidance for predicting, assessing, and mitigating paleontological resources. The classification should be considered at an intermediate point in the analysis, and should be used to assist in determining the need for further mitigation assessment or actions.

The descriptions for the classes below are written to serve as guidelines rather than as strict definitions. Knowledge of the geology and the paleontological potential for individual units or preservational conditions should be considered when determining the appropriate class assignment. Assignments are best made by collaboration between land managers and knowledgeable researchers.

Class 1 – **Very Low**. Geologic units that are not likely to contain recognizable fossil remains.

- Units that are igneous or metamorphic, excluding reworked volcanic ash units.
- Units that are Precambrian in age or older.

(1) Management concern for paleontological resources in Class 1 units is usually negligible or not applicable.

(2) Assessment or mitigation is usually unnecessary except in very rare or isolated circumstances.

The probability for impacting any fossils is negligible. Assessment or mitigation of paleontological resources is usually unnecessary. The occurrence of significant fossils is non-existent or extremely rare.

Class 2 – **Low**. Sedimentary geologic units that are not likely to contain vertebrate fossils or scientifically significant nonvertebrate fossils.

- Vertebrate or significant invertebrate or plant fossils not present or very rare.
- Units that are generally younger than 10,000 years before present.
- Recent aeolian deposits.
- Sediments that exhibit significant physical and chemical changes (i.e., diagenetic alteration).

(1) Management concern for paleontological resources is generally low.

(2) Assessment or mitigation is usually unnecessary except in rare or isolated circumstances.

The probability for impacting vertebrate fossils or scientifically significant invertebrate or plant fossils is low. Assessment or mitigation of paleontological resources is not likely to be necessary. Localities containing important resources may exist, but would be rare and would not influence the classification. These important localities would be managed on a case-by-case basis.

Class 3 – **Moderate** or **Unknown**. Fossiliferous sedimentary geologic units where fossil content varies in significance, abundance, and predictable occurrence; or sedimentary units of unknown fossil potential.

- Often marine in origin with sporadic known occurrences of vertebrate fossils.
- Vertebrate fossils and scientifically significant invertebrate or plant fossils known to occur intermittently; predictability known to be low.

(or)

- Poorly studied and/or poorly documented. Potential yield cannot be assigned without ground reconnaissance.

Class 3a – **Moderate Potential.** Units are known to contain vertebrate fossils or scientifically significant nonvertebrate fossils, but these occurrences are widely scattered. Common invertebrate or plant fossils may be found in the area, and opportunities may exist for hobby collecting. The potential for a project to be sited on or impact a significant fossil locality is low, but is somewhat higher for common fossils.

Class 3b – **Unknown Potential.** Units exhibit geologic features and preservational conditions that suggest significant fossils could be present, but little information about the paleontological resources of the unit or the area is known. This may indicate the unit or area is poorly studied, and field surveys may uncover significant finds. The units in this Class may eventually be placed in another Class when sufficient survey and research is performed. The unknown potential of the units in this Class should be carefully considered when developing any mitigation or management actions.

(1) Management concern for paleontological resources is moderate; or cannot be determined from existing data.

(2) Surface-disturbing activities may require field assessment to determine appropriate course of action.

This classification includes a broad range of paleontological potential. It includes geologic units of unknown potential, as well as units of moderate or infrequent occurrence of significant fossils. Management considerations cover a broad range of options as well, and could include pre-disturbance surveys, monitoring, or avoidance. Surface-disturbing activities will require sufficient assessment to determine whether significant paleontological resources occur in the area of a proposed action, and whether the action could affect the paleontological resources. These units may contain areas that would be appropriate to designate as hobby collection areas due to the higher occurrence of common fossils and a lower concern about affecting significant paleontological resources.

Class 4 – **High**. Geologic units containing a high occurrence of significant fossils. Vertebrate fossils or scientifically significant invertebrate or plant fossils are known to occur and have been documented, but may vary in occurrence and predictability. Surface disturbing activities may adversely affect paleontological resources in many cases.

Class 4a – Unit is exposed with little or no soil or vegetative cover. Outcrop areas are extensive with exposed bedrock areas often larger than two acres. Paleontological resources may be susceptible to adverse impacts from surface disturbing actions. Illegal collecting activities may impact some areas.

Class 4b – These are areas underlain by geologic units with high potential but have lowered risks of human-caused adverse impacts and/or lowered risk of natural degradation due to moderating circumstances. The bedrock unit has high potential, but a protective layer of soil, thin alluvial material, or other conditions may lessen or prevent potential impacts to the bedrock resulting from the activity.

- Extensive soil or vegetative cover; bedrock exposures are limited or not expected to be impacted.
- Areas of exposed outcrop are smaller than two contiguous acres.
- Outcrops form cliffs of sufficient height and slope so that impacts are minimized by topographic conditions.
- Other characteristics are present that lower the vulnerability of both known and unidentified paleontological resources.

(1) Management concern for paleontological resources in Class 4 is moderate to high, depending on the proposed action.

(2) A field survey by a qualified paleontologist is often needed to assess local conditions.

(3) Management prescriptions for resource preservation and conservation through controlled access or special management designation should be considered.

(4) Class 4 and Class 5 units may be combined as Class 5 for broad applications, such as planning efforts or preliminary assessments, when geologic mapping at an appropriate scale is not available. Resource assessment, mitigation, and other management considerations are similar at this level of analysis, and impacts and alternatives can be addressed at a level appropriate to the application.

The probability for impacting significant paleontological resources is moderate to high, and is dependent on the proposed action. Mitigation considerations must include assessment of the disturbance, such as removal or penetration of protective surface alluvium or soils, potential for future accelerated erosion, or increased ease of access resulting in greater looting potential. If impacts to significant fossils can be anticipated, on-the-ground surveys prior to authorizing the surface disturbing action will usually be necessary. On-site monitoring or spot-checking may be necessary during construction activities.

Class 5 – **Very High**. Highly fossiliferous geologic units that consistently and predictably produce vertebrate fossils or scientifically significant invertebrate or plant fossils, and that are at risk of human-caused adverse impacts or natural degradation.

Class 5a – Unit is exposed with little or no soil or vegetative cover. Outcrop areas are extensive with exposed bedrock areas often larger than two contiguous acres. Paleontological resources are highly susceptible to adverse impacts from surface disturbing actions. Unit is frequently the focus of illegal collecting activities.

Class 5b – These are areas underlain by geologic units with very high potential but have lowered risks of human-caused adverse impacts and/or lowered risk of natural degradation due to moderating circumstances. The bedrock unit has very high potential, but a protective layer of soil, thin alluvial material, or other conditions may lessen or prevent potential impacts to the bedrock resulting from the activity.

- Extensive soil or vegetative cover; bedrock exposures are limited or not expected to be impacted.
- Areas of exposed outcrop are smaller than two contiguous acres.
- Outcrops form cliffs of sufficient height and slope so that impacts are minimized by topographic conditions.
- Other characteristics are present that lower the vulnerability of both known and unidentified paleontological resources.

(1) Management concern for paleontological resources in Class 5 areas is high to very high.

(2) A field survey by a qualified paleontologist is usually necessary prior to surface disturbing activities or land tenure adjustments. Mitigation will often be necessary before and/or during these actions.

(3) Official designation of areas of avoidance, special interest, and concern may be appropriate.

The probability for impacting significant fossils is high. Vertebrate fossils or scientifically significant invertebrate fossils are known or can reasonably be expected to occur in the impacted area. On-the-ground surveys prior to authorizing any surface-disturbing activities will usually be necessary. Onsite monitoring may be necessary during construction activities.

Attachment 2.
Guidance for Implementing the Potential Fossil Yield Classification (PFYC) System

Introduction

The Potential Fossil Yield Classification (PFYC) system will aid in assessing the potential for discovery of significant paleontological resources or the impact of surface disturbing activities to these resources.

It is intended to assist in determining proper mitigation approaches for surface disturbing activities, disposal or acquisition actions, recreation possibilities or limitations, and other BLM-approved activities. It will provide consistent information for input and analysis during planning efforts. The PFYC system can also highlight the areas most likely to be a focus of paleontological research efforts or illegal collecting. It is hoped that this system will allow BLM to direct management efforts toward potentially significant areas and reduce efforts in areas of lower potential.

This classification system was originally developed by the Forest Service's Paleontology Center of Excellence and the Region 2 (FS) Paleontology Initiative in 1996. Modifications were made by the BLM's Paleontological Resources staff in subsequent years.

Paleontological resources are closely associated with the geologic rock units containing them; that is, fossils are found more frequently in some rock units than others. The management of paleontological resources can thus be tied to the geologic units present at or near the ground surface, with greater management emphasis aimed at higher potential geologic units.

Uses

This PFYC system is utilized for land use planning efforts and for the preliminary assessment of potential impacts and proper mitigation needs for specific projects. It is intended to provide a tool to assess potential occurrences of significant paleontological resources. It is meant to be applied in broad approach for planning efforts, and as an intermediate step in evaluating specific projects.

There are five Classes with Class 1 being Very Low Potential and Class 5 being Very High Potential. Although granite, lava beds, and other igneous or metamorphic rock types are usually considered to be void of any fossils, outcrops of these rocks may have fissure fillings, cave-like structures, sinkholes, and other features that may preserve significant paleontological resources or information, so the potential is not zero; therefore Class 1 is applied to these rock types usually considered not to contain fossil resources.

It is intended that this system replace the current Condition Classification in the Handbook (H-8270-1), for Paleontological Resource Management. In general, the following is a comparison of the Condition Classification rankings to the new PFYC Classes:

Classes: Condition (from H-8270-1)	**PFYC Class** (this Instruction Memorandum)
Condition 1 – Areas known to contain vertebrate fossils or noteworthy occurrences of invertebrate or plant fossils. (Note: this refers to known localities or groups of localities)	PFYC Class 4 (High) or Class 5 (Very High), based on geologic unit.
Condition 2 – Areas with exposures of geological units or settings that have high potential to contain vertebrate fossils or noteworthy occurrences of invertebrate or plant fossils.	PFYC Class 3 (Moderate), Class 4 (High), or Class 5 (Very High), based on geologic unit.
Condition 3 – Areas that are very unlikely to produce vertebrate fossils or noteworthy occurrences of invertebrate or plant fossils.	PFYC Class 1 (Very Low) or Class 2 (Low).

Assignment of Classes

A separate class ranking is assigned to each recognized geologic formation or member present at the surface. Deposits of young alluvium (post-Pleistocene) or thick soils can often be ignored. However, geologic mapping may not separate the older Pleistocene alluvium which, may contain significant vertebrate fossils, and thus these units need to be carefully considered. Available geologic mapping, depending on map scale, may combine multiple formations or units. In these cases, the assigned classification should use the highest class of those included units. For ease of application, the classifications should be integrated into a Geographic Information System (GIS) based geologic map.

The classification is initially determined by the Regional Paleontologist; the State Office Paleontology Lead in collaboration with the Regional Paleontologist; or by knowledgeable individuals from a paleontology museum, university paleontology department, or consulting firm working under a formal agreement. Several States have already completed an initial classification and are incorporating the system into new planning and mitigation efforts.

To maintain consistency in planning efforts, mitigation requirements, and other management approaches, the classification should be applied to each formation on a state-wide basis, and even across State boundaries. But in some situations, geologic characteristics within formations may change across the State or region and may alter the potential for fossil occurrence. These differences may be a characteristic of the formation, be variable in occurrence, and unmappable at a workable scale; or may indicate a regional gradient, where a formation is highly fossiliferous in one portion of the State, but has lowered potential in another area. A variable occurrence in potential may be included in the general information about the formation. A regional gradient can be addressed by assigning a different class for separate areas.

Multiple class assignments for an individual formation should be applied in consultation with the State Office to maintain consistency across Field Office boundaries.

Over time, additional information may be acquired or developed that may suggest that a change in the class assignment is appropriate, especially from the Unknown Class (3b) to a higher or lower class. The classification should reflect the most current information, and recent research or discoveries may indicate a change is warranted. However, any changes should be measured against existing applications or use of the current classification, such as usage in Resource Management Plans (RMPs) or other planning or management documents.

Application

In planning documents and other general applications, these classes allow for uniform discussion of the paleontologic resource, potential adverse impacts, and management approaches. Assessment of general conditions, such as acres or percentages of each class, or spatial identification of important areas can be determined and presented in simple manner. Identification of areas of potential concern with other resources can be identified using GIS mapping or explained in the text body in simple fashion.

The PFYC classes may also be utilized to assess the possibility of adverse or beneficial impacts from land tenure adjustment (disposal or acquisition) proposals prior to on-the-ground surveys.

A primary purpose of the PFYC is to assess the possible impacts from surface disturbing activities and help determine the need for pre-disturbance surveys and monitoring during construction. This assessment should be an intermediate step in the analysis process; and local conditions such as amount of exposed bedrock should be considered when final mitigation needs are determined. The determination should also be supplemented by occurrences of known fossil localities and local geologic and topographic knowledge.

Mitigation Needs Assessment

Impacts of most surface-disturbing activities, and the need for mitigation efforts, are addressed by the local Field Office. Some larger actions, such as major pipeline projects, may be handled by the State

Office, or even as multi-State projects. In all these cases, the assessment of impacts to paleontological resources and need for mitigation can be addressed in similar fashion through a progression of steps. The following outlines the general steps used to apply the PFYC system to this mitigation process.

1. **Identify the Proposed Action and affected area.** Consider the area directly impacted by the action, as well as areas that may be impacted by vehicle drive ways, equipment parking, storage areas, and increased access. Also consider the depth of disturbance to determine possible subsurface impacts.

2. **Identify the potential impacts to paleontological resources.** Determine the geologic units that may be impacted and the associated PFYC classes, and consult other sources of information about known localities or paleontological research that may have been done previously.

   Based on the PFYC class and any additional resource information, determine the probability of impacting significant paleontological resources. If known localities are in the area of possible impact, determine if those localities can be avoided by altering the proposed action, such as repositioning a well pad location or rerouting a pipeline around a locality.

3. **Determine the need for field survey or other mitigation efforts.** On-the-ground field surveys, on-site monitoring, spot-checking at key times during construction, or locality avoidance are all possible mitigation approaches to lessen adverse impacts.

   - If the PFYC class for the impacted area is Class 1 or 2, and there are no known localities within the area, no further assessment is typically needed.
   - If a Class 3a (Moderate Potential) unit underlies the area, the local geologic conditions should be considered, as well as any known localities in the region. It may be necessary to consult with the Regional Paleontologist or other qualified paleontologist to assess the local conditions.
   - If a Class 3b (Unknown Potential) unit underlies the area, it may be appropriate to require an on-site preliminary assessment by a qualified paleontologist.
   - If the area is a Class 4b (buried bedrock with High Potential) or Class 5b (buried bedrock with Very High Potential), an assessment of the possible impacts to bedrock units must be made. If the proposed action will not penetrate the protective soil or alluvial layer, a pre-work survey or monitoring during the activity may not be necessary. If the potential exists to remove the protective layer and impact the bedrock unit below, it may be prudent to require a pre-work field survey and/or on-site monitoring during disturbance or spot-checks at key times. Because the bedrock unit is typically buried for much of the area in question, a pre-work survey may not always be necessary, as the fossil material may not be visible. However, it may then be more important to have an on-site monitor during disturbance or spot-checks at key times.
   - If it is a Class 4a (exposed bedrock with High Potential) or Class 5a (exposed bedrock with Very High Potential) area, it will be necessary in most (Class 4a) or almost all (Class 5a) situations to require a pre-activity field survey of the areas directly and indirectly impacted.
   - Larger projects may impact multiple geologic units with differing PFYC Classes. In those cases, field survey and monitoring may be applied at differing levels. For example, surveys may be appropriate only on the Class 4 and 5 formations and not the Class 2 formations along a pipeline project. Careful mapping and detailed field notes should reflect the differing survey/monitoring intensities, and should be included in the consultant's report to BLM.

4. **Conduct Pre-work Field Survey.** Field surveys are almost always needed for Class 4 and 5 units, especially exposed bedrock areas (Class 4a and 5a). Class 3 units may or may not require a survey. Local conditions, such as vegetated areas or pockets of bedrock exposure, may affect the need and intensity of field surveys.

   The consultant is required to submit a report of findings after completion of the field survey. In addition to standard reporting information, the report should contain the consultants'

recommendations for further mitigation, and this recommendation should be considered when determining the need for and type of on-site monitoring or locality avoidance.

5. **Monitor during disturbance activities.** Those areas that have been determined to have a Very High potential (Class 5) for adverse impacts should typically be monitored at all times when surface-disturbing activities are occurring. If the area has a High potential (Class 4), it may be appropriate to examine the exposed unit, including the spoil or storage piles, only at key times. These times are dependent on the activity, but typically are: when bedrock is initially exposed, occasionally during active excavation, and when the maximum exposure is reached and before backfilling has begun. This monitoring and spot-checking must be performed by a permitted paleontologist or their BLM-approved representative. The monitor has the authority to briefly pause any activity to inspect a possible find. These pauses are intended to allow for identification of possible fossil resources and should only last a few minutes to a couple hours.
6. **Evaluate significant finds.** If significant paleontological resources are discovered during surface disturbing actions or at any other time, the proponent or any of his agents must: (a) stop work immediately at that site; (b) contact the appropriate BLM representative, typically the project inspector or Authorized Officer, as soon as possible; and (c) make every effort to protect the site from further impacts, including looting, erosion, or other human or natural damage. The BLM or designated paleontologist will evaluate the discovery and take action to protect or remove the resource within 10 working days. Work may not resume at that location until approved by the official BLM representative. In some cases, such as recovery of a dinosaur, further activity at that site may be delayed until the discovered fossils are recovered, or until the project is modified to avoid impacting the find. Because of the potential for lengthy delays, the BLM should assure that the project proponent understands this possibility prior to approval to begin work.

These steps are included here to provide general guidance, and it may be appropriate to modify or skip them for various situations. However, a brief discussion of the background and reason for modification should be placed in the project file.

For all surface-disturbing activities occurring within Class 3 or higher units, a stipulation should be included in the permitting document.

Further Information

Detailed information on the geologic units and paleontological resources within a State can often be obtained from State geological surveys, geological or paleontological museums, geology departments at universities or colleges, paleontological permittees or other researchers or within the BLM from Regional Paleontologists or knowledgeable Geologists.

Scientific publications, such as professional journals or State geological survey reports, often contain general and detailed information about paleontological and geological resources relevant to fossil potential and occurrences for specific areas. Current and past paleontological permittee reports usually include precise locality data and maps, and often contain discussions of findings and their significance.

INSTRUCTION MEMORANDUM NO. 2009-011

UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
WASHINGTON, D.C. 20240

October 10, 2008

In Reply Refer To:
8270, 1790 (240) P

EMS TRANSMISSION 10/29/2008

Expires: 09/30/2010

To: All State Directors

From: Assistant Director, Renewable Resources and Planning

Subject: **Assessment and Mitigation of Potential Impacts to Paleontological Resources**

Program Areas: Paleontological Resources Management, Environmental Assessment

Purpose: This Instruction Memorandum (IM) provides guidelines for assessing potential impacts to paleontological resources in order to determine mitigation steps for federal actions on public lands under the Federal Land Policy and Management Act (FLPMA) and the National Environmental Policy Act (NEPA). These guidelines also apply where a federal action impacts split-estate lands. In addition, this IM provides field survey and monitoring procedures to help minimize impacts to paleontological resources from federal actions in the case where it is determined that significant paleontological resources will be adversely affected by a federal action.

Policy/Action: It is the policy of the BLM that potential impacts from federal actions on public lands, including land tenure adjustments, be identified and assessed, and proper mitigation actions be implemented when necessary to protect scientifically significant paleontological resources. This policy also applies to federal actions impacting split-estate lands and is subject to the right of landowners to preclude evaluation and mitigation of paleontological resources on their land. Paleontological resources removed from public lands require a Paleontological Resources Use permit for collection. Significant paleontological resources collected from public lands are federal property and must be deposited in an approved repository. Paleontological resources collected from split-estate lands are the property of the surface-estate owner, and their disposition will be in accordance with the surface agreement between the landowner and the permittee.

Timeframe: This guidance is effective immediately for all BLM offices.

Background: Surface disturbing activities may cause direct adverse impacts to paleontological resources through the damage or destruction of fossils; or loss of valuable scientific information by the disturbance of the stratigraphic context in which fossils are found. Indirect adverse impacts may be created by increased accessibility to important paleontological resources leading to looting or vandalism. Land tenure adjustments may result in the loss of significant paleontological resources to the public if paleontological resources pass from public ownership. Generally, the project proponent is responsible for the cost of implementing mitigation measures including the costs of investigation, salvage and curation of paleontological resources.

This IM together with the Potential Fossil Yield Classification system (PFYC; see IM 2008-009) will provide guidance for the assessment of potential impacts to paleontological resources, field survey and monitoring procedures, and recommended mitigation measures that will better protect paleontological resources impacted by federal actions. This guidance expands and clarifies the guidance in the Handbook H-8270-1 (General Procedural Guidance for Paleontological Resource Management) Chapter III (Assessment & Mitigation) and will be incorporated into the next Handbook revision.

Impact on Budget: Costs are minimal for implementation of this guidance since mitigation of paleontological resources is already part of any approval of surface-disturbing actions on public lands.

Manual/Handbook Affected: Supersedes Handbook H-8270-1 (General Procedural Guidance for Paleontological Resource Management) Chapter III.B.

Coordination: Washington Office Division of Cultural and Paleontological Resources and Tribal Consultation.

Contact: For questions regarding application of this policy and guidance, please contact Lucia Kuizon, National Paleontologist, at (202) 452-5107 or lkuizon@blm.gov.

Signed by:
Edwin L. Roberson
Assistant Director
Renewable Resources and Planning

Authenticated by:
Robert M. Williams
Division of IRM Governance,WO-560

2 Attachments:

1- Guidelines for Assessment and Mitigation of Potential Impacts to Paleontological Resources
2- Paleontological Resources Assessment Flowchart

Attachment 1.
Guidelines for Assessment and Mitigation of Potential Impacts to Paleontological Resources

Introduction

Surface disturbing federal actions on public and split-estate lands may cause direct adverse impacts to paleontological resources through the damage or destruction of fossils or the disturbance of the stratigraphic context in which they are located. Indirect adverse impacts may be created from increased accessibility to fossils leading to looting or vandalism activities. Land tenure adjustments may result in the loss of significant paleontological resources to the public if fossils pass from public ownership.

Under the Federal Land Policy and Management Act (FLPMA) and the National Environmental Policy Act (NEPA), federal actions and land tenure adjustments that may impact or result in a loss of paleontological resources on public or split-estate lands are evaluated, and necessary mitigation is identified.

I. Assessment of Potential Impacts to Paleontological Resources

The following sections outline general steps designed to assist in the analysis and assessment of possible impacts to paleontological resources from proposed actions. These sections are sequential in order and provide for termination of the assessment at various stages if the analysis indicates no impacts are likely to occur.

A. Scoping. Field Offices must assess all proposed federal actions to identify possible effects to significant paleontological resources (see Appendix A for definition) that are potentially recoverable and are likely to be within the zone of expected surface disturbance or relatively close to the surface. The direct effects of all surface activities and the indirect effects of increased public access and land tenure adjustments must be considered in any paleontological assessment. The assessment will determine whether further analysis will be necessary. The Paleontology Program Coordinator (Paleontology Coordinator – see Appendix A for definition) has primary responsibility for the scoping process for projects within the Field Office area, but the Paleontology Program Lead (Paleontology Lead – see Appendix A for definition) may be responsible for projects that span multiple Field or District Offices, and can support the Paleontology Coordinator as requested.

1. Surface only activities – If the proposed project will not disturb potentially fossil-yielding bedrock or alluvium, no additional work is necessary. The project file should be documented as appropriate. Examples of such projects include weed spraying, mechanical brush treatment, geophysical exploration, or surface disturbing activities such as road construction when the fossil resource is expected to be buried well below project compression or excavation depth or when surface fossil resources would be left undamaged.
2. Land Tenure Adjustments – If parcels are identified to pass from public ownership in a proposed land tenure adjustment action but contain no potential for recoverable, significant paleontological resources, no additional work is necessary. The project file should be documented as appropriate, and conclusions addressed in the environmental document. This situation may arise, for example, in areas consisting only of granitic bedrock where paleontological resources would not normally occur.
3. Young alluvial deposits or deep soils may cover and obscure sedimentary bedrock, and any fossils that may occur in that bedrock would be unidentifiable or irretrievable prior to

disturbance actions. In most of these cases, the fossil resources cannot be quantified, but the potential for impacting paleontological resources should be mentioned in the evaluation of the proposal, i.e., the planned disturbance will pass through the soil layer and impact a bedrock unit which is known to contain significant fossils elsewhere.

If the initial scoping identifies the possibility for adversely affecting significant paleontological resources, further analysis is necessary. If there will be no impact or potential impact based on the action or the fossil resource may be impacted, but is too deep to be recovered, e.g., deep well bore passing through a fossil formation, the project file must be documented, and no additional assessment is necessary.

B. Analysis of Existing Data. If scoping suggests the possibility of disturbing fossil-yielding bedrock or alluvium that is near to the surface and that may contain significant paleontological resources that are potentially recoverable, more in-depth analysis is necessary. Geologic mapping reflecting the Potential Fossil Yield Classification (PFYC) should be consulted, along with any other easily accessible information, such as GIS-based locality data, other known paleontological locality information, and existing paleontological reports for the area, aerial photos, or soils maps.

1. Potential Fossil Yield Classification (PFYC) – This is a system for categorizing the probability of geologic units to contain scientifically significant paleontological resources or noteworthy fossil occurrences. It has five levels or Classes, with Class 1 applied to geologic units that are not likely to contain significant fossils through Class 5 for geologic formations that have a high potential to yield scientifically significant fossils on a regular basis (see IM No. 2008-009). This classification does not reflect rare or isolated occurrences of significant fossils or individual localities, only the relative occurrence on a formation- or member-wide basis. Any rare occurrences may require additional assessment and mitigation if they fall within the area of anticipated impacts.
2. If the results of the preliminary analysis determine that the proposed project will only affect geologic units not likely to contain significant fossils or that have a very low or low potential for significant fossils (PFYC Class 1or 2), and no scientifically important localities are known to occur in the area, the project file should be documented, and no additional paleontology assessment is necessary.
3. The results of an analysis of a proposed project may indicate the potential to disturb PFYC Class 3, 4, or 5 formations or potentially fossil-bearing alluvium, or known significant localities, which may then suggest the need for field surveys and/or other mitigation measures. The results may also identify areas where little or nothing is known of the fossil record so that additional attention may be given to these areas during field survey. The analysis should consider the likely impacts on the known or potential fossil resource and should be the basis for determining the need for or level of additional assessments.

C. Determining the Need for Field Surveys and Mitigation. The previously discussed procedures may result in the determination that the project may encounter bedrock or an alluvial zone that has a moderate or high potential to contain significant paleontological resources. However, it does not determine the appropriate action, such as a field survey, on-site monitoring, special stipulations, avoidance, or other mitigation.

1. If the need for further work is not clearly evident after the analysis, the Authorized Officer and/or Project Leader should be consulted for a final decision. The Paleontology Lead or Regional Paleontologist may also be consulted. A brief written report of findings should be prepared, including the rationale for supporting the decision not to require a field survey or additional monitoring. The report should be signed by the Authorized Officer and placed in

the project file. For example, a seismic survey using vibroseis trucks may be proposed on areas of deep soils, or a temporary recreational event may be planned in an area of low fossil potential. These types of projects are not likely to have a reasonable potential to adversely affect important paleontological resources. The file should be documented and a standard discovery stipulation attached to the permit proposal.

2. If the analysis in Sec. I.B indicates a reasonably high expectation of not just encountering a potential fossil-bearing zone and also causing adverse impacts to significant paleontological resources, the determination must be made as to (1) whether adverse effects cannot be avoided; (2) whether the adverse impacts can be avoided by altering the location or scope of the project; (3) whether the impacts can be mitigated through development of special stipulations such as requiring on-site monitoring; or (4) whether field surveys will be necessary to determine the presence or absence of significant paleontological resources.
3. In the case where it is known that significant paleontological resources will be adversely impacted, the preferred course of action is avoidance of the impact by moving or rerouting the site of construction, or eliminating or reducing the need for surface disturbance.
4. Application of specific stipulations may reduce or eliminate adverse impacts in many cases. A standard discovery stipulation should be included in any permit approval that is likely to affect significant paleontological resources. The stipulation should mandate an immediate work stoppage in the area of discovery, notification to the Authorized Officer, and protection of the material and geological context. Other stipulations may be appropriate on a case-by-case basis.

   (a) A suggested standard discovery stipulation for a discretionary federal action is:
   The permittee shall immediately notify the BLM Authorized Officer of any paleontological resources discovered as a result of operations under this authorization. The permittee shall suspend all activities in the vicinity of such discovery until notified to proceed by the Authorized Officer and shall protect the discovery from damage or looting. The permittee may not be required to suspend all operations if activities can be adjusted to avoid further impacts to a discovered locality or be continued elsewhere. The Authorized Officer will evaluate, or will have evaluated, such discoveries as soon as possible, but not later than 10 working days after being notified. Appropriate measures to mitigate adverse effects to significant paleontological resources will be determined by the Authorized Officer after consulting with the operator. Within 10 days, the operator will be allowed to continue construction through the site, or will be given the choice of either (1) following the Authorized Officer's instructions for stabilizing the fossil resource in place and avoiding further disturbance to the fossil resource, or (2) following the Authorized Officer's instructions for mitigating impacts to the fossil resource prior to continuing construction through the project area.

   Note: C.1 and C.2 above would be conducted at the permittee's expense. By regulation, after a 3809 plan of operations is approved or where there is no plan, the BLM is responsible for the cost of any investigation and recovery of fossil materials.

   (b) Other stipulations may be developed to reduce potential impacts, preferably in consultation with the project proponent. These may include (1) techniques to reduce surface disturbance, (2) briefings for all personnel about the potential for discovery, (3) requiring all finds be reported, and (3) using a "light touch" in sensitive areas. These should be made a formal part of the authorization for the project and discussed at a preconstruction meeting or an on-site meeting in the case of oil and gas operations.

(c) All proponents should be directed to share the current rules and regulations regarding fossil theft and the limitations to free use collecting of invertebrate and plant fossils on BLM-administered lands with all employees and subcontractors under their direction. Unlawful removal, damage, or vandalism of paleontological resources will be prosecuted by federal law enforcement. Theft or damage to government property by a proponent, a proponent's employee, or a subcontractor that is under a proponent's direction may lead to legal actions against the proponent.

5. If avoidance actions or stipulating measures are insufficient to protect known paleontological resources, a written assessment must be completed to determine the need for field survey or monitoring. This assessment must include the anticipated direct or indirect impacts associated with the project, the inadequacies of avoidance or special stipulations to protect the resource, existing paleontological information and known localities, relevant geologic information, and the potential for additional discoveries. The assessment must be completed by the Paleontology Coordinator.

   (a) In some cases, bedrock will not be visible at the surface in the project area (for example, where thin soils or alluvium obscure all outcrops), but the proposed excavation will likely penetrate into bedrock with known significant paleontological resources. Because fossil material will not be visible at the ground surface in these cases, it may be appropriate to forego a field survey prior to excavation, but require on-site monitoring or spot-checks when bedrock is finally encountered. If construction monitoring is proposed, the written assessment must include a thorough justification for the recommendation.

   (b) The State Office may require the Paleontology Coordinator to notify the Paleontology Lead that a field survey or monitoring is deemed appropriate prior to the final decision to require the survey or monitoring. The notification should minimally include the name of the project, the legal description of the location or other locational information, a brief summary of the proposed action, reason(s) for the decision to require a survey or monitoring, and any other relevant information. Concurrence of the Paleontology Lead or Regional Paleontologist may be required prior to the final decision for requiring a survey or monitoring.

   (c) A standardized assessment document may be developed that can be applied to projects that are similar in nature, relatively small, and repetitive in approach for use within a Field Office or District. This written assessment is intended to simplify the documentation process for those projects that are likely to have minimal impacts, and may be structured as a programmatic assessment, a form, a checklist, or other document with standard items. This assessment must include the name of the project, the legal description of the location or other locational reference, a brief summary of the proposed action, reason(s) for the decision, and any other relevant information. The parameters in the assessment should be designed to identify the need for a field survey. For example, the parameters may indicate a field survey may be required for road and well pad construction activities occurring on Class 4 or 5 formations where the formation is likely to be encountered during surface disturbing activities. The Field Manager, in consultation with the Paleontology Lead, must approve the use of a programmatic assessment prior to initial implementation.

6. The decision to require a field survey or monitoring must be made by the Authorized Officer and documented in the project file. If required, a copy of the decision must be furnished to the Paleontology Lead.

II. Procedures for Conducting a Paleontological Field Survey

If the assessment of existing data indicates: (a) the presence or high probability of occurrence of vertebrate fossils or uncommon nonvertebrate fossils (PFYC Class 4 or 5), or that the probability is unknown (Class 3), in the area of a proposed federal action or transfer of title, and (b) a reasonable probability that those resources will be adversely affected by the proposed action, a paleontological field survey should be conducted.

A. Definition of Field Surveys. Field Surveys are pedestrian surveys to be performed in areas where significant fossils can be expected to occur within the boundary and immediate vicinity of the anticipated disturbance, or where the probability of encountering significant fossils is unknown.

1. Field surveys are performed prior to any surface disturbing activities. Before conducting field surveys, the project location should be as final as possible and any staking of the location should be complete.

2. Surveys are conducted by a BLM Regional Paleontologist, Paleontology Lead, Paleontology Coordinator, appropriately trained and supervised BLM staff, or by a BLM-permitted consulting paleontologist hired by the project proponent.

   (a) At the Field Manager's discretion, other qualified BLM staff may conduct surveys on small projects. Performance of surveys by BLM staff must also be approved by the Regional Paleontologist, Paleontology Lead, or Paleontology Coordinator.

   (b) Surveys that are complex in nature, constrained by construction schedules, or otherwise cannot be performed by BLM staff should be performed by a consulting paleontologist holding a valid BLM Paleontological Resources Use Permit. Submission of reports may be done directly by the paleontologist to the BLM. The project proponent is also responsible for all costs associated with the survey, including the consulting paleontologist's fees and charges, all survey costs, fossil preparation to the basic identification stage, analyses, reports, and curation costs directly related to mitigation of the project's anticipated impacts. Any required monitoring and mitigation costs are also the responsibility of the project proponent. These costs are to be negotiated between the project proponent and the consulting paleontologist prior to beginning any data gathering, analysis, or field work, and these negotiations do not require BLM involvement or approval. Any new, additional, or modified curation agreements between the paleontologist and the official repository must be in place prior to starting field work.

   (c) Authorization for an activity to proceed cannot be given by a consulting paleontologist. Performance of the survey, either by a consulting paleontologist or BLM staff, or submission of the report DOES NOT constitute approval for the activity to proceed. The BLM must review the report, including adequacy of the field methods and findings. The Authorized Officer must approve the findings and determine the need for monitoring prior to approval to proceed.

B. Conducting Field Surveys. Field surveys must be performed by the Principal Investigator or an approved Field Agent or Field Monitor (see section IV.C., Types of Field Personnel for descriptions of these individuals) as authorized under a Paleontological Resource Use Permit, or by a BLM Regional Paleontologist or qualified BLM designee. Field surveys and collections performed as a mitigation measure are not intended to be scientific research studies, but are meant to identify, avoid, or recover paleontological resources to prevent damage or destruction from project activities. However, proper scientific techniques and procedures must be utilized during all mitigation efforts.

Safety should be an important consideration; therefore, surveys should not be attempted on cliff faces, in open, non-reinforced trenches deeper than five feet, or other unsafe areas.

1. The scope of the survey is dependent upon the scale of the project. Small projects are defined as less than 10 acres, or, if linear, less than five miles; large projects exceed those dimensions.
2. At the start of field work, the consulting paleontologist (paleontologist) must contact the Paleontology Coordinator in each affected Field Office who may require a visit to that office. After an initial visit each year, the paleontologist may contact the Field Office by telephone or email prior to subsequent field trips, at the discretion of the Field Office. Information about the survey schedule, additional personnel, emergency field contact information, and any other pertinent data should be provided to the Paleontology Coordinator. The Field Office will inform the paleontologist of any conditions that may impact the survey, such as fire danger or restrictions, drought restrictions, wildlife timing restrictions, management restrictions, road restrictions or construction, and any other relevant information.
3. During the field survey, the paleontologist surveys, locates, and documents all paleontological resources within 200 feet of the proposed project location or corridor, or less distance upon approval.

   (a) Where significant paleontological resources are at risk, data collection alone does not constitute mitigation of damage. All significant fossils that may be damaged or destroyed during project activities must be collected, along with all relevant contextual and locational data. Specimens must be collected during the survey or prior to commencement of any surface-disturbing activities.

   (b) In many cases, isolated gar scales, chelonid (turtle) carapace or plastron fragments, crocodile and fish teeth, and unidentifiable bone fragments do not need to be collected. The location must be recorded and a description of the fossil material noted in the field notes and on a BLM Locality Form as part of the report. The context of these types of fossils should be considered, as they may represent rare occurrences or unusual faunal associations, and thus may be scientifically important and must be documented and voucher specimens collected where appropriate.

   (c) Occurrences of plant or invertebrate fossils should be recorded and representative examples or voucher specimens collected where appropriate. Additional mitigation measures may be appropriate in some cases for these types of localities.

   (d) If a large specimen or a concentration of significant fossils is located during the field survey, the available time and/or personnel may not allow for full recovery during the survey. The specimen(s) and locality(ies) should be stabilized as needed, and a determination made as to whether avoidance is necessary or whether full recovery of the specimen is required at a later time prior to disturbance activities. The Authorized Officer and project proponent must be notified, the mitigation alternatives discussed including funding for recovery, and a decision reached as soon as possible. If avoidance or later recovery is selected for mitigation, the find should be stabilized, buried if needed to protect the fossils and context, and appropriate measures implemented to reduce adverse effects from natural or human causes.
4. During the survey, locations or areas that exhibit a lithology suggesting a high probability of subsurface fossil material must be recorded, and a recommendation for the need for on-site monitoring, spot-checking, or testing should be made in the report. This may include areas where no fossil material was found on the surface during the survey. The recommendation

should consider the size and type of planned disturbance, such as the depth of a trenching operation or the acreage of surface disturbance.

5. Surveys must be performed only during times when the ground is visible and not frozen. This will often preclude surveys during winter months in many areas. Biological timing restrictions, such as critical nesting or birthing times, may confine or delay field activities. Project proponents should be informed of BLM's requirement for performing any field surveys as soon as possible and should be advised of the possibilities for delays in survey completion based on seasonal weather conditions or other management restrictions to allow for adequate scheduling of available time.

C. Report of Survey Findings. After completion of the field survey, the paleontologist must file a written report with the BLM and the designated repository. If required, a copy should also be filed with the project proponent. This report must summarize the results of the survey as well as appropriate geological and paleontological background information as described below. It should also include any recommendations for on-site monitoring or other mitigation. For small projects (less than 10 acres), the report must be filed within 30 days after completion of the survey unless specific approval for a different time frame has been received from the BLM. The time frame for submission of the report for large projects should be negotiated during project scoping. On a case-by-case basis, approval to begin project activities may be granted for those portions of the project area noted to be less paleontologically sensitive prior to final approval of the report.

1. Reports of the general findings and the background information must be submitted to the BLM project manager or Authorized Officer (if appropriate), the Paleontology Lead or Regional Paleontologist, and each affected Field Office. Reports must include the following details, as applicable. Items (a) and (b) should appear at the beginning of the report and may be presented as a title page in multi-page reports. Some of these categories may be combined.

   (a) Name, affiliation, address, date of report, and permit number (if consultant) of paleontologist doing the survey.

   (b) Project name and number (if used), name of proponent, and general location of project.

   (c) Date(s) of survey and names of any personnel assisting with the survey.

   (d) Brief description of the proposed project, emphasizing potential impacts to paleontological resources.

   (e) Description of background research conducted. (Include overview of known paleontological information, institutions consulted, previous surveys in the area, previous projects of similar nature in the area, and general description of survey techniques employed).

   (f) Summary of regional and local geology. May reference earlier projects for relevant information.

   (g) Summary of regional and local paleontology. May reference earlier projects for relevant information.

   (h) Summary of the survey results.

   (i) Significance of findings.

   (j) Potential impacts to paleontological resources resulting from the project.

   (k) Detailed mitigation recommendations that may lessen potential adverse impacts.

   (l) Potential fossiliferous areas to allow for future assessment of sites if applicable.

   (m) Cited and other pertinent references.

(n) Map of project area, indicating areas surveyed, known localities, and new discoveries.

(o) Relevant photos, diagrams, tables to aid in explaining, clarifying, or understanding the findings.

(p) Listing of collected material, including field numbers, field identifications, and elements, cross-referenced to locality field numbers. This list may be submitted in electronic format, preferably in spreadsheet format.

(q) BLM locality form (8270-3) or equivalent for each new locality (including localities where fossils were observed but not collected) with a 1:24000 scale map showing the localities (not reduced in scale during photocopying) (see items 2 and 3 below).

2. Exact locations of fossil localities contained in these reports are considered sensitive and must not be included in any public document. The BLM locality form (8270-3) or equivalent, 1:24000 scale map showing the localities, and any other information containing specific fossil locations may be bound separately or placed in a separate section to allow for preservation of confidential locality data. A copy of this confidential section must be submitted to the Paleontology Lead (in some cases, two copies may be required). A copy for each affected Field Office may be required. Another copy must be submitted to the official repository with the collected materials.
3. BLM GPS recording and data standards must be used to report paleontological locality data. Existing USGS topographic maps are often based on the NAD27 standard, so locality data calculated from a map base must be converted before submission. Data must be recorded and reported with a mean error of +/- 12.5 meters or less, at a 95 percent confidence level. For small localities, data should be reported as point data. Larger polygonal localities should be reported using coordinates of a centroid and a description of the approximate size, or the key coordinate points of a bounding polygon. Linear features, such as roads or surveyed project boundaries, must be reported as line data. The 1:24000 scale map(s) accompanying the locality forms should graphically illustrate the locality, either as a point or an outline of the locality as appropriate, and be clearly labeled with the locality or field number.

D. Report Approval. The Authorized Officer will analyze the Survey Report for adequacy within 10 working days of receipt. Notification accepting the report, or explaining any identified deficiencies, will be sent to the consulting paleontologist and the project proponent with a copy placed in the project file. Any deficiencies must be corrected as soon as possible, usually initiated within five working days, and the report must be resubmitted for approval. Any resubmissions must be prompt, but consideration will be made for the amount of time needed for major corrections. Deficiencies directly affecting the survey, such as inadequate survey procedures or incomplete data, must be corrected before granting approval for the project to proceed. Deficiencies not directly affecting the survey, such as curation issues, will not prevent approval of the project, but must be corrected as soon as possible.

III. Determination of Further Mitigation Requirements

The need for additional mitigation to protect paleontological resources will be determined on a case-by-case basis. The Authorized Officer, in consultation with Regional Paleontologist or the Paleontology Lead, will analyze the Survey Report for survey findings and any mitigation recommendations. If no further mitigation is needed, the Authorized Officer will promptly notify the project proponent that there are no additional paleontological surveys or mitigation measures required, and the project may proceed pending any other approvals. The project file must be documented indicating acceptance of the survey report and identifying any additional mitigation

requirements. If it is determined that additional mitigation efforts are needed to protect or preserve the paleontological resources, the project proponent will be notified as soon as possible. The Authorized Officer and/or the Paleontology Lead usually develop and approve the mitigation procedures or recommend a project be redesigned in consultation with the project proponent. Factors such as locality or specimen significance, economics, safety, and project urgency will be considered when developing mitigation measures. Additional mitigation measures will be developed and implemented as timely as possible so as not to delay project actions.

A. Relocation. The preferred mitigation technique is to change the project location based on the results of the field survey. Relocation, however, may necessitate a field survey of the new area, as well as resurveys by other resource specialists. Anticipation of this contingency prior to or during the original survey may allow for survey of an expanded area at the same time. If relocation will eliminate impacts and is acceptable to all parties, then a report to the file, including a map showing the original and revised locations, must be completed documenting the change. Approval for the project to proceed in the revised location may then be granted by the Authorized Officer to the project proponent. When avoidance is not possible, appropriate mitigation may include excavation or collection (data recovery), stabilization, monitoring, protective barriers and signs, or other physical and administrative protection measures.

B. Deferred Fossil Collection. In some cases, fossil material may have been identified, but not completely collected during the initial field survey, such as a partial dinosaur or other large fossil assemblage. It may be possible to complete the recovery of this material and all related data prior to beginning construction activities, and thus mitigate the adverse impact. This may require a shift in the project schedule and must be coordinated with the project proponent. Approval by the Authorized Officer for the project to proceed will only be granted when recovery of the fossil material and field data is completed. A report to the file and the project proponent documenting the recovery and indicating that no further mitigation is required must be completed, and the report signed by the Authorized Officer. If the discovery cannot be fully collected within the available time frame, it may have to be avoided by relocating or redesigning the project.

IV. Procedures for Field Monitoring

The purpose of on-site monitoring is to assess and collect any previously unknown fossil material uncovered during the project activities or soon after surface-disturbing actions. Based on the initial scoping, the field survey and recommendations, and the plan of operations, it may be necessary to require monitoring of surface-disturbing activities. Monitoring may be required as part of an overall mitigation for a project which was developed during the NEPA process, or upon the discovery of paleontological resources during project activities.

A. Monitoring Plan. A monitoring plan can be developed by a BLM paleontologist or a qualified paleontologist hired by the proponent. The plan must be appropriately scaled to the size and complexity of the anticipated monitoring. If developed by a third party, the appropriate Paleontology Lead or Regional Paleontologist shall review the plan for sufficiency prior to acceptance. Monitoring of the project may proceed when the monitoring plan is approved by the Authorized Officer. A monitoring plan indicates the treatments recommended for the area of the proposed disturbance and must minimally address the following:

1. The recommended approach to additional specimen collection, such as total or partial recovery or sampling; and
2. The specific locations and intensity of monitoring or sampling recommended for each geologic unit, stratigraphic layer, or area impacted.

3. Monitoring intensity is determined based on the analysis of existing data and/or field surveys and any previous monitoring efforts.

B. Types of Monitoring. There are two types of monitoring: 1) on-site, performed during ongoing operations, and 2) spot-checks, performed during or after disturbance, or at key times during the progress of the project.

1. On-site monitoring – In areas with a high probability for buried fossils, the presence of a monitor at the site of disturbance at all times that disturbance is occurring may be warranted. The need for a full-time monitor is based on the findings of the survey, the local geology, and the proposed actions. Efforts will be made to complete fossil recovery with minimal work stoppage. However, in some cases, an extended period of work stoppage may be required, so coordination with the project proponent or representative is important (see D below). Prior to beginning the monitoring work, the monitor, company supervisor, and machinery operators should agree on procedures for brief work stoppages to allow for examination of finds. It is critical that safety be of utmost concern because of the presence of heavy machinery and open trenches.
1. The monitor must assess any finds, collect loose fossil material and related data, and take appropriate steps to mitigate any current or potential damage. Consideration of the size of the expected fossils must also be considered; for example, microfossils may not be visible during excavation activities. It may be appropriate to collect samples of matrix for later recovery of microvertebrate fossils or other analyses. Activities planned to occur during night time should be assessed relative to the potential to uncover significant fossils. Fossils may not be visible at night in trenching or grading operations, so construction activities may need to be suspended during night time in sensitive areas.
2. Spot-checking – In areas with a moderate to high probability for unknown fossil material, it may be more appropriate to check only at key times rather than maintain continuous monitoring of operations. Key times for scheduling spot-checking are when the fossil-bearing bedrock is exposed to view or prior to placing spoil material back into the excavation. Examples of these key times may be when a pipeline trenching operation is complete but before pipe is placed and the trench backfilled or prior to redistribution of topsoil. Spot-checking requires close coordination with the project proponent and the paleontologist, and usually requires the paleontologist to be available on short notice. In some instances, it may be advantageous to allow rain and/or wind to erode away loose matrix and concentrate fossil material to increase visibility. The paleontologist will coordinate with the project proponent to allow sufficient time for this action to occur, as appropriate to conditions, expected fossil material, and construction schedules.

3. The paleontologist should report potentially fossiliferous areas in the final report to allow for future assessment of sites, even if no fossils were located during the project monitoring.

C. Types of Field Personnel. Depending on the complexity of the project, it may be necessary to employ a number of paleontology field personnel simultaneously. There may be a lack of fully qualified paleontologists to perform all the necessary monitoring during the scheduled times of construction. Use of additional personnel for field work is permissible, but Field Agents and Field Monitors (described below) must be requested by the Permittee and authorized by the BLM prior to field work.

1. **Principal Investigator** – The person listed as Permittee (Permit item 1a) on the Paleontological Resources Use Permit is the Principal Investigator (PI) and is responsible for all actions under the permit, for meeting all permit terms and conditions, and for the

performance of all other personnel. This person is also the contact person for the project proponent and the BLM.

2. **Field Agent** – Other qualified paleontologists may perform field work independently of the PI under the conditions of this permit. Résumés must be submitted to BLM and must demonstrate qualifications equivalent to those of Permittees. Field Agents must be listed on the permit under "Name(s) of individual(s) responsible for planning, supervising, and carrying out fieldwork" (Permit item 8) or authorized in a separate letter from BLM. They must follow all the permit terms and conditions applicable to field work and must carry a copy of the permit, included terms and conditions, and separate authorizing letter (if used) while in the field. Field work results must be reported to the PI, who will then submit required reports.
3. **Field Monitor** – Field Monitors may be utilized for supplemental on-site monitoring of surface-disturbing activities when the PI or a Field Agent is performing field work elsewhere. Field Monitors must have sufficient field experience to demonstrate acceptable knowledge of fossil identification, collection methods, and paleontological techniques. The PI must supply a summary of each person's experience to the BLM prior to field work. Field Monitors must be approved by the BLM prior to performing field work and must carry a copy of the permit while in the field. The PI or Field Agent must be in communication with the Field Monitor using a portable communication device, such as a cell phone or two-way radio, and are required to be near enough to the Field Monitor to allow for prompt examination of all fossil discoveries (no more than two hours away) by the PI or Field Agent.
4. **Field Assistant** – Additional personnel not meeting the previously cited experience or knowledge levels may be utilized during field work, but must be under direct, on-site supervision of either the PI or a Field Agent as part of a supervised crew. Field assistants must have at least four to eight hours of training or experience received from a qualified paleontologist in identifying paleontological resources prior to performing field work or when first utilized in this capacity. A listing of all Field Assistants (including contact information) must be supplied prior to any field work. All discoveries made by a Field Assistant must be immediately reported to the PI or Field Agent on site. To ensure proper supervision, an appropriate ratio of Field Assistants per PI or Field Agent must be maintained. The complexity of the project, the area to be covered, and the experience of the assistants are some of the factors that should be considered in determining the proper ratio, but commonly five to seven assistants is the maximum number that can be supervised by one PI or Field Agent.

D. Work Stoppage. If significant fossil material is discovered during construction activities, the PI, Field Agents, and Field Monitors have the authority to temporarily halt surface disturbing actions until an assessment of the find is completed and appropriate protection measures taken. Efforts will be made to complete fossil recovery with minimal work stoppage. However, in some cases, an extended period of work stoppage may be required. If the paleontological resource can be avoided, mitigated, or collected within approximately two hours, work may resume after approval from the PI or Field Agent, and the Authorized Officer must be notified as soon as possible of the discovery and any mitigation efforts that were undertaken. If the find cannot be mitigated within a reasonable time (two hours), the concurrence of the Authorized Officer or official representative for a longer work stoppage must be obtained. Work may not resume until approval is granted from both the PI or Agent and the Authorized Officer.

V. Final Project Report

Upon completion of all field work, including survey and monitoring, the PI must submit within 30 days, a written final report to the Authorized Officer, Paleontology Lead, and the designated repository. A copy of the report may be provided to the project proponent if required, but without the BLM Locality forms. Reports must include the following details. Items 1 and 2 should appear at the beginning of the report, and may be presented as a title page in multi-page reports.

1. Name, affiliation, address, date of report, and permit number (if consultant) of the paleontologist doing the survey.
2. Project name and number (if used), name of proponent, and general location of project.
3. Date(s) of the survey and names of any personnel assisting with the survey.
4. Brief description of project and expected impacts to paleontological resources.
5. A summary of mitigation performed.
6. A summary of findings, including important discoveries.
7. A description of potentially fossiliferous areas to allow for future assessment of sites, even if no fossils were located during the project monitoring.
8. A completed BLM locality form 8270-3 or equivalent for each new locality using Universal Transverse Mercator (UTM) NAD 83 coordinates, and 1:24000 scale maps with new localities plotted using points or polygons as appropriate. Locality forms, maps, and any other information containing specific fossil locations should be bound separately or assembled as a separate section to allow for preservation of confidential locality data.
9. List of specimen field numbers and field identifications of collected material, cross-referenced to the locality field number. This list may be submitted in electronic format, preferably in a spreadsheet format.

If the survey was performed by BLM, a report similar in contents must be written and filed in the project file, and the project proponent notified as soon as possible upon completion.

VI. Completion of Mitigation Responsibility

When the final report with the specimen inventory and the signed receipt of confirmation of museum deposition are accepted by the BLM, mitigation for paleontological resources related to the project will be considered completed. The project proponent will be notified in writing as soon as possible by the Authorized Officer after consulting with the Paleontology Lead or Regional Paleontologist and a copy of the notification placed in the project file.

The responsibility of the project proponent ends when appropriate mitigation related directly to the project is completed and final approval is received from the Authorized Officer. Any additional field collection, quarrying, final specimen preparation, etc. will be considered to be research, and will be the responsibility of the consulting paleontologist or another approved party. The project proponent will not be held responsible for completion of any research project. However, the project proponent can choose to sponsor further research. A separate research permit will be required for additional research activities.

VII. Collections Resulting from Assessment and Mitigation

Fossil specimens and related data collected from public lands during field surveys and mitigation remain the property of the Federal government. They must be placed in the approved repository(s) identified on the Paleontological Resource Use Permit held by the consulting paleontologist as soon

as practical and receipt(s) of collections submitted to the BLM, but no later than 60 days after all field work is completed. Written approval from the Paleontology Lead or Regional Paleontologist is required if additional time is needed for transfer of all specimens and field data.

VIII. Resource Management Updates

Based on findings resulting from any of the above steps, the project file, locality and specimen information, and other BLM data should be updated to reflect any new or modified information. Paleontology permit files should be checked and updated, as well as any other administrative information.

The PFYC Class assignments can be assessed based on the analysis, survey, and monitoring results. New information may indicate a change in the PFYC Class is appropriate for one or several geologic units. Other applications of the PFYC system should be considered, such as the use for impact analyses in planning documents or for survey and mitigation determinations for other projects. Any changes in classification must be made in consultation with the Paleontology Lead or Regional Paleontologist to maintain consistency across Field Office boundaries.

Appendix A to Attachment 1 – Definitions

(As applicable to BLM management of paleontological resources)

Alluvium – A general term for clay, silt, sand, gravel, or similar unconsolidated detrital material [fragments of rock or mineral material derived from older rocks] deposited during relatively recent geologic time by a stream or other body of running water as a sorted or semi-sorted sediment in the bed of the stream or its flood plain or delta, or as a cone or fan at the base of a mountain slope; especially, such a deposit of fine-grained texture (silt or silty clay) deposited during a time of flood (*from* American Geological Institute (AGI), Glossary of Geology, 1972 ed.)

Alluvium may contain paleontological resources in older alluvial deposits. The location on the landscape often will provide clues to the potential for paleontological resources within alluvial deposits. As an example, alluvium developed near major river courses or lake margins has a much higher potential to contain significant paleontological resources than alluvium (colluvium) formed from slope wash.

Approved Repository – Meets the Department of the Interior 411 Departmental Manual (DM) provisions for museum property, including capability for providing adequate long-term curatorial services, such as a physically secure environment, and maintaining professional staff qualified to catalog, care for, preserve, retrieve, and loan, where appropriate, these materials and associated records.

Bedrock – A general term for the rock, usually solid, that underlies soil or other unconsolidated, surficial material (*from* American Geological Institute (AGI), Glossary of Geology, 1972 ed.) For paleontological purposes, bedrock generally excludes alluvium, colluvium, sand dunes, and loess (fine-grained blanket deposit of marl or loam). In certain situations, bedrock may contain recent soils/sediments with fossils.

Colluvium – A general term applied to any loose, heterogeneous, and incoherent mass of soil material or rock fragments deposited chiefly by mass-wasting, usually at the base of a steep slope or cliff; e.g., talus, cliff debris, and avalanche material. Also, alluvium deposited by unconcentrated surface run-off or sheet erosion, usually at the base of a slope (*from* American Geological Institute (AGI), Glossary of Geology, 1972 ed.)

Field Agent – Other qualified paleontologists may perform field work independently of the PI under the conditions of this permit. Résumés must be submitted to BLM and must demonstrate qualifications equivalent to those of Permittees. Field Agents must be listed on the permit under "Name(s) of individual(s) responsible for planning, supervising, and carrying out fieldwork" (Permit item 8) or authorized in a separate letter from BLM. They must follow all the permit terms and conditions applicable to field work and must carry a copy of the permit, included terms and conditions, and separate authorizing letter (if used) while in the field. Field work results must be reported to the PI, who will then submit required reports.

Field Assistant – Additional personnel not meeting the previously cited experience or knowledge levels may be utilized during field work, but must be under direct, on-site supervision of either the PI or a Field Agent as part of a supervised crew. Field assistants must have at least 4 to 8 hours of training or experience received from a qualified paleontologist in identifying paleontological resources prior to performing field work or when first utilized in this capacity. A listing of all Field Assistants (including contact information) must be supplied prior to any field work. All discoveries made by a Field Assistant must be immediately

reported to the PI or Field Agent on site. To ensure proper supervision, an appropriate ratio of Field Assistants per PI or Field Agent must be maintained. The complexity of the project, the area to be covered, and the experience of the assistants are some of the factors that should be considered in determining the proper ratio, but commonly five to seven assistants is the maximum number that can be supervised by one PI or Field Agent.

Field Monitor – Field Monitors may be utilized for supplemental on-site monitoring of surface-disturbing activities when the PI or a Field Agent is performing field work elsewhere. Field Monitors must have sufficient field experience to demonstrate acceptable knowledge of fossil identification, collection methods, and paleontological techniques. The PI must supply a summary of each person's experience to the BLM prior to field work. Field Monitors must be approved by BLM prior to performing field work and must carry a copy of the permit while in the field. The PI or Field Agent must be in communication with the Field Monitor using a portable communication device, such as a cell phone or two-way radio, and are required to be near enough to the Field Monitor to allow for prompt examination of all fossil discoveries (no more than two hours) by the PI or Field Agent.

Field Survey – Pedestrian (walking) surveys performed in areas where significant fossils are expected to occur within the boundary or immediate vicinity of an anticipated disturbance. Surveys are performed by a qualified paleontologist or BLM Regional Paleontologist or other officially appointed BLM employee prior to any surface disturbing activities. Survey activities also include concurrent collection of significant fossils.

Land Tenure Adjustments/Change in Title – Changes in ownership or administration of surface or mineral estates, typically exchanges or sales, which may result in a change in ownership or control of paleontological resources.

Monitoring – a) On-site observation during all surface disturbing activities to assess and collect any previously-unknown fossil material uncovered by the project activities. b) Examination of excavation or spoil piles at key times during project activities. Monitoring must be performed by a permitted paleontologist, field agent, or field monitor (see section ***IV.C***.), Regional Paleontologist, or other officially appointed BLM employee, and occurs during or soon after surface disturbing actions.

Paleontological Locality (Locality) – A geographic point or area where a fossil or associated fossils are found in a related geological context. A paleontological locality is confined to a discrete stratigraphic layer, structural feature, or physiographic area.

Paleontology Program Coordinator (Paleontology Coordinator) – The employee designated by the local BLM Office Manager to manage paleontological resource issues, including planning, mitigation, budget, and other administrative duties. The local point of contact for paleontological resource use permittees, the State Office Paleontology Program Lead, and the Regional Paleontologist. The employee is usually a geologist or archaeologist.

(a) In some offices, additional employees may be designated by the supervisor to determine the need for field surveys and monitoring for some projects, or other duties in support of the paleontology program. The scope of duties for these additional employees must be approved by the Paleontology Program Lead and closely coordinated with the Paleontology Coordinator.

(b) A few current BLM employees may meet the same professional qualifications that are required for a BLM Paleontological Resources Use Permit applicant. BLM-approved training and field experience may also allow employees to gain sufficient background to

achieve competency in the field. With the approval of the Regional Paleontologist and the Office Manager or Deputy State Director, these employees may be designated as qualified to perform field surveys or monitoring. The current availability of these employees must also be approved by the unit manager or Deputy State Director, typically on a project-by-project basis or within a defined time period. Depending on official duties, local roles and responsibilities, and management preferences, these employees may or may not be the Paleontology Coordinator.

Paleontology Program Lead (Paleontology Lead) – Any one of the following: the Regional Paleontologist in the states with an identified position; the paleontologist at Grand Staircase-Escalante National Monument; or the State Office Archeologist in the states without a Regional Paleontologist.

Principal Investigator – The person listed as Permittee (Permit item 1a) on the Paleontological Resources Use Permit is the Principal Investigator (PI) and is responsible for all actions under the permit, for meeting all permit terms and conditions, and for the performance of all other personnel. This person is also the contact person for the project proponent and the BLM.

Regional Paleontologist – The BLM paleontologist that provides professional expertise in paleontology, and is responsible for interpreting relevant laws, authorities, and policy for the administration of the BLM paleontology program for all States in his/her respective region, and as the program interface between Field and/or District Offices, State Offices, and the Washington Office. In some cases, the Regional Paleontologist also serves as the State Office Paleontologist.

Significant Paleontological Resource (syn. **Significant Fossil Resource**) – Any paleontological resource that is considered to be of scientific interest, including most vertebrate fossil remains and traces, and certain rare or unusual invertebrate and plant fossils. A significant paleontological resource is considered to be scientifically important because it is a rare or previously unknown species, it is of high quality and well-preserved, it preserves a previously unknown anatomical or other characteristic, provides new information about the history of life on earth, or has identified educational or recreational value. Paleontological resources that may be considered to not have paleontological significance include those that lack provenience or context, lack physical integrity because of decay or natural erosion, or that are overly redundant or are otherwise not useful for research. Vertebrate fossil remains and traces include bone, scales, scutes, skin impressions, burrows, tracks, tail drag marks, vertebrate coprolites (feces), gastroliths (stomach stones), or other physical evidence of past vertebrate life or activities.

Soil – The natural medium for growth of land plants (*from* American Geological Institute (AGI), Glossary of Geology, 1972 ed.) Generally, well-developed soils do not contain paleontological resources. However, the C horizon (the substratum above bedrock that is little affected by soil forming processes) may occasionally contain Pleistocene-aged fossils.

Stipulations – Written conditions that may restrict or impose limits on approved activities, or require that certain procedures be followed. The general usage herein encompasses several formal terms specific to other use authorizations such as Mitigation, Terms and Conditions, Conditions of Approval, and Standard Stipulations.

Surface disturbance – Disruption of the ground surface and subsurface. Disruption may damage or destroy significant paleontological resources and their geological context.

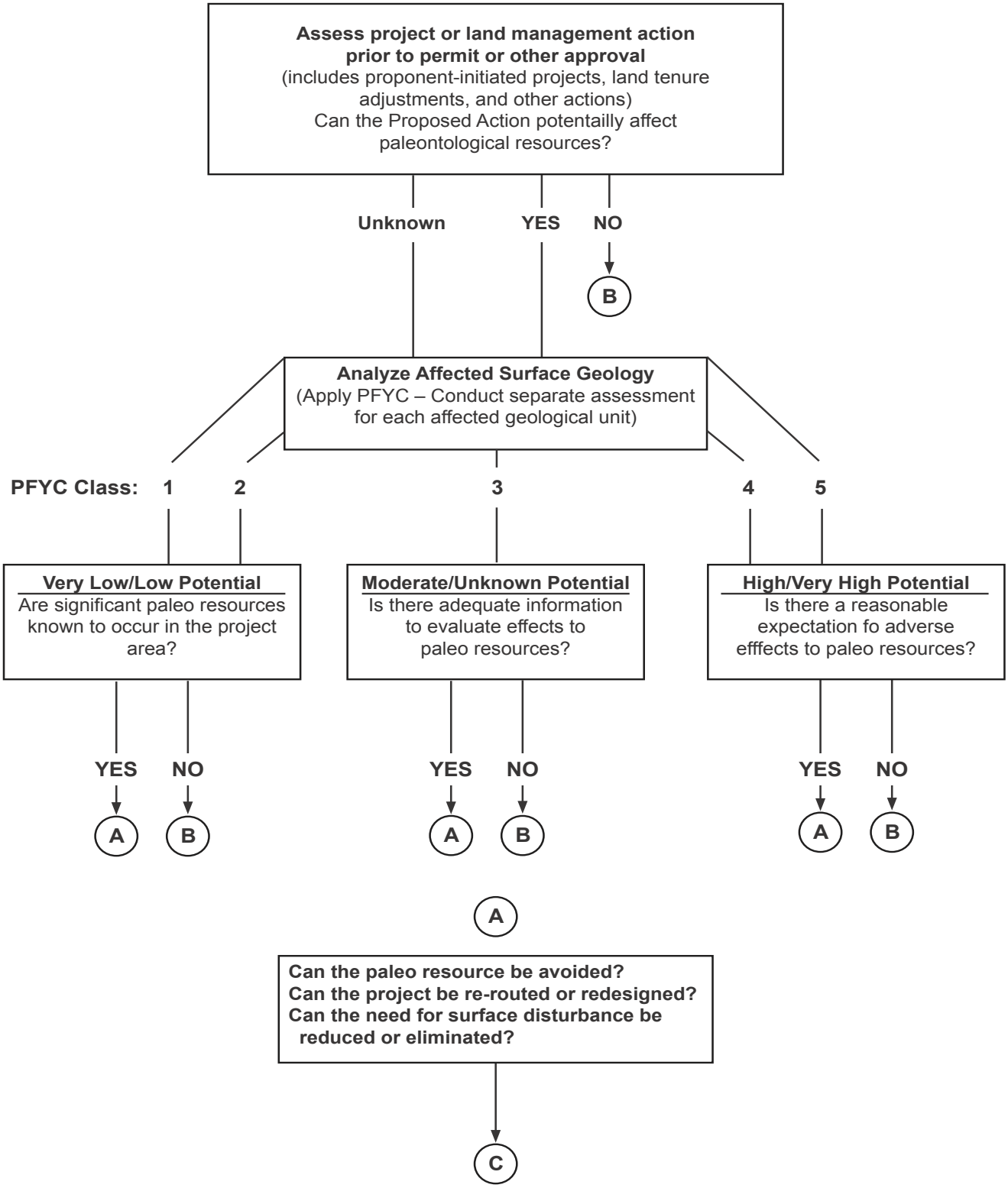
– Generally excludes: fire (but not fire activities, see below), vegetation mowing, weed spraying, grazing, natural erosion, fence building

– Some activities that may impact the ground surface and must be assessed on a case-by-case basis are:

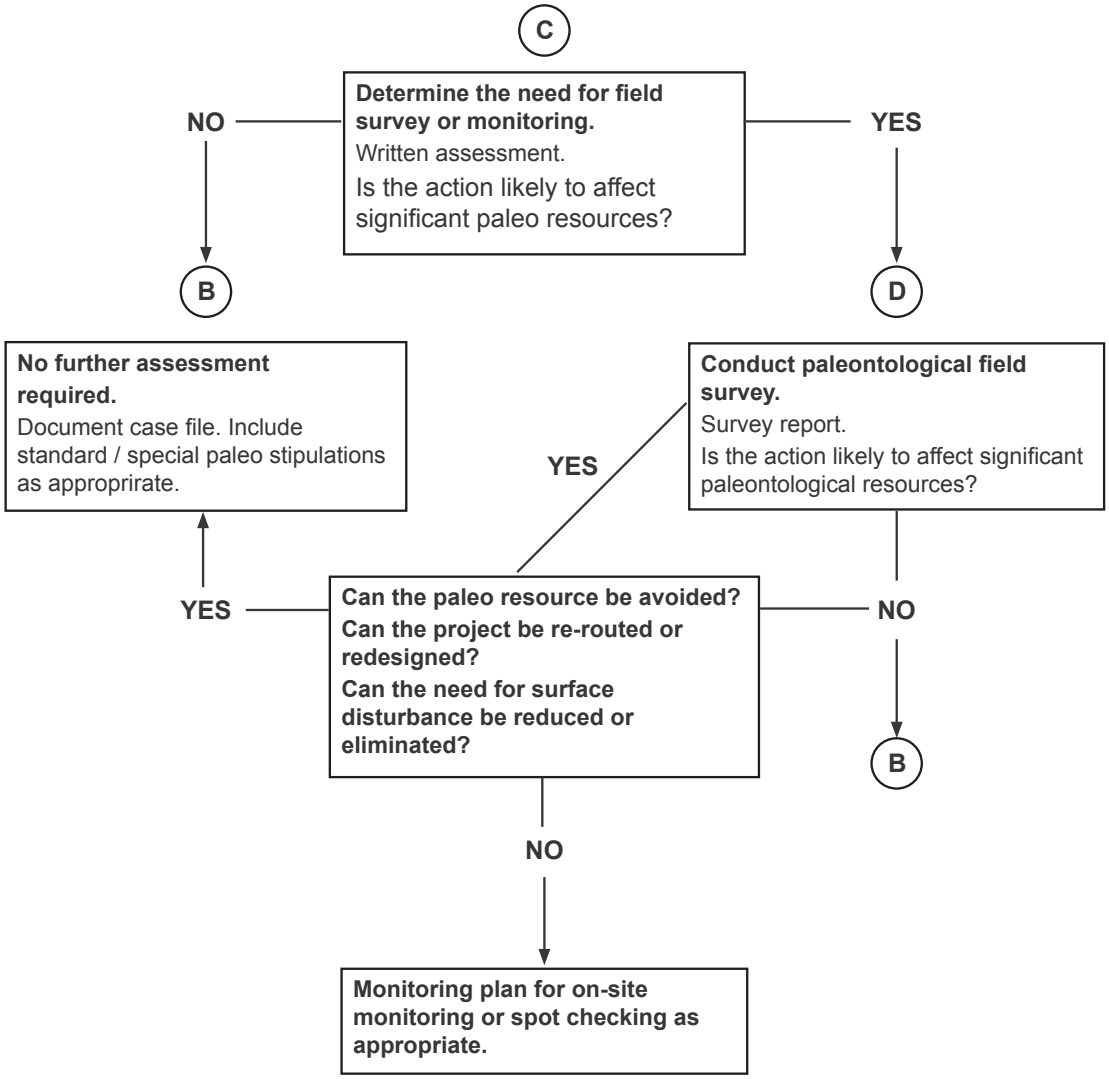
- Mechanized vegetative treatments – chaining, sagebrush chopping, etc.
- Seismic activities – vibroseis techniques, cross-country travel
- Fire management activities – line building, brush removal and thinning using mechanized equipment
- Recreational activities – OHV, rock collecting, mountain biking, public events

Voucher Specimen – A representative sample that verifies the kind of fossil material found during a field survey, and is collected and curated in an approved repository along with its associated field data.

Attachment 2.
Paleontological Resources Assessment Flowchart



Paleontological Actions



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APPENDIX E: CD-C RECLAMATION FOR ALTERNATIVES B, D, AND F

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This appendix addresses reclamation practices for the CD-C project area and is applicable to Alternatives B, D, and F. This plan will be implemented by the Operators to achieve successful reclamation on federal lands disturbed by natural gas operations within the CD-C project area. Appendix M describes reclamation practices for the CD-C project area applicable to Alternative C.

The 2015 Approved Resource Management Plan Amendment for Greater Sage-Grouse (ARMPA, BLM 2015b) calls for separate reclamation guidance in Priority Habitat Management Areas (PHMAs). Reclamation in the 160,000 acre PHMA within the CD-C project area under the Proposed Action and all alternatives will be guided by the Reclamation Plan found in Appendix M of the ARMPA. It can be accessed at: https://eplanning.blm.gov/epl-front-office/projects/lup/9153/63202/68444/015_Wyoming_ARMPA_Appendix_M_Reclamation-Plan.pdf

In addition to the above guidance, the requirements outlined in Appendix 36 of the Rawlins Field Office (RFO) Resource Management Plan (RMP), the Bureau of Land Management (BLM) Wyoming State Reclamation Policy, and the BLM Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development (BLM 2006) will be adhered to. Operators are responsible for the reclamation of surface disturbance in accordance with federal regulations and the standards outlined in Onshore Oil and Gas Order #1 and the Federal Land Policy Management Act (FLPMA).

The project area consists largely of the sagebrush steppe ecosystem. This ecosystem is characterized by limited soil resources, low precipitation, and predominantly shrub and grass vegetation communities. The project area has a harsh arid climate, receives approximately 6-10 inches of precipitation per year, is situated at 6,300-7,800 feet, and has a short growing season. Soils are often thin with little to no organic matter, low water holding capacity, and/or have undesirable chemical properties. These conditions can make vegetation re-establishment difficult, with marginal success from basic reclamation efforts.

Procedures presented in this plan are designed to allow flexibility based on specific conditions encountered at each proposed disturbance site. All criteria and requirements presented in this plan pertain to all disturbances in the CD-C natural gas development area, including well pads, pipelines, roads, and ancillary facilities.

PART I: INTRODUCTION AND RECLAMATION CRITERIA

Reclamation Goals, Objectives, and Principles

The Wyoming State BLM Reclamation Policy focuses on 10 requirements which apply to all surface disturbing activities. These requirements must be addressed for all proposed disturbances in site specific reclamation plans (SSRPs), which are submitted to the BLM with the project proposal and must be approved by the BLM prior to implementation of the project.

The 10 requirements of the Wyoming State BLM Reclamation Policy are as follows:

1. Manage all waste materials
2. Ensure subsurface integrity, and eliminate sources of ground and surface water contamination
3. Re-establish slope stability, surface stability, and desired topographic diversity
4. Reconstruct and stabilize water courses and drainage features
5. Maintain the biological, chemical, and physical integrity of the topsoil and subsoil (where appropriate)
6. Prepare site for re-vegetation
7. Establish a desired self-perpetuating native plant community
8. Re-establish a complementary visual composition
9. Manage invasive plants
10. Develop and implement a reclamation monitoring and reporting strategy

The goal of reclamation in the project area is to return the disturbed land to a condition approximate to or better than that which existed before disturbance, by restoring plant cover and species composition of the site to its pre-disturbance direction (BLM 2008). To accomplish this goal, the lease operators and right-of-way holders should design reclamation efforts to include the establishment of a self-sustaining, diverse vegetation community comprised of species native to the region, in sufficient density and diversity that approximates a natural, undisturbed vegetation community.

In order to facilitate reclamation, the following fundamental reclamation assumptions will be the basis of the site specific and science-based reclamation approaches that will be used in the CD-C project area:

1. Reclamation success will be based on setting reasonable, achievable, and measurable reclamation goals that are representative of the conditions in the CD-C area.
2. Soil is the basic building block of successful reclamation.
3. In the CD-C project area, approximately 50 percent of the soils are classified as sensitive (saline, sodic, sandy, very shallow, clayey).
4. Adaptive management principles will be used to adapt to changing environmental conditions that may occur during the reclamation process.

Reclamation Success Criteria

Reclamation success criteria are necessary to measure reclamation performance and success, and to ensure that disturbed lands are being reclaimed in an appropriate manner and timeframe. The Wyoming BLM Reclamation Policy identifies both a short term and long term goal for reclamation:

1. Short-term: immediately stabilize disturbed areas and provide conditions necessary to achieve the long-term goal.
2. Long-term: facilitate eventual ecosystem reconstruction to maintain a safe and stable landscape and meet the desired outcomes of the land use plan.

Interim reclamation occurs following construction of a well pad and is concentrated on areas of the well pad that are no longer required during the operational period of the well. Final reclamation occurs once disturbance of the area is complete and facilities have been removed. Disturbances such as pipelines will immediately proceed towards final reclamation; disturbances such as well pads or compressor stations will initially focus on interim reclamation and, once operations cease and infrastructure is removed, will continue towards final reclamation.

Interim reclamation success criteria in the CD-C project area have been identified and are as follows:

1. All vegetation on the disturbed site must be desirable perennial species as represented by the seed mix or reference site species or as deemed desirable by the BLM in review and approval of the site specific reclamation plan.
2. Vegetation basal cover should be 70 percent of pre-disturbance or reference area basal cover.
3. Invasive weeds or other undesirable species will comprise no more than 10 percent of the total vegetative cover; no noxious weeds will be allowed.
4. Erosional features should be equal to or less than the adjacent area.
5. In years 3–6:
    a. A seedling density of 3 to 4 seedlings per foot of drill row or transect should occur. In some areas such as badlands, sodic and/or saline/alkaline soils, this standard may be reduced to one to two seedlings per foot to be commensurate with the naturally low vegetative cover, unless significant surface erosion is anticipated and will be at the discretion of the BLM.
    b. A species diversity of at least 50 percent of the species contained in the seed mix and/or present on adjacent areas will be present, and no single species will account for more than 50 percent of the total vegetative cover unless its dominance is higher than 50 percent on adjacent undisturbed areas.

Final reclamation success criteria should incorporate the short term and long term goals in order to address the spatial and temporal aspects of reclamation. Final reclamation success criteria in the CD-C project have been identified and are as follows:

1. Pre-disturbance surveys or surveys of adjacent undisturbed natural ground cover and species composition should occur. The vegetation will consist of 80 percent of pre-disturbance (or reference site) ground cover and 90 percent dominant species, no noxious weeds. Erosion features will be equal to or less than the surrounding area, the pre-disturbance survey, or approved reference sites.
    a. The vegetation will consist of species included in the seed mix and/or occurring in the surrounding natural vegetation or as deemed desirable by the BLM in review and approval of the site specific reclamation plan. No single species will account for more than 30 percent total vegetation composition unless it is evident at higher levels in the adjacent landscape. Vegetation canopy cover, production and species diversity shall approximate the surrounding undisturbed area.

PART II: RECLAMATION PRACTICES

Phases of Reclamation

In general, the life cycle of a natural gas related disturbance is composed of 4 to 5 stages, which correspond with the 4 to 5 stages of reclamation:

1. Pre-disturbance planning and site preparation
2. Facility construction
3. Interim reclamation (if applicable e.g. pipelines transition right to final reclamation)
4. Final reclamation,
5. Reclamation maintenance

1. Pre-Disturbance Planning and Site Preparation

Pre-disturbance planning and careful attention to site layout are the first steps to optimizing reclamation success, and are used to develop the SSRP. In addition, pre-disturbance planning and inventory aids in the identification of any issues, such as sensitive soils, steep topography, or invasive species that may reduce the potential for successful reclamation. Decisions made during this phase of a project can facilitate reclamation efforts through the use of Best Management Practices (BMPs) to minimize the extent and severity of project-related environmental impacts.

a. Pre-disturbance site selection

Consideration of topography, geology, and micro-climate during the planning phase can facilitate re-contouring efforts and aid in reclamation. For example, a site on a south-facing slope might indicate that more drought tolerant species should be selected than if the site is on a north-facing slope.

Sites should be constructed to maximize the area that will be re-contoured during the interim reclamation phase. Designing disturbances to be the minimum size needed to safely conduct operations will minimize the amount of re-contouring and reclamation required on the site.

The ability to rapidly meet reclamation objectives and satisfy reclamation performance standards may be limited by the vegetation community for a given site. Sites that consist of woody shrubs may require a longer period to achieve successful reclamation when compared to a site composed primarily of grass species. During planning, the vegetation composition of a potential site should be carefully considered.

Pre-disturbance planning of operational and reclamation activities will be important in minimizing impacts on critical wildlife habitat and other resources. It may be necessary to schedule activities to occur

at times outside of breeding or migrating periods, for example. Modified reclamation practices (such as special seed mixes) may be recommended for areas with unique habitat conditions.

Areas such as alkali flats, badlands, dunes, rocky outcrops, or other such sites can be exceedingly difficult or infeasible to reclaim. These areas can have highly erodible soils, steep slopes, low precipitation, and/or other physical, biological, and/or chemical limitations. Because reclamation in these areas is more difficult, such sites should be avoided if possible. In addition, avoidance areas stipulated in the RMP include:

i. Areas with high erosion potential, including rugged topography and steep (>25 percent) slopes
ii. Area with saturated soils
iii. Within 500 feet of perennial drainages, ponds, lakes, wetlands, playas, or riparian areas; and
iv. Within 100 feet of ephemeral and intermittent drainages

b. Pre-disturbance soil salvage planning and soil inventory

The Wyoming State BLM Reclamation Policy (BLM 2012) specifies that the biological, chemical, and physical integrity of the topsoil and subsoil must be maintained. The following points are emphasized in the policy:

i. Identify, delineate, and segregate all topsoil and subsoil, using site specific soil evaluation and testing if necessary or required.
ii. Protect all stored soil material from erosion, degradation, and contamination.
iii. Incorporate stored material into the disturbed landscape.
iv. Seed soils to be stored beyond one growing season with desirable vegetation.
v. Identify stockpiles with appropriate signage.

Suitable soils have physical and chemical characteristics favorable for plant growth, including soil depth, pH, electrical conductivity, texture, surface features, and organic matter content. Incorporation of unsuitable materials in the soil stockpile will impair plant growth, and potentially affect successful reclamation. A site specific soil evaluation should be used to investigate and characterize the site's soils in order to obtain sufficient information to develop the site specific soil salvage plan; fundamental characterization of soils ahead of disturbance can identify potential problems. The BLM will determine on a site specific basis whether a proposed location requires a site specific soil evaluation. Soil characteristics that may hinder successful reclamation include:

i. Soils with a pH of 8.4 or higher or a pH lower than 6.0
ii. No suitable soil or very shallow suitable soil, less than 3 inches in depth
iii. Soil solutions with an electrical conductivity (EC) greater than 8 dS/m
iv. Sodium Adsorption Ratio (SAR) of 13 or higher when pH is greater than 8.4 and EC is greater than 4 dS/m
v. Soil textures of clay, sand, or loamy sand
vi. Surface and subsurface soil in and through the root zone dominated by coarse material greater than 2 mm in diameter and greater than 40 percent of the soil profile

The site specific soil evaluation should evaluate depth as well as physical and chemical characteristics of the soil(s) encountered at the site. Site specific soils data and the soil salvage plan for the site, along with photographs of the soil pit(s) and vegetation community, should be included in the SSRP that is submitted with the project proposal. If deemed necessary by the BLM specialists' onsite inspection, further soil testing will be required. Soils testing and reports will be the responsibility of the Operators.

c. Baseline vegetation assessment

Gathering vegetation data before a site has been cleared documents pre-disturbance site conditions and in turn guides reclamation decisions. Seed mixes should be based on desirable vegetation that has historically grown on-site and return of cover should be gauged by comparison with actual pre-

disturbance site conditions and/or reference areas. The following vegetation characteristics can signal a high probability of reclamation problems:

i. The presence of halophytes, e.g. saltbush
ii. The presence of alkali halophytes, e.g. greasewood, halogeton
iii. The presence of noxious or invasive species, e.g. cheatgrass, Russian thistle, Russian knapweed, halogeton

Methodologies used to determine the information for the vegetation inventory are included in BLM guidelines for vegetation sampling: Sampling Vegetation Attributes, Interagency Technical Reference (1996). This document can be found online at: http://www.blm.gov/nstc/library/pdf/samplveg.pdf.

d. Reference site selection

A reference site is a land unit which is representative, in terms of physiography, soils, vegetation, and land use history, of an area that is to be disturbed. Reclaimed sites are compared to reference sites to determine successful interim and final reclamation. In Wyoming, a site may be comprised of multiple ecological communities (e.g. dunes, alkali flats, and sagebrush). Ecological variation at a given site can make it difficult to evaluate which adjacent area should serve as a reference. A reference site should be chosen based upon the pre-disturbance assessment and the identified dominant community on the site. One reference site for a proposed disturbance site with more than one ecological community may not be suitable. A reference site located adjacent to the site to be disturbed, with similar soils, vegetation, and aspect should be chosen. Any use of a reference site must have prior authorization by the BLM.

e. Site Specific Reclamation Plan

Onshore Oil and Gas Order #1 and the FLPMA both require that the proponent submit either Plans for Surface Reclamation (Onshore Oil and Gas Order 1.III.D.4.j) or proposed construction and reclamation techniques, respectively (43 CFR 2804.12(a)(3)); these are collectively known as site specific reclamation plans (SSRPs). The Wyoming State BLM Reclamation Policy (BLM 2012) provides more detail on the standards that the BLM requires project proponents to meet when surface disturbing activities are permitted. The SSRP is required for all disturbances, and should incorporate information collected during the pre-disturbance site assessments and present a strategy that considers both interim and final reclamation, including reclamation monitoring, reporting, and maintenance. The reclamation plan should describe the pre-disturbance soil and vegetation for the site in addition to other parameters such as topography, hydrology, and other characteristics that are relevant to reclamation of the site. The plan should provide an ecological site classification, a seed mix recommendation appropriate for the classification, a topsoil salvage plan, and other site specific conditions. Reclamation monitoring for interim and final reclamation should also be addressed in the plan.

The SSRP should also include a description of site preparation activities that prepare a site for re-vegetation activities. In general, these activities include replacement of stockpiled suitable and unsuitable soils, re-establishment of a stable subsurface environment, re-contouring, soil compaction relief, and incorporation of soil amendments. The SSRP should also include considerations of how surface stability will be achieved, including:

i. Redistribution of the soil materials in a manner designed to optimize re-vegetation
ii. Relief of soil compaction of the re-distributed soil to an appropriate depth
iii. Reconstruction of pre-disturbance topography, including:
    - Re-establishment of pre-disturbance contour
    - Elimination of high walls, cut slopes, or topography depressions on site
    - Reconstruction of drainages and reclamation of impoundments to maintain the drainage pattern, profile, and dimension to exhibit similar hydrologic characteristics approximate to pre-disturbance function
iv. Minimization of wind, sheet, and rill erosion on and/or adjacent to the reclaimed area
v. Use of BMPs such as erosion matting as appropriate to protect seed and seedling establishment

Proposed seed mixes and seeding methods should be presented in the SSRP; the plan will describe when seeding will occur and specify the method by which seeding will occur, e.g. broadcast or drilling. Seeding depth should also be specified.

Providing multifunctional and sustainable seed mixes for interim and final reclamation is necessary for increasing the potential for successful and timely re-vegetation and site stability. Plant diversity and habitat functionality are influenced by the seed choices applied to an area slated to be reclaimed. Appropriate native plant materials should be selected based on the pre-disturbance vegetation survey, site characteristics, and/or ecological site description. Seeds may be obtained from commercial sources, certified weed-free seed mixes, or local collections provided they are collected in areas without invasive species.

Soil amendments may be used in reclamation if the soil is lacking necessary chemical, biological, physical, or organic materials to support growth of suitable plant materials; all uses of soil amendments must be approved by the BLM prior to application and/or use. Any proposed soil amendments must be described in the SSRP, and should include:

i. What the application of identified soil amendments is intended to accomplish
ii. Which amendments will be applied
iii. What method of application will be used
iv. The timing of application relative to other reclamation practices

Soil amendments should be selected based on the pre-disturbance and/or existing soil characteristics and scientific recommendations. Any BMPs that will be used during site construction and reclamation must also be described in the SSRP. Approval of the SSRP will be required by the BLM prior to implementation. Upon review of the proposed project, the BLM will provide Conditions of Approval (COAs); these conditions may modify the approach included in the SSRP. Requirements for notification of timelines to complete specific reclamation activities may be specified in the COAs.

2. Facility Construction

The objective of reclamation during the construction phase is to salvage suitable soil identified in the soil salvage plan and segregate it from less desirable subsoil to ensure that construction activities do not hinder future reclamation of the site.

a. Soil Salvage Operations

Prior to soil salvage, removal of large woody vegetation may be required. Woody materials salvaged during clearing should be piled outside of the disturbed area and not mixed or buried in the soil stockpiles. Salvaged woody materials should be stored for use during reclamation activities. Grasses, forbs, and small woody vegetation such as sagebrush should be salvaged along with the suitable soil and stockpiled. Suitable soil should be salvaged from all disturbed locations where surficial soils are considered suitable prior to placement of non-suitable soil fill. This should include the footprints of any stockpile locations where non-suitable soil will be placed (such as material excavated during construction of a reserve pit).

The pre-disturbance soil salvage plan described above is the basis for soil salvage activities during site construction. Stockpile locations and soil salvage depth are specified in the plan. Soil salvage depth may vary in the different areas delineated in the plan. On some sites a constant soil salvage depth may be specified for the entire location. The area of stripping should include all locations identified in the pre-disturbance soil salvage plan, including areas where non-suitable soils will be stockpiled. Soil salvage operations typically utilize wheel tractor-scrapers. However, equipment selection may be influenced by factors such as ground condition or topography where use of track dozers, haul trucks, and loaders may be more practical. Regardless of the type of equipment used, care should be taken to follow the stripping depth recommendations provided in the soil salvage plan. Over-excavation during soil stripping may negatively alter the quality of salvaged soils and reduce the potential for reclamation success.

b. Soil Stockpile Management

The salvaged soil will be stockpiled at the edge of the site for later use during interim and final reclamation. The stockpile locations are required to be identified in the project proposal. Stockpile dimensions should be designed to accommodate the required volume and, to the extent possible, the area of the stockpiles should be minimized in order to reduce the overall project disturbance. Separate stockpiles are required to be provided for soils that are determined to be suitable for reclamation purposes, and non-suitable soils that may have been excavated during reserve pit or flare pit construction. These separate stockpiles should be labeled with appropriate signage.

During interim reclamation, topsoil can be re-spread; a portion of the suitable soil stockpile can be set aside for final reclamation. The volume of soils to be saved should be approximately equivalent to the ratio of the final area to be reclaimed to the maximum area of disturbance. Stockpiles should be protected from erosion, degradation, and contamination. Salvaged soils that are suitable for reclamation purposes and that will be stored beyond one growing season should be seeded with desirable vegetation to control erosion and weeds.

3. Interim Reclamation

The goal of interim reclamation is to stabilize portions of disturbed sites no longer subject to disturbance from ongoing activities. For example, interim reclamation may occur in the perimeter area of a natural gas well site while the inner portion of the site is still used for production. Interim reclamation objectives include stabilizing the disturbed soil surface, controlling runoff and erosion, and establishing native vegetation.

Specific reclamation practices that may be used during interim reclamation are described in more detail in Attachment A, Reclamation Practices.

4. Final Reclamation

Final reclamation will be conducted on areas where all operations have ceased and no further disturbance will occur. For example, final reclamation is required once a well has reached the end of its productive life and all equipment is removed from the location. During final reclamation, site stabilization and vegetation establishment will take place after recontouring on any remaining disturbed portions of the well pad not previously addressed during interim reclamation. This usually consists of an area in the well pad center that contained the wellhead, equipment, and vehicle turn around area, in addition to the access road. Final reclamation measures are designed to achieve compliance with the ten reclamation requirements stipulated by the BLM Wyoming Reclamation Policy (BLM 2012), the Approved RMP for the RFO, and the specific success criteria presented in this plan.

5. Reclamation Maintenance

Reclamation maintenance ensures that vegetation, site stabilization, and other measures function properly until achieving successful reclamation. Successful final reclamation may take many years and success will vary depending on site specific conditions. Regular reclamation maintenance may be necessary to identify and solve potential reclamation issues. Reclamation monitoring, as described later in this document, will provide annual feedback on whether to conduct special reclamation maintenance inspections and develop site specific reclamation maintenance prescriptions.

Reclamation maintenance techniques and site specific maintenance prescriptions may include, but are not limited to:

Forensic soil/vegetation investigations

a. Inter-seeding or spot seeding
b. Re-seeding
c. Fertilizer or other soil amendment applications
d. Weed control

e. Compaction relief
f. Erosion control devices and BMPs
g. Wildlife and/or livestock exclusion fences
h. Snow fences for collecting moisture

PART III: RECLAMATION MONITORING AND REPORTING

Types of Monitoring Required

Monitoring determines whether disturbed sites are meeting reclamation success criteria, and is conducted to observe and record environmental conditions at the reclaimed site. Monitoring also documents development of the reseeded plant community, invasive species, soil stability, and ecosystem function. Continued characterization after disturbance is appropriate for monitoring site maturation and stability, particularly when problematic soil conditions or invasive weeds are identified. Monitoring also provides the data necessary for tracking disturbances in the project area. Mapping of disturbance areas and results of monitoring should be entered into a database tracking worksheet. This worksheet provides an accounting of the disturbances on an annual basis and will be maintained by the BLM. Vegetation monitoring and disturbed site evaluation for any component of the reclamation plan may take place at intervals agreed to by the BLM and the Operator; generally, the intervals for monitoring and reporting will be set annually unless otherwise agreed to as a condition of approval of the reclamation plan.

The Operator will inspect well pads, access roads, pipeline rights-of-way, and other disturbed areas associated with natural gas development in the CD-C project area. The assessment will include status of re-vegetation, erosion control, and weed control efforts at each site. Monitoring personnel should be experienced in plant identification, soils, and range management. Success monitoring should be conducted during the peak growing season (late May through July) in order to minimize the effect of seasonal fluctuations in plant life cycles and to ensure that the majority of plan species will be identifiable. Operators may elect to conduct additional monitoring as necessary.

Monitoring will evaluate the following:

1. Location status (reserve pit, cover soil stockpile, seeding status)
2. Basal cover of vegetation by species on site
3. Basal cover of vegetation by species in native range adjacent to site
4. Seedling counts by species for recently seeded disturbances in the first growing season
5. Extent of rock, litter, and bare ground
6. Noxious and invasive weed infestations
7. Grazing severity
8. Wildlife and/or livestock use
9. Evidence and extent of erosion
10. Effectiveness of erosion control measures
11. Reclamation maintenance recommendations

Operators may use any BLM-approved method to collect the necessary basal cover, plant species, ground cover, and erosion data. More information is available online at http://www.blm.gov/nstc/library/pdf/samplveg.pdf.

Seedling counts should be conducted for recently seeded disturbances using a quadrat covering a minimum of one-half square meter. At least ten quadrats should be located on the disturbed area. These quadrats may be located along two or more 50-foot long transects, or randomly located throughout the disturbed area.

Grazing severity should be recorded as none, low, moderate, or high using the following criteria (BLM 1996):

1. None: 0–5 percent utilization. The key species show no evidence of grazing use or negligible use.

2. Low: 5–40 percent utilization. The key species may be topped, skimmed, or grazing in patches. Between 60 and 95 percent of current seed stalks remain intact. Young plants are undamaged.
3. Moderate: 40–60 percent utilization. Approximately half of the available forage (by weight) on key species appears to have been utilized. Fifteen to 25 percent of current seed stalks remain intact.
4. High: 60–100 percent utilization. Approximately 60 percent or more of the available forage on key species appears to have been utilized. Less than 10 percent of the current seed stalks remain. Shoots of rhizomatous grasses are missing. There may be indications of repeated use. There may be no evidence of reproduction or current seed stalks. The remaining stubble may be at the same level of the soil surface.

If there is evidence of grazing, the wildlife, wild horse, and/or livestock usage is identified based on fecal matter present on the site and should be recorded as one of the following:

1. Wildlife
2. Livestock
3. Wild horses
4. All
5. Unknown

Based on the field evaluation, monitoring personnel will recommend any necessary reclamation maintenance. During annual monitoring, crews should establish one permanent photo point at each site and record the location using GPS. At each photo point, field personnel should take five photographs: four standing at the photo point and facing in each of the cardinal directions and one close-up of the soil surface from approximately 1.5 meters above. Field personnel should also take additional photographs that document any unusual conditions. These include, but are not limited to, distinct areas within the location where re-vegetation has failed, weed infestations, high grazing use, soil crusting, salt precipitation, and uncommon plant species.

Monitoring should also evaluate soil erosion characteristics using the Erosion Condition Classification System (reference), which includes the following:

1. Site aspect
2. Slope gradient (percent) range
3. Photographs and notes
4. Rills (small erosion rivulets)
5. Gullies
6. Flow patterns
7. Pedestals
8. Surface rock fragments
9. Surface litter
10. Soil movement

When a disturbance is not in the stable category using this method, monitoring crews should note observations on erosion features present and make recommendations for corrective actions.

Reclamation Reporting

Operators will submit results of disturbed area tracking, annual monitoring, and reclamation implementation/maintenance to the BLM on an annual basis by December 1st for the previous year..

Operators will provide the BLM with a GIS layer of all disturbance areas on an annual basis, due on December 1st. The GIS data layer will be accompanied by metadata sufficient to describe the data attributes, coordinate system, and methods. Attributes included in the data layer will include:

1. Location name
2. Unique identifier

3. Operator
4. Type of disturbance (well pad, seeded area, roads, pipelines, etc.)
5. Disturbance data
6. Area
7. Reclamation stage (not reclaimed, interim reclamation, final reclamation)

Monitoring results should be provided to the BLM annually by each Operator in a tabular, digital format and must include the following information:

1. Location name
2. Unique identifier
3. Operator
4. Date of most recent monitoring
5. Method of sampling vegetation
6. Percent basal vegetation cover of grass, forbs, shrubs, weeds, and cover crops on site
7. Percent litter, rock, and bare ground cover on site
8. Percent basal vegetation cover or grass, forbs, and shrubs off site
9. Percent litter, rock, and bare ground cover off site
10. Recommended reclamation maintenance

Operators will calculate the following from the above data:

1. On site desirable basal cover (Grass + Forb + Shrub)
2. Off site desirable basal cover (Grass + Forb + Shrub)
3. Basal cover of disturbed area vegetation as percent of basal cover of undisturbed vegetation
    - (Disturbed Area Grass+ Forb + Shrub basal cover)/(Undisturbed Area Grass + Forb + Shrub basal cover)

To request concurrence from the BLM that a location or multiple locations meet reclamation success criteria, Operators should prepare a separate report. Monitoring data must show that the location has met reclamation success criteria for at least three consecutive years. This report must be provided to the BLM by December 1st for the previous year's locations, and should discuss the Operator's reasoning and provide site specific data and photographs. This will include vegetation monitoring data to the species level.

For reclamation earthwork, the following will be reported:

General	WYW# (Oil and Gas Lease or ROW)
	Project Name
	Project Type (Well, Access Road, Pipeline, Facility, etc.)
	Qtr/Qtr Sec, T, R, County, State
Disturbance	Disturbance Dates
	Start-End
Reclamation	Reclamation Type (Interim/Final)
	Earthwork Contractor Name
	Earthwork & Topsoil Completion Date
	Soil Preparation Ripping Depth
	Area (Acres or Square Feet)

Seeding	Seeding Contractor Name
	Seeding Date
	Seedbed Preparation Methods (Disc, Harrow, Depths)
	Seeding Method (Drill, Broadcast, Depths)
	Copy of Seed Tag (Species %, Purity %, Germination %)
	Actual Seeding Rate (Lbs/Acre)
	Area Seeded (Acres or Square Feet)
Other	Soil Amendments Used (Describe)
	Mulching/Erosion Netting/Tackifier
	Fenced Location
	Snow Fencing
Weeds	Type(s) of Weed Treated
	Weed Contractor Name
	Contractor License #
	Weed Treatment Date
	Weed Treatment Type (Chemical, Mechanical)
	Chemicals Used and Rates Applied
	Area Treated (Acres or Square Feet) (GIS Extent and Location)
Inspection	Inspector's Name, Company, ID
	Inspection Date
	Time After Seeding
	Seedlings/Square Feet Growing
	% and Extent of Bare Soil
	% Ground Cover (Describe)
	% Desirable Species (Describe)
	% Noxious/Invasive Weeds (Describe)
	Erosion Features Present? (Describe)
	Evidence of Livestock Grazing (Describe)
	Reclamation Successful (Yes/No)
Reporting	Completed Spreadsheet or Database
	GIS Layer With Attribute Table With Site Data as Detailed
	Detail Disturbance Extent and Location
Monitoring	Permanent Reference Point
	Reference Photos
	Close-Up Photos
Future Management Prescription	Reseeding
	Weed Control Needed
	Erosion control Needed
	Grazing/Predation Issues
	Other Cultural or Mechanical Needs

PART IV: RECLAMATION OF ROADS AND PIPELINES

Information Specific to Roads and Pipelines

To minimize disturbance associated with roads and pipelines, pipeline corridors would be partially contained within the road Right-of-Way (ROW) corridors, where practical. In addition, existing roads within the CD-C project area will be utilized to the maximum extent practical. Where roads and/or pipelines cross drainages, construction and installation operations would be designed to protect drainages and timed to coincide with periods of low flow (late summer, fall, or winter). Crossings would be perpendicular to flow, and removal and disturbance of riparian vegetation would be minimized. These areas would be disturbed in consultation with the U.S. Army Corps of Engineers (COE), when necessary, and reclamation of these areas would occur in accordance with COE requirements.

New roads would follow natural contours and would be constructed in accordance with BLM road standards (BLM 1991). Surface runoff control would be incorporated into all road designs in accordance with BLM standards and would be approved by the BLM. Road grades, ditches, culverts, sediment traps, material cuts and fills, and topsoil and spoil material storage areas would be designed and located in the field prior to construction. Road culvert locations and spacing would be approved by the BLM prior to construction and would be in accordance with BLM standards.

When constructing and reclaiming pipelines, existing crowned and ditched roads would be used for access, where practical, to minimize surface disturbance. Pipelines would follow new or existing roads or other pipelines, wherever practical. Pipeline trenches would not be placed in access road borrow ditches unless no other reasonable locations are available. Clearing of pipeline ROWs would be accomplished with the least amount of disturbance necessary. No construction activities would be allowed when soils are saturated or frozen without prior approval from the BLM.

APPENDIX F: WATER RESOURCES SUPPORTING DATA

WEPP Model F-106

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Table F-1. BLM rain gage yearly precipitation averages (gages within and adjacent to the CD-C project area)

Name	Location	Record	Minimum (inches)	Maximum (inches)	Average (inches)
Adams	SWSW Section 11 T17N: R92W	1987 - 2010	4.58	12.91	8.52
Creston	SESE Section 22 T20N: R92W	1986 - 1996, 1998 - 2010	4.95	11.70	7.96
Cyclone Rim	SWSW Section 36 T25N: R96W	1986 - 2010	2.51	8.08	5.04
Echo Springs	NENE Section 6 T17N: R92W	1961 - 1970, 1974 - 2010	4.03	14.74	7.57
Flat Top	SESW Section 31 T15N: R93W	1974 - 1983, 1985 - 2003, 2005 - 2010	3.73	14.50	9.28
LaClede	SWSW Section 30 T18N: R93W	1987 - 2010	3.57	9.26	6.66
Little Robber	SWSW Section 7 T14N: R91W	1961 - 1971, 1974 - 1987, 1989 - 2010	4.28	15.14	9.59
Man and Boy	SESW Section 2 T17N: R95W	1963 - 1964, 1966 - 1972, 1974 - 1976, 1978 - 1982, 1984 - 1988, 1990 - 2010	3.85	10.74	7.14
Mexican Graves	NWSE Section 22 T16N: R93W	1961, 1964 - 1968, 1970 - 1972, 1974 - 1983, 1985 - 1986, 1988 - 2010	5.04	13.33	7.74
Mud Springs	NESW Section 7 T22N: R91W	1986 - 2010	3.55	9.27	6.52
North Tipton	SESW Section 21 T21N: R96W	1987, 1989 - 1994, 1996 - 2002, 2004 - 2010	3.38	8.62	6.24
Tipton	NESE Section 36 T19N: R96W	1986 - 1991, 1993 - 2010	4.50	11.07	8.44
Willow Creek	NWNE Section 32 T16N: R94W	1980 - 1981, 1983, 1986 - 1993, 1997 - 2010	3.16	12.10	7.35
		Average for all Gages =			**7.54**
		Minimum Average for all Gages =			**3.93**
		Maximum Average for all Gages =			**11.65**

Table F-2. Flow statistics from USGS gaging stations located within and adjacent to the CD-C project area

Station Name	Station Number	Drainage Area (sq. mi.)	Period of Record	Mean Flow[1] (cfs)	Mean Annual Runoff (ac-ft/yr)	Median Flow[2] (cfs)	Min. Flow[2] (cfs)	Max. Flow (cfs) Date
Upper Green Basin (HUC 140401)								
Bitter Creek	09216545	308	7/1975 – 9/1981	3.7	2,773	1.0	0	333 7/25/1975
White-Yampa Basin (HUC 140500)								
Little Snake River near Dixon	09257000	988	10/1/1910 - 9/30/1923 10/1/1938 – 9/30/1971 4/1/1972 – 9/30/1997[4]	514	372,355	100	0	10,400 5/16/1984
Muddy Creek near Baggs	09259000	1,257 (1,187)[3]	10/1/1987 - 9/30/1991	14.8	10,675	2.8	0.03	632 3/23/1988
Muddy Creek below Young Draw near Baggs	09258980	1,150	4/17/2004 - 2/15/2011	18.0	13,066	1.1	0.07	499 3/8/2007
Great Divide Basin (HUC 140402)								
Separation Creek near Riner	09216527	53	10/1/1975 - 9/30/1981	1.8	1,300	0	0	76 4/20/1980
Separation Creek at upper station near Riner	09216525	42	7/1/1975 - 9/30/1975	1.3	na	0.8	0.5	21 9/11/1975

[1] *Over period of record (cubic feet per second)*
[2] *Of mean daily values.*
[3] *Contributing drainage area.*
[4] *Daily flow measurements were only made from April through October during this time; not included in calculation of mean or median flow.*

Source: USGS 2007a,,USGS 2011a

Table F-3. Surface water rights and use within 1 mile of the CD-C project area

SEO Designation (As Assigned)	Surface Water Rights
Stock	277
Irrigation; Stock	13
Irrigation	12
Fish Propogation; Stock; Wetlands	7
Reservoir Supply	6
Domestic	4
Fish Propogation; Stock; Wetlands; Combined Beneficial Use	4
Stock; Wetlands	3
Stock; Wetlands; Combined Beneficial Use	3
Industrial; Stock	3
Industrial; Stock; Temporary, Combined Beneficial Use	3
Drilling; Industrial; Oil Refining/Production; Temporary	1
Fish Propogation	1
Fish Propogation; Flood Control; Stock	1
Fish Propogation; Recreation; Stock; Combined Beneficial Use	1
Fish Propogation; Stock; Combined Beneficial Use	1
Industrial; Irrigation; Stock	1
Irrigation; Reservoir Supply	1
Irrigation; Reservoir Supply; Stock	1
Irrigation; Stock	1
Reservoir Supply; Stock	1
Wetlands	1
Wildlife	1
Total	**347**
Use Included in in SEO Designation	**Surface Water Rights**
Stock	317
Irrigation	29
Wetlands	7
Fish Propogation	11
Reservoir Supply	9
Industrial	8
Domestic	4
Temporary	4
Wildlife	1
Oil Refining/Production	1
Flood Control	1
Recreation	1
Total [1]	**393**

[1] *Total (456) exceeds the number of permitted surface water rights (383) since individual rights may have multiple uses.*
Source: SEO 2014

Table F-4. Surface water rights within 1 mile of the CD-C project area

WR Number	Priority Date	Status	Company / Individual	Facility Name	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Source Name	Latitude	Longitude
P10131.0S	03/02/1981	Complete		P. H. FOURTEEN STOCK RESERVOIR	STO	018N	091W	11	NE1/4 NE1/4	2.7	PH Fourteen Draw	41.555725	-107.606017
P10132.0S	03/02/1981	Complete		CHICKEN SPRINGS STOCK RESERVOIR	STO	018N	091W	21	SW1/4 SE1/4	0.6	Chicken Spring Wash	41.516717	-107.650478
P10136.0S	03/02/1981	Complete		PH TWELVE STOCK RESERVOIR	STO	019N	091W	25	SW1/4 SE1/4	0.5	PH Twelve Draw	41.586861	-107.593697
P10137.0S	03/02/1981	Complete		FILLMORE CREEK STOCK RESERVOIR	STO	019N	091W	35	SW1/4 SE1/4	1.4	Fillmore Creek	41.573797	-107.610003
P10217.0R	09/07/1995	Fully Adjudicated		Upper Dike Reservoir	STO; WET; COMBBU	016N	092W	05		37.4	Muddy Creek	41.385605	-107.767137
P10218.0R	09/07/1995	Fully Adjudicated	`	Middle Dike Reservoir	STO; WET; COMBBU	016N	092W	05		40.2	Muddy Creek	41.389323	-107.774347
P10219.0R	09/07/1995	Fully Adjudicated		Lower Dike Reservoir	STO; WET; COMBBU	016N	092W	05	SW1/4 SW1/4	159.0	Muddy Creek	41.380980	-107.780422
P10282.0S	10/05/1987	Complete		44 RANCH PIT NO. 2 NP STOCK RESERVOIR	STO	020N	092W	30	SE1/4 SW1/4	4.7	Kerry's Cove	41.674736	-107.808875
P10283.0S	10/05/1987	Complete	USDI - BLM	TIPTON ROAD WELL PIT.	STO	020N	096W	06	SE1/4 NE1/4	2.3	SCARLET SAHARA DRAW	41.739847	-108.261183
P10286.0S	10/05/1987	Complete		44 RANCH STOCK RESERVOIR	STO	020N	092W	22	NE1/4 NE1/4	3.7	Ollie's Draw	41.700003	-107.741703
P10331.0S	10/05/1987	Complete		BIG ROBBER DETENTION DAM NO. 1 STOCK RESERVOIR	STO	014N	092W	17	NE1/4 NW1/4	2.5	Muddy Crown Draw	41.190075	-107.776450
P10333.0S	10/05/1987	Complete		ADAM'S PIT NO. 2 STOCK RESERVOIR	STO	018N	094W	20	NW1/4 SW1/4	2.3	RED MIRAGE DRAW	41.519933	-108.023797
P10338.0S	10/08/1987	Complete		ADAM'S PIT NO. 1 STOCK RESERVOIR	STO	017N	094W	06	SE1/4 NW1/4	3.1	North Barrel Springs Draw	41.480169	-108.037661
P10350.0S	12/07/1987	Complete		PIT 1795 A STOCK RESERVOIR	STO	017N	095W	14	SE1/4 NW1/4	0.3	Little Rose Draw	41.452756	-108.074686
P10505.0S	09/30/1988	Complete	PH LIVESTOCK CO	NIELS STOCK RESERVOIR	STO	021N	092W	25	NW1/4 NW1/4	4.4	Barren Draw	41.767910	-107.754590
P10506.0S	09/30/1988	Complete	PH LIVESTOCK CO	CRESTON STOCK RESERVOIR	STO	021N	092W	27	SE1/4 NW1/4	5.7	Creston Draw	41.764770	-107.790320
P1051.0S	01/11/1955	Complete	EUREKA SHEEP CO	EUREKA #7 STOCK RESERVOIR	STO	017N	093W	17	SW1/4 NW1/4	2.7	North Barrel Springs	41.451150	-107.908019
P10521.0S	12/19/1988	Complete		LOWER WINDMILL	STO	016N	093W	17	NE1/4 SW1/4	0.2	Folly Draw	41.356078	-107.889339
P10522.0S	12/19/1988	Complete		LACLEDE NO. 2 STOCK RESERVOIR	STO	017N	093W	26	SE1/4 SW1/4	1.2	Barrell Springs Draw	41.412928	-107.846672
P10523.0S	12/19/1988	Complete		MEXICAN GRAVES STOCK RESERVOIR	STO	016N	093W	19	SE1/4 NW1/4	2.8	Herder Draw	41.346606	-107.910250

Table F-4. Surface water rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company / Individual	Facility Name	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Source Name	Latitude	Longitude
P10525.0S	12/19/1988	Complete		BIG FLAT STOCK RESERVOIR	STO	017N	093W	12	SE1/4 SE1/4	0.4	Cloverleaf Ridge Draw	41.456881	-107.816319
P10527.0R	05/05/1997	Unadjudicated		Wamsutter Saltwater Disposal No. 2 Reservoir	IND_SW; TEM; COMBBU	019N	094W	13	NW1/4 NW1/4	42.0	Dry Lake Bed (closed basin)	41.628796	-107.946825
P10528.0R	05/05/1997	Unadjudicated		Wamsutter Saltwater Disposal No. 3 Reservoir	IND_SW; TEM; COMBBU	022N	094W	35	SW1/4 NW1/4	7.5	Monument Lake (A closed basin)	41.836891	-108.006100
P10530.0S	12/19/1988	Complete		FIELD CHECK STOCK RESERVOIR	STO	021N	092W	21	NW1/4 NE1/4	0.5	Farmer Draw	41.782342	-107.802925
P10546.0R	07/08/1997	Fully Adjudicated		Red Wash #2 Wetland Reservoir	FIS; STO; WET; COMBBU	016N	092W	32	SW1/4 NE1/4	143.4	Little Snake River	41.316702	-107.771917
P10547.0R	07/08/1997	Fully Adjudicated		Red Wash #3 Wetland Reservoir	FIS; STO; WET; COMBBU	016N	092W	32	SW1/4 NE1/4	8.1	Little Snake River	41.316702	-107.771917
P10548.0R	07/22/1997	Fully Adjudicated		Red Wash #1 Wetland Reservoir	FIS; STO; WET; COMBBU	016N	092W	29	SE1/4 SW1/4	39.7	Little Snake River	41.323955	-107.776725
P10549.0R	07/22/1997	Fully Adjudicated		Red Wash #4 Wetland Reservoir	FIS; STO; WET; COMBBU	016N	092W	31	NE1/4 NE1/4	21.4	Flats Draw	41.320326	-107.786339
P10558.0S	12/29/1988	Complete		LEAKY STOCK RESERVOIR	STO	017N	092W	32	SW1/4 NW1/4	6.0	Leaks Draw	41.405525	-107.794033
P10559.0S	12/29/1988	Complete		SOUTH ECHO NO. 2 STOCK RESERVOIR	STO	018N	092W	28	SW1/4 SE1/4	3.5	Echo Draw	41.501108	-107.762650
P10560.0S	12/29/1988	Complete		WEST DOTY NO. 4 STOCK RESERVOIR	STO	017N	093W	10	SW1/4 SE1/4	16.1	Swigger Draw	41.458047	-107.860344
P10564.0S	12/29/1988	Complete		PIT 1694 #1 STOCK RESERVOIR	STO	016N	094W	27	NE1/4 SE1/4	0.9	Wild Rube Draw	41.327186	-107.955889
P10675.0S	03/31/1989	Complete		HORSE BUTTE STOCK RESERVOIR	STO	019N	091W	06	SE1/4 NE1/4	1.0	No Job Draaw	41.651342	-107.683461
P10676.0S	03/31/1989	Complete		NORTH CRESTON NO. 4 STOCK RESERVOIR	STO	021N	091W	28	SW1/4 SW1/4	14.0	South Creston Draw	41.756519	-107.696789
P10699.0S	03/31/1989	Complete		COAL GULCH NO. 2 STOCK RESERVOIR	STO	018N	093W	26	SW1/4 SW1/4	0.9	Coal Gulch	41.501939	-107.851258
P10710.0S	05/17/1989	Complete		QUIT CLAIM STOCK RESERVOIR	STO	017N	092W	08	SE1/4 NW1/4	3.2	Quit Draw	41.463933	-107.791078
P10711.0S	05/17/1989	Complete		UPPER COAL GULCH STOCK RESERVOIR	STO	018N	092W	22	NW1/4 NW1/4	1.5	South Fork Coal Gulch	41.526914	-107.754889
P10712.0S	05/17/1989	Complete		BACKBONE STOCK RESERVOIR	STO	020N	092W	20	NE1/4 NE1/4	1.7	Latham Draw	41.701097	-107.778683

Table F-4. Surface water rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company / Individual	Facility Name	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Source Name	Latitude	Longitude
P10713.0S	05/17/1989	Complete		SUGAR LOAF STOCK RESERVOIR	STO	018N	092W	04	NW1/4 SW1/4	0.7	Sugar Wash	41.562989	-107.773814
P10779.0S	05/17/1989	Complete		LOWER COAL BANK STOCK RESERVOIR	STO	018N	093W	10	SE1/4 SW1/4	2.5	Lower Coal Bank Wash	41.543936	-107.864592
P10780.0S	05/17/1989	Complete		SOUTH ECHO #4 STOCK RESERVOIR	STO	018N	092W	18	NE1/4 NE1/4	0.3	North Divide Draw	41.542008	-107.798747
P10867.0S	01/24/1990	Complete		CLAY FLAT STOCK RESERVOIR	STO	016N	093W	01	NE1/4 NW1/4	1.3	Doty Draw	41.397311	-107.814331
P10869.0S	01/24/1990	Complete		1795 B STOCK RESERVOIR	STO	017N	095W	22	NE1/4 SE1/4	0.9	Trail Wash	41.433492	-108.085331
P10872.0S	01/24/1990	Complete		CENTER STOCK RESERVOIR	STO	014N	093W	10	SE1/4 SW1/4	1.0	Upper Hangout Draw	41.193183	-107.852583
P10873.0S	01/24/1990	Complete		TIP TOP STOCK RESERVOIR	STO	014N	093W	13	NW1/4 NE1/4	1.0	Upper Top Draw	41.189650	-107.807400
P10876.0S	01/24/1990	Complete		LATHAM STOCK RESERVOIR	STO	021N	092W	02	NW1/4 NW1/4	1.2	Basin Draw	41.827300	-107.774192
P10877.0S	01/24/1990	Complete		HORSE PASTURE DRAW STOCK RESERVOIR	STO	019N	093W	26	NE1/4 SW1/4	2.5	Horse Pasture Draw	41.592486	-107.845828
P10878.0S	01/24/1990	Complete		POWERLINE PIT STOCK RESERVOIR	STO	019N	095W	20	NW1/4 NE1/4	1.4	Powerline Wash	41.613664	-108.129231
P10879.0S	01/24/1990	Complete		FIVE MILE STOCK RESERVOIR	STO	021N	095W	35	NW1/4 SW1/4	1.1	Five Mile Draw	41.745442	-108.122756
P11011.0S	07/12/1990	Complete		SOUTH BALDY BUTTE STOCK RESERVOIR	STO	017N	092W	14	SE1/4 SE1/4	2.4	Baldy Draw	41.444056	-107.722608
P11012.0S	07/12/1990	Complete		WEST DOTY #5 STOCK RESERVOIR	STO	017N	092W	20	SW1/4 SE1/4	1.4	Doty No. 2 Draw	41.427642	-107.785767
P11013.0S	07/12/1990	Complete		WEST DOTY #2 STOCK RESERVOIR	STO	017N	093W	36	NE1/4 NE1/4	17.7	Big Doty Draw	41.410847	-107.817572
P11027.0S	06/04/1990	Complete		IRRIGATION DITCH STOCK RESERVOIR	STO	016N	092W	21	NW1/4 SW1/4	0.2	East Fork Muddy Creek	41.342958	-107.763722
P11029.0S	06/04/1990	Complete		NORTHWEST BORDER STOCK RESERVOIR	STO	016N	092W	34	NW1/4 NW1/4	1.4	Northwest Border Draw	41.320331	-107.743108
P11061.0S	08/09/1990	Complete		ELECTRIC WELL STOCK RESERVOIR	STO	017N	092W	34	NE1/4 NE1/4	1.6	Upper Electric Well Draw	41.410444	-107.740633
P11069.0S	09/06/1990	Complete		BADWATER #11 STOCK RESERVOIR	STO	018N	091W	28	SE1/4 NW1/4	0.7	Lower Chicken Springs Wash	41.507689	-107.651883
P11070.0S	09/06/1990	Complete		BADWATER #10 STOCK RESERVOIR	STO	018N	091W	22	SW1/4 SW1/4	0.5	Chicken Spring Wash	41.514856	-107.640858
P11074.0S	09/06/1990	Complete		BADWATER #13 STOCK RESERVOIR	STO	018N	091W	30	SE1/4 SE1/4	1.9	Upper Badwater Draw	41.501550	-107.682644
P11109.0S	08/23/1990	Complete		SOUTH ECHO #1 STOCK RESERVOIR	STO	018N	092W	30	SE1/4 SE1/4	2.5	Upper Echo Draw	41.499572	-107.796903

Table F-4. Surface water rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company / Individual	Facility Name	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Source Name	Latitude	Longitude
P11127.0R	04/12/2001	Complete	SAMSON RESOURCES CO`	CRYSTAL SOLUTIONS FTE RESERVOIR	IND_SW; IRR_SW; STO	019N	093W	19	SW1/4 SE1/4	0.0	Adams Draw	41.602578	-107.917344
P11131.0S	09/06/1990	Complete		KARO STOCK RESERVOIR	STO	024N	096W	35	SE1/4 SE1/4	0.7	Lost Draw	42.003725	-108.222803
P11158.0S	11/01/1990	Complete		SALISBURY STOCK RESERVOIR	STO	017N	092W	25	SW1/4 NE1/4	3.3	Salisbury Draw	41.422110	-107.706760
P11159.0S	11/01/1990	Complete	WEBER RANCH INC	TREE STOCK RESERVOIR	STO	017N	092W	19	SW1/4 NW1/4	4.4	Little Coal Gulch	41.433990	-107.805570
P11312.0S	09/11/1991	Complete		BADWATER #3 STOCK RESERVOIR	STO	019N	091W	30	SW1/4 SW1/4	2.3	North Divide Draw	41.586864	-107.696731
P11313.0S	09/11/1991	Complete		EXCLOSURE STOCK RESERVOIR	STO	013N	092W	03	NW1/4 NE1/4	3.8	Dogleg Draw	41.132028	-107.732278
P11314.0S	09/11/1991	Complete		SOUTH FLAT TOP #2 STOCK RESERVOIR	STO	014N	092W	33	NW1/4 SW1/4	7.5	Dogleg Draw	41.139336	-107.762311
P11315.0S	09/11/1991	Complete		SOUTH FLAT TOP STOCK RESERVOIR	STO	014N	093W	24	SW1/4 SE1/4	1.0	Nubs Draw	41.163206	-107.810683
P11316.0S	09/11/1991	Complete		MEXICAN FLATS STOCK RESERVOIR	STO	016N	093W	33	SW1/4 SE1/4	8.8	Mexican Flats Draw	41.308575	-107.868572
P11322.0S	09/04/1991	Complete		BIG ROBBER STOCK RESERVOIR	STO	014N	092W	08	SE1/4 NW1/4	4.3	Robber Flat Draw	41.200925	-107.776575
P11323.0S	09/04/1991	Complete		LITTLE ROBBER STOCK RESERVOIR	STO	014N	092W	12	SE1/4 SW1/4	0.5	Robbers Playa Draw	41.193628	-107.699978
P11324.0S	09/04/1991	Complete		WILD HORSE STOCK RESERVOIR	STO	014N	092W	15	NW1/4 NE1/4	15.8	Wagner Gulch	41.191022	-107.731825
P11325.0S	09/04/1991	Complete		DETENTION 1492-3 STOCK RESERVOIR	STO	014N	092W	26	SE1/4 SE1/4	5.4	Rattle Draw	41.151136	-107.709367
P11326.0S	09/04/1991	Complete		DETENTION 1492 #1 STOCK RESERVOIR	STO	014N	092W	28	NW1/4 NE1/4	1.8	North Fork Cottonwood Creek	41.161589	-107.753622
P11327.0S	09/04/1991	Complete		STANDARD ROAD STOCK RESERVOIR	STO	015N	092W	05	SE1/4 NW1/4	2.4	Glenarm Creek	41.301536	-107.775589
P11328.0S	09/04/1991	Complete		SOUTH BARREL #5 STOCK RESERVOIR	STO	015N	092W	07	NW1/4 NW1/4	1.4	South Barrel Draw	41.293069	-107.801536
P11329.0S	09/04/1991	Complete		SOUTH MUDDY #2 STOCK RESERVOIR	STO	015N	092W	11	NW1/4 NW1/4	1.7	Highway Mud Wash	41.291411	-107.723906
P11330.0S	09/04/1991	Complete		DETENTION 1592-2 STOCK RESERVOIR	STO	015N	092W	28	SE1/4 SW1/4	6.9	Bunny Drop Draw	41.235939	-107.758214
P11331.0S	09/04/1991	Complete		JUNIPER RIDGE STOCK RESERVOIR	STO	016N	092W	10	NE1/4 NE1/4	0.2	Juniper Ridge Draw	41.378319	-107.728694
P11332.0S	09/04/1991	Complete		MORGAN STOCK RESERVOIR	STO	014N	093W	14	NE1/4 NW1/4	1.9	Morgan Draw	41.189600	-107.832511

Table F-4. Surface water rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company / Individual	Facility Name	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Source Name	Latitude	Longitude
P11333.0S	09/04/1991	Complete		SW FLAT TOP STOCK RESERVOIR	STO	014N	093W	15	SW1/4 NE1/4	1.2	Flat Out Draw	41.187308	-107.849514
P11336.0S	09/04/1991	Complete		SOUTH BARREL #4 STOCK RESERVOIR	STO	015N	093W	15	SE1/4 SE1/4	1.4	Upper Painted Draw	41.266369	-107.843794
P11338.0S	09/04/1991	Complete		FLAT TOP #1 STOCK RESERVOIR	STO	015N	093W	27	SW1/4 NE1/4	3.3	Twin Draw	41.246372	-107.848403
P11339.0D	08/28/1911	Fully Adjudicated		Hay Ditch No. 1	IRR_SW; STO	024N	097W	35	NE1/4 SE1/4	0.0	Red Creek	42.006979	-108.342453
P11340.0D	07/09/1912			Hay Ditch No. 2	IRR_SW; STO	024N	097W	35	NE1/4 SE1/4	0.0	Red Creek	42.006979	-108.342453
P11340.0S	09/04/1991	Complete		SOUTH BORDER STOCK RESERVOIR	STO	016N	093W	35	NW1/4 SW1/4	2.3	South Barrel Springs Draw	41.313606	-107.838178
P11341.0D	07/09/1912	Fully Adjudicated		Bush Creek Ditch	IRR_SW; RES	024N	097W	12	NW1/4 NW1/4	0.0		42.073792	-108.338028
P11346.0S	09/09/1991	Complete		FILLMORE BEND STOCK RESERVOIR	STO	019N	091W	26	SE1/4 NW1/4	2.6	Fillmore Creek	41.594361	-107.616183
P11347.0S	09/09/1991	Complete		BADWATER #5 STOCK RESERVOIR	STO	019N	091W	32	NW1/4 SW1/4	1.1	Bad Water Creek	41.577736	-107.678800
P11348.0S	09/09/1991	Complete		LAZY YS STOCK RESERVOIR	STO	019N	092W	04	NW1/4 NW1/4	0.4	County Line Draw	41.657800	-107.777247
P11355.0S	09/09/1991	Complete		BADWATER #8 STOCK RESERVOIR	STO	018N	091W	20	SE1/4 SW1/4	1.4	South Divide Wash	41.516067	-107.673050
P11356.0S	09/09/1991	Complete		BADWATER #14 STOCK RESERVOIR	STO	018N	091W	30	SE1/4 NE1/4	0.1	Upper Badwater Draw	41.508819	-107.682661
P11358.0S	09/09/1991	Complete		MCINTOSH STOCK RESERVOIR	STO	013N	093W	02	NW1/4 NE1/4	4.3	McINtosh Draw	41.132283	-107.828972
P11360.0S	09/09/1991	Complete		WINDMILL DRAW STOCK RESERVOIR	STO	016N	094W	25	NE1/4 NW1/4	2.3	Herder Draw	41.335772	-107.928886
P11367.0R	05/31/2002	Complete		RED WASH #5 WETLAND RESERVOIR	FIS; STO; WET	016N	092W	32	SE1/4 NE1/4	0.0	Muddy Creek	41.316172	-107.767331
P11367.0S	09/09/1991	Complete		WEST 44 - ECHO STOCK RESERVOIR	STO	019N	093W	36	NE1/4 NE1/4	0.4	Standard Draw	41.584119	-107.815139
P11368.0S	09/09/1991	Complete		DRY LAKE STOCK RESERVOIR	STO	019N	094W	26	SE1/4 SE1/4	1.8	Spring Pit Draw	41.588720	-107.951610
P11369.0S	09/09/1991	Complete		TINY DRAW STOCK RESERVOIR	STO	019N	097W	26	NE1/4 NE1/4	1.6	Tiny Draw	41.599969	-108.294433
P11370.0S	09/09/1991	Complete		SOUTH WAMSUTTER STOCK RESERVOIR	STO	019N	094W	22	NE1/4 SW1/4	2.5	South Wamsutter Rim Draw	41.606810	-107.980450
P11760.0R	05/27/2004	Complete		DUCK POND #5 RESERVOIR	FIS; STO; WET	016N	092W	08	NW1/4 SW1/4	0.0	Muddy Creek	41.371236	-107.783519
P12670.0S	11/08/1995	Complete		OVERLAND #1	STO	017N	094W	14	SW1/4 SW1/4	1.4	Overland Trail Wash	41.443192	-107.963600

Table F-4. Surface water rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company / Individual	Facility Name	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Source Name	Latitude	Longitude
P12671.0S	11/08/1995	Complete		NILAND NO. 1	STO	016N	092W	35	NW1/4 SE1/4	0.4	One Draw	41.312092	-107.715881
P12672.0S	11/08/1995	Complete		PINE BUTTE	STO	017N	092W	10	NE1/4 SW1/4	3.3	Antelope Creek	41.459672	-107.749586
P12702.0R	10/31/2005	Complete	DOUBLE EAGLE PETROLEUM CO.	LSRCD SECTION 13 RESERVOIR		016N	093W	13	NE1/4 NW1/4	0.0	Blue Eagle Creek	41.364331	-107.814106
P12784.0S	03/22/1996	Complete		LOST CREEK RIM (6475)	STO	024N	096W	24	SW1/4 SW1/4	0.5	North Lonely Draw	42.032619	-108.217853
P12785.0R	11/24/2006	Complete	SAMSON RESOURCES	HOLDING POND 5-6 RESERVOIR	IND_SW	019N	093W	19	NW1/4 SE1/4	0.0	Adams Draw	41.606819	-107.918189
P12790.0S	03/22/1996	Complete		BUSH LAKE WATER (6257)	STO	024N	097W	12	NE1/4 NE1/4	0.5	Bush Lake	42.069169	-108.324903
P12791.0S	03/22/1996	Complete		SAND DUNE (6474)	STO	023N	097W	13	SE1/4 NE1/4	0.4	Red Sand Draw	41.968783	-108.325125
P12793.0S	03/22/1996	Complete		WASHOUT	STO	013N	092W	03	NE1/4 SE1/4	2.7	Dogleg Draw	41.124814	-107.728825
P12796.0S	03/22/1996	Complete		PRESIDIO (6256)	STO	024N	097W	26	NE1/4 SW1/4	0.4	Luman Butte Draw	42.023119	-108.352614
P12969.0S	10/17/1997	Fully Adjudicated		Barrel Springs Stock Reservoir	STO	018N	096W	25	SW1/4 NE1/4	4.0	Hansen Draw	41.507086	-108.170297
P13332.0R	07/03/2008	Complete		REDWASH NO. 6 WETLAND RESERVOIR	FIS; STO; WET	016N	092W	32	SE1/4 NW1/4	0.0	Muddy Creek	41.317283	-107.774719
P13377.0R	07/19/1996	Complete		DUCK POND NO. 4 RESERVOIR	WET	016N	092W	08	NW1/4 NW1/4	7.7	Muddy Creek	41.378019	-107.782753
P13446.0R	05/07/2009	Complete		ENLARGED WAMSUTTER EVAPORATION POND 2, CELLS 3 AND 4 RESERVOIR	IND_SW	022N	094W	35	SW1/4 NW1/4	0.0	Monument Lake (A closed basin)	41.836111	-108.004500
P13758.0S	02/01/2000	Complete	HOWARD B LEE FAMILY LP	LEE FAMILY #1 STOCK RESERVOIR		014N	092W	36	NE1/4 SW1/4	0.0	Lee Draw	41.139319	-107.700206
P15043.0D	03/26/1918			Savage Supply Ditch	RES; STO	021N	091W	28	NE1/4 SE1/4	0.0	South Creston Draw	41.761383	-107.682686
P15320.0D	12/29/1918	Unadjudicated		Supply Ditch	IRR_SW; STO	019N	095W	05	SE1/4 SE1/4	0.0	Red Wash Draw	41.645730	-108.122375
P16944.0D	03/07/1925			Eagle Nest Ditch	DOM_SW; IRR_SW; STO	024N	095W	03	NE1/4 NE1/4	0.0	Lost Creek	42.087545	-108.124426
P16959.0D	03/13/1925	Unadjudicated		Dew Ditch No. 1	IRR_SW	016N	092W	05	SE1/4 SW1/4	0.0	Muddy Creek	41.382175	-107.776014
P17152.0S	07/08/1994	Complete		WASHAKIE STOCK RESERVOIR	STK	017N	092W	05	SW1/4 NE1/4	1.5	Washakie Draw	41.478697	-107.786144

Table F-4. Surface water rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company / Individual	Facility Name	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Source Name	Latitude	Longitude
P17154.0S	07/08/1994	Complete		LSRCD/WEBER PIT #1 (WEST) STOCK RESERVOIR	STO	016N	092W	08		0.0	Muddy Creek	41.368806	-107.776311
P17155.0S	07/08/1994	Complete		LSRCD/WEBER PIT #2 (EAST) STOCK RESERVOIR	STO	016N	092W	08		0.0	Muddy Creek	41.368175	-107.773956
P17276.0S	07/26/2004	Complete		HICKS STOCK RESERVOIR	STO	014N	091W	32	SE1/4 SE1/4	3.3		41.135147	-107.652194
P18054.0S	03/20/2006	Complete		H & C #3 DAM STOCK RESERVOIR	STO	014N	091W	32		0.5	Impossible Draw	41.141081	-107.659361
P18265.0S	03/20/2006	Complete		CHANT #2 STOCK RESERVOIR	STO	013N	091W	05	NE1/4 SW1/4	1.2	Flute Draw	41.124769	-107.661769
P18716.0S	10/25/2007	Complete		PS-3 STOCK RESERVOIR	STO	016N	092W	28		10.5	PS-3 Draw	41.333064	-107.764081
P18862.0S	03/19/2008	Complete	USDI - BLM	MEXICAN FLATS PIT #1 STOCK RESERVOIR	STO	015N	092W	17	SW1/4 SE1/4	0.0	Soco Draw	41.266161	-107.771889
P19181.0S	03/02/2009	Complete	USDI - BLM	BOSS STOCK RESERVOIR	STO	015N	093W	34	SW1/4 SW1/4	0.0	Boss Draw	41.224319	-107.859500
P19495.0D	12/21/1940	Unadjudicated		Diversion Ditch	RES	021N	093W	27	NE1/4 SE1/4	0.0	Five Mile Draw	41.759650	-107.893863
P2339.0R	08/11/1911	Complete	SWEETWATER CATTLE CO	ENL HAY RESERVOIR	IRR_SW; STO	024N	097W	35	SE1/4 NE1/4	5846.6	Red Creek	42.011770	-108.343910
P25157.0D	08/11/1976	Unadjudicated		Siberia Ridge Unit Well #5 (Water Haul)	DRI; IND_SW; OIL; TEM	023N	096W	25	NW1/4 NW1/4	0.0	Lost Creek Draw	41.942215	-108.218117
P25633.0D	01/21/1977	Unadjudicated		Adams Portable Pump Irrigation System No. 1	IRR_SW	017N	092W	14	NE1/4 NW1/4	0.0	Muddy Creek	41.454389	-107.732955
P25634.0D	01/21/1977	Fully Adjudicated		Adams Portable Pump Irrigation System #2	IRR_SW	017N	092W	15	SE1/4 NE1/4	0.0	Muddy Creek	41.449464	-107.740288
P25635.0D	01/21/1977	Fully Adjudicated		Adams Portable Pump Irrigation System No. 3	IRR_SW	017N	092W	15	NW1/4 SE1/4	0.0	Muddy Creek	41.446482	-107.746797
P25636.0D	01/21/1977	Fully Adjudicated		Adams Portable Pump Irrigation System # 4	IRR_SW	017N	092W	15	SE1/4 SW1/4	0.0	Muddy Creek	41.443103	-107.751506
P3472.0R	03/26/1918	Incomplete	SAVAGE LIVESTOCK CO	SAVAGE RESERVOIR	STO	021N	091W	28	SE1/4 NE1/4	14.1	South Creston Draw	41.765030	-107.679990
P3834.0S	11/27/1961	Complete	P H LIVESTOCK CO.	HANSEN STOCK RESERVOIR	STO	018N	096W	09	SW1/4 SW1/4	1.8	Hansen Draw	41.543994	-108.237000
P4387.0S	08/22/1961	Complete		DALEY DAM STOCK RESERVOIR	STO	018N	096W	18	SE1/4 NW1/4	8.7	North Fork Bitter Creek	41.537892	-108.271539
P5071.0S	03/29/1965	Complete	PIONEER LIVESTOCK CO.	MONUMENT LAKE STOCK RESERVOIR	STO	022N	093W	31	SE1/4 NW1/4	1.0	MONUMENT L DRAW	41.837164	-107.961125

Table F-4. Surface water rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company / Individual	Facility Name	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Source Name	Latitude	Longitude
P5245.0R	02/10/1940	Complete	USDI DIVISION OF GRAZING	GOVERNMENT NO. 1 RESERVOIR	STO	018N	093W	17	SE1/4 NE1/4	98.6	Government Draw No. 1	41.537590	-107.892410
P547.0R	07/20/1904	Complete		HAY RESERVOIR	IRR_SW; STO	024N	097W	35	NE1/4 SE1/4	2480.0	Red Creek	42.009040	-108.341370
P5751.0S	12/12/1966	Complete	LOUIS LARSEN SHEEP CO.	PRONGHORN STOCK RESERVOIR	STO	022N	093W	05	NE1/4 NW1/4	1.9	East Fork Sourdough Gulch	41.912728	-107.943514
P6146.0D	07/20/1904	Fully Adjudicated		Hay Ditch	IRR_SW; STO	023N	097W	02	NW1/4 SW1/4	0.0	Red Creek	41.995344	-108.354645
P6453.0D	01/19/1905	Fully Adjudicated		Hay Supply Ditch	IRR_SW; RES; STO	024N	097W	14	NW1/4 NE1/4	0.0	Bush Creek	42.059323	-108.347738
P6486.0S	11/12/1969	Complete	USDI - BLM	PRICKLEY PEAR PIT STOCK RESERVOIR	STO	014N	091W	20	NE1/4 NE1/4	1.6	Prickley Pear Draw	41.175500	-107.652080
P6558.0S	12/08/1969	Complete	USDI - BLM	"V" SPREADER PIT STOCK RESERVOIR		014N	092W	01	NW1/4 SE1/4	0.9	Tom Draw	41.211740	-107.695120
P6563.0S	12/08/1969	Complete	USDI - BLM	POCKET STOCK RESERVOIR		014N	092W	29	SW1/4 NE1/4	2.0	Pocket Draw	41.158670	-107.771250
P6571.0S	12/10/1969	Complete	USDI - BLM	DIKE VIEW STOCK RESERVOIR	STO	014N	092W	32	NW1/4 NE1/4	2.0	Dike View Draw	41.146590	-107.771860
P6572.0S	12/10/1969	Complete	USDI - BLM	MEXICAN FLATS NO. 1 STOCK RESERVOIR	STO	016N	093W	29	NE1/4 SE1/4	1.3	Beatle Draw	41.327780	-107.880220
P6573.0S	12/10/1969	Complete	USDI - BLM	MEXICAN FLATS NO. 3 STOCK RESERVOIR		016N	093W	22	NE1/4 NE1/4	1.7	Tick Draw	41.351080	-107.843110
P6576.0S	12/10/1969	Complete	USDI - BLM	ROCKY RIDGE PIT STOCK RESERVOIR		014N	091W	05	SW1/4 SE1/4	2.0	Reef Draw	41.207450	-107.655930
P6578.0S	12/10/1969	Complete	USDI - BLM	TANGLED CHAIN PIT STOCK RESERVOIR		014N	091W	28	SW1/4 NE1/4	2.0	Impossible Draw	41.156680	-107.638250
P6632.0S	02/19/1970	Complete	USDI - BLM	HARDSHIP		014N	091W	21	SW1/4 NE1/4	4.4	Impossible Draw	41.171710	-107.636020
P6655.0S	03/09/1970	Complete	USDI - BLM	THUNDER		014N	091W	17	SW1/4 NE1/4	2.0	Thunder Draw	41.187860	-107.656800
P6656.0S	03/09/1970	Complete	USDI - BLM	BOTTLE	STO	014N	091W	08	SE1/4 NE1/4	1.2	Bottle Draw	41.201140	-107.652440
P6712.0S	04/27/1970	Complete	USDI - BLM	CONTINENTAL		018N	092W	12	NE1/4 NE1/4	2.2	Fan Draw	41.556530	-107.700930
P6713.0S	04/27/1970	Complete	USDI - BLM	EAST ECHO		019N	093W	14	SE1/4 SE1/4	2.8	Echo Springs Draw	41.616910	-107.837940
P6714.0S	04/27/1970	Complete	USDI - BLM	WEST ECHO		019N	093W	20	SE1/4 SE1/4	3.0	Echo Springs Draw	41.604650	-107.894820
P6715.0S	04/27/1970	Complete	USDI - BLM	NORTHWEST ECHO		019N	093W	06	NW1/4 NE1/4	3.2	Dry Lake Bed (closed basin)	41.657450	-107.919330
P6871.0S	01/25/1971	Complete	USDI - BLM	CEDAR STOCK RESERVOIR		016N	092W	09	NE1/4 NE1/4	0.9	South Cedar Draw	41.377620	-107.749160

Table F-4. Surface water rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company / Individual	Facility Name	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Source Name	Latitude	Longitude
P6914.0S	01/25/1971	Complete	USDI - BLM	MEXICAN FLATS NO. 2 STOCK RESERVOIR		016N	093W	17	NW1/4 NE1/4	1.3	Herder Draw	41.363710	-107.886240
P7346.0E	05/31/2002	Partially Adjudicated	USDI - BLM	RED WASH SECOND ENLARGEMENT OF Muddy Ditch	FIS	016N	092W	32	NE1/4 NE1/4	0.0	Muddy Creek	41.320333	-107.767117
P7403.0E	05/27/2004	Complete		DUCK POND #5	RES	016N	092W	05	NE1/4 NW1/4	0.0	Muddy Creek	41.395256	-107.777031
P7467.0R	06/21/1972	Unadjudicated		Seaverson Reservoir	FIS; REC; STO; COMBBU	019N	092W	24	NW1/4 NE1/4	335.8	FILLMORE/FILMORE CREEK	41.613470	-107.706787
P7598.0E	07/03/2008	Complete	LITTLE SNAKE RIVER CONSERVATION DISTRICT	REDWASH THIRD ENLARGEMENT OF Muddy Ditch	RES	016N	092W	20	SE1/4 NE1/4	0.0	Muddy Creek	41.345483	-107.766328
P7716.0S	06/26/1974	Complete	USDI - BLM	BARREL (INDEX #4370) STOCK RESERVOIR		017N	095W	02	NW1/4 NE1/4	4.4	North Barrel Springs Draw	41.483730	-108.071240
P7717.0S	06/26/1974	Complete	USDI - BLM	WEST FLATTOP (INDEX #4358) STOCK RESERVOIR		014N	093W	03	SE1/4 NW1/4	3.0	South Fork West Flattop Draw	41.215900	-107.852660
P7718.0S	06/26/1974	Complete	USDI - BLM	UPPER TWIN (INDEX #4355) STOCK RESERVOIR		015N	093W	33	SE1/4 NE1/4	3.0	Twin Draw	41.230390	-107.862190
P7719.0S	06/26/1974	Complete	USDI - BLM	UPPER PAINTED (INDEX #4354) STOCK RESERVOIR		015N	093W	22	SW1/4 SE1/4	2.7	Upper Painted Draw	41.252090	-107.847850
P7720.0S	06/26/1974	Complete	USDI - BLM	LOWER PAINTED (INDEX #4353) STOCK RESERVOIR		015N	093W	22	NW1/4 NW1/4	3.0	Lower Painted Draw	41.264080	-107.858230
P7721.0S	06/26/1974	Complete	USDI - BLM	BLUE GAP (INDEX #4319) STOCK RESERVOIR		015N	092W	23	NW1/4 NE1/4	3.8	Little Blue Gap Draw	41.262530	-107.714400
P7739.0S	06/24/1974	Complete		STRANBURG STOCK RESERVOIR	STO	022N	095W	33	SW1/4 NE1/4	1.5	Stranburg Draw	41.837383	-108.151053
P7740.0S	06/26/1974	Complete	USDI - BLM	ROCKY POINT (INDEX #4348) STOCK RESERVOIR		018N	096W	30	SW1/4 SE1/4	3.0	Laney Wash	41.501870	-108.263870
P7741.0S	06/26/1974	Complete	USDI - BLM	RED LAKE (INDEX #4342) STOCK RESERVOIR	STO	018N	094W	08	NE1/4 NE1/4	3.2	Corral Draw	41.556620	-108.009370
P7742.0S	06/26/1974	Complete	USDI - BLM	RED FLAT (INDEX #4341) STOCK RESERVOIR		019N	095W	36	NW1/4 SW1/4	3.0	Confusion Draw	41.577640	-108.061900

Table F-4. Surface water rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company / Individual	Facility Name	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Source Name	Latitude	Longitude
P7745.0S	06/26/1974	Complete	USDI - BLM	TWO DRAW (INDEX #4366) STOCK RESERVOIR		018N	095W	08	SW1/4 SE1/4	19.5	Upper Rim Draw	41.545010	-108.129700
P7746.0S	06/26/1974	Complete	USDI - BLM	FIVE COYOTE (INDEX #4352) STOCK RESERVOIR		015N	093W	21	NW1/4 SE1/4	5.1	Five Coyote Draw	41.257390	-107.869350
P7747.0S	06/26/1974	Complete	USDI - BLM	TOAD STOOL (INDEX #4321) STOCK RESERVOIR		013N	091W	04	NW1/4 SW1/4	7.2	Toad Stool Draw	41.125260	-107.647230
P7750.0S	06/26/1974	Complete	USDI - BLM	DELANEY RIM (INDEX #4369) STOCK RESERVOIR		018N	095W	26	SW1/4 NW1/4	2.4	East Wash	41.509070	-108.081310
P7753.0S	06/26/1974	Complete	USDI - BLM	NORTHEAST POINT (INDEX #4343) STOCK RESERVOIR		019N	095W	20	NW1/4 SW1/4	4.3	West Fork Northeast Wash	41.606390	-108.138860
P7754.0D	03/29/1907	Fully Adjudicated		Muddy Ditch	IRR_SW	016N	092W	20	SE1/4 NE1/4	0.0	Muddy Creek	41.345543	-107.766426
P7754.0S	06/26/1974	Complete	USDI - BLM	TORTILLA (INDEX #4344) STOCK RESERVOIR		019N	095W	30	NW1/4 NW1/4	2.0	Tortilla Draw	41.599050	-108.158450
P7760.0S	06/26/1974	Complete	USDI - BLM	TWELVEMILE (INDEX #4318) STOCK RESERVOIR		018N	093W	30	NW1/4 NE1/4	3.6	Coal Bank Lake Draw	41.513220	-107.919100
P7761.0S	06/26/1974	Complete	USDI - BLM	EIGHTMILE (INDEX #4317) STOCK RESERVOIR		018N	093W	06	NE1/4 SE1/4	3.8	Coal Bank Wash	41.564690	-107.915230
P7763.0S	06/26/1974	Complete	USDI - BLM	EAST RED DRAW (INDEX #4345) STOCK RESERVOIR		019N	095W	18	NE1/4 NW1/4	3.2	Middle Red Draw	41.627960	-108.153300
P7764.0S	06/26/1974	Complete	USDI - BLM	MIDDLE RED DRAW (INDEX #4346) STOCK RESERVOIR		019N	096W	24	SW1/4 NE1/4	3.6	Middle Red Draw	41.609870	-108.168440
P7765.0S	06/26/1974	Complete	USDI - BLM	WEST RED DRAW (INDEX #4347) STOCK RESERVOIR		019N	096W	22	SE1/4 SE1/4	3.6	West Red Draw	41.602720	-108.201970
P7775.0S	06/26/1974	Complete	USDI - BLM	LITTLE DRAW (INDEX #4368) STOCK RESERVOIR		017N	095W	36	SW1/4 NW1/4	2.8	Mulligan Draw	41.407910	-108.061930
P7776.0S	06/26/1974	Complete	USDI - BLM	BOY (INDEX #4367) STOCK RESERVOIR		017N	095W	16	NE1/4 NW1/4	5.5	Wild Rose Draw	41.454830	-108.114550
P7777.0S	06/26/1974	Complete	USDI - BLM	STRATTON NW (INDEX #4365) STOCK RESERVOIR		018N	095W	06	SW1/4 NW1/4	3.5	Upper Rim Draw	41.566160	-108.156020

Table F-4. Surface water rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company / Individual	Facility Name	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Source Name	Latitude	Longitude
P7778.0S	06/26/1974	Complete	USDI - BLM	UPPER RED DRAW (INDEX #4351) STOCK RESERVOIR		019N	097W	36	SW1/4 NE1/4	3.6	Red Wash Draw	41.580430	-108.282010
P7779.0S	06/26/1974	Complete	USDI - BLM	MAN AND THE BOY (INDEX #4350) STOCK RESERVOIR		018N	096W	36	NW1/4 NE1/4	3.0	Man and the Boy Draw	41.498090	-108.167760
P7780.0S	06/26/1974	Complete	USDI - BLM	RABBIT BRUSH (INDEX #4349) STOCK RESERVOIR		018N	096W	10	NE1/4 SE1/4	3.0	Rabbit Brush Draw	41.548870	-108.201610
P794.0S	04/01/1954	Complete	CARBON COUNTY SHEEP & CATTLE COMPANY	CEDAR DRAW PIT STOCK RESERVOIR	STO	017N	092W	33	SW1/4 SW1/4	6.1	Cedar Draw	41.400097	-107.773631
P8043.0S	10/16/1975	Complete		RED LAKE STOCK RESERVOIR		019N	095W	15	NE1/4 SE1/4	2.7	Red Draw	41.621020	-108.085850
P8044.0S	10/16/1975	Complete		WAMSUTTER RIM STOCK RESERVOIR		019N	095W	11	NW1/4 SE1/4	2.7	Wamsutter Rim Lake	41.635500	-108.071810
P8045.0S	10/16/1975	Complete	UNION LAND RESOURCES	FREWEN STOCK RESERVOIR		019N	094W	05	NW1/4 SW1/4	2.7	Frewen Draw	41.649860	-108.022240
P8046.0S	10/16/1975	Complete	UNION LAND RESOURCES	WAMSUTTER STOCK RESERVOIR		019N	094W	03	NE1/4 SW1/4	2.3	Latham Draw	41.650150	-107.980430
P8515.0S	09/12/1978	Complete	UNION PACIFIC RAILROAD	ELWOOD STOCK RESERVOIR		018N	093W	21	NE1/4 NE1/4	2.6	Government Draw No. 1	41.526940	-107.874420
P8521.0S	09/25/1978	Complete		ADAMS #1B STOCK RESERVOIR		019N	093W	31	SE1/4 NW1/4	2.7	Standard Draw	41.582450	-107.924980
P8522.0S	09/25/1978	Complete		ADAMS #1C STOCK RESERVOIR		019N	094W	11	NW1/4 SE1/4	2.7	Esther Draw	41.635970	-107.956430
P8523.0S	09/25/1978	Complete		ADAMS #1D STOCK RESERVOIR		019N	094W	09	NE1/4 SW1/4	2.7	Cecil Draw	41.635600	-107.999670
P8524.0S	09/25/1978	Complete		ADAMS #1E STOCK RESERVOIR		019N	094W	19	NW1/4 NE1/4	2.7	Jody Draw	41.613830	-108.033170
P8707.0S	08/20/1980	Complete	P.H. LIVESTOCK	HANSEN STOCK RESERVOIR		020N	093W	29	SE1/4 SE1/4	1.0	Hansen Draw	41.676250	-107.893360
P8944.0S	10/16/1981	Complete		29-18-92 NO. 1 STOCK RESERVOIR		018N	092W	29	SE1/4 SW1/4	0.4	Sage Chicken Draw	41.502280	-107.788770
P8945.0S	10/16/1981	Complete		21-18-92 NO. 1 STOCK RESERVOIR		018N	092W	21	SW1/4 NW1/4	0.2	South Fork Coal Gulch	41.521580	-107.774840
P8947.0S	10/16/1981	Complete		15-18-92 NO. 2 STOCK RESERVOIR		018N	092W	15	SW1/4 NW1/4	1.3	Echeverria Draw	41.536340	-107.754480
P8948.0S	10/16/1981	Complete		15-18-92 NO. 1 STOCK RESERVOIR		018N	092W	15	SE1/4 SE1/4	2.9	South Fork Coal Gulch	41.531080	-107.738660
P8949.0S	10/16/1981	Complete		13-18-92 NO. 1 STOCK RESERVOIR		018N	092W	13	SW1/4 NW1/4	0.8	West Fork Holler Draw	41.537100	-107.718010

Table F-4. Surface water rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company / Individual	Facility Name	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Source Name	Latitude	Longitude
P8950.0S	10/16/1981	Complete		25-18-93 NO. 1 STOCK RESERVOIR		018N	093W	25	SW1/4 SE1/4	0.5	Sheephead Draw	41.501630	-107.821790
P8951.0S	10/16/1981	Complete		11-18-93 NO. 1 STOCK RESERVOIR		018N	093W	11	SW1/4 NE1/4	1.0	Coal Bank Wash	41.552180	-107.840510
P9013.0R	07/05/1985	Unadjudicated		Mexican flats Water Disposal Reservoir	IND_SW; TEM; COMBBU	015N	092W	17	SW1/4 NE1/4	28.6	Soco Draw	41.273395	-107.771910
P9111.0D	06/07/1909			Rasmussen Ditch No. 1	IRR_SW; STO	019N	095W	04	SW1/4 SW1/4	0.0	Un-named Creek	41.646193	-108.119722
P9112.0D	06/07/1909			Rasmussen Ditch No. 2	IRR_SW; STO	019N	095W	05	SW1/4 NE1/4	0.0	Un-named Creek	41.653347	-108.129387
P9113.0D	06/07/1909			Rasmussen Ditch No. 3	IRR_SW; STO	019N	095W	05	SW1/4 NE1/4	0.0	NAMING ERRORS	41.653347	-108.129387
P9423.0R	08/31/1984	Incomplete	KENNECOTT URANIUM CO	REB FINAL IMPOUNDMENT RESERVOIR	WL	023N	094W	03	SW1/4 NE1/4	3128.0	Battle Spring Draw	41.997847	-108.017633
P9534.0R	09/22/1988	Fully Adjudicated		Little Robber Detention Dam Reservoir	FIS; STO; COMBBU	014N	092W	14	NW1/4 NE1/4	550.6	Little Robbers Gulch	41.189264	-107.716693
P9620.0S	03/25/1985	Complete		ADOBE COVE PIT STOCK RESERVOIR		016N	092W	30	SE1/4 NE1/4	0.8	Flats Draw	41.331210	-107.786340
P9621.0S	03/25/1985	Complete		NO. BARREL SPRINGS PIT STOCK RESERVOIR		016N	093W	09	NW1/4 NW1/4	0.7	Red Draw	41.379140	-107.876610
P9622.0S	03/25/1985	Complete		LONE PIT STOCK RESERVOIR	STO	016N	093W	25	SE1/4 SE1/4	3.2	Barrel Springs Draw	41.324350	-107.804590
P9623.0S	03/25/1985	Complete		BARREL SPINGS DRAW PIT STOCK RESERVOIR	STO	016N	094W	12	SE1/4 SW1/4	0.7	Barrel Springs Draw	41.368470	-107.928880
P9659.0S	03/25/1985	Complete		BLUE GAP PIT STOCK RESERVOIR		015N	092W	23	NW1/4 NE1/4	3.5	Little Blue Gap Draw	41.262520	-107.714420
P9755.0S	09/12/1985	Complete		BADWATER #7 STOCK RESERVOIR		018N	091W	18	NE1/4 SE1/4	2.3	Holler Draw	41.533830	-107.684210
P9756.0S	09/12/1985	Complete		RATTLESNAKE STOCK RESERVOIR		014N	092W	23	NE1/4 NW1/4	14.7	Rattlesnake Draw	41.174280	-107.717760
P9757.0S	09/12/1985	Complete		DETENTION DAM 1682 #4 STOCK RESERVOIR		014N	092W	34	NE1/4 NE1/4	10.0	Dike View Draw	41.146460	-107.729280
P9758.0S	09/12/1985	Complete		DOUBLE COVE STOCK RESERVOIR		018N	092W	26	SW1/4 NE1/4	3.0	Double Cove	41.508690	-107.726230
P9759.0S	09/12/1985	Complete		LOST SHEEP STOCK RESERVOIR		013N	093W	01	NW1/4 SE1/4	3.3	Lost Sheep Gulch	41.123510	-107.809490
P9763.0S	09/12/1985	Complete		LOWER MIDDLE RED DRAW STOCK RESERVOIR	STO	019N	096W	24	SW1/4 NE1/4	6.0	Middle Red Draw	41.609867	-108.168436

Table F-4. Surface water rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company / Individual	Facility Name	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Source Name	Latitude	Longitude
P9774.0S	09/27/1985	Complete		BADWATER #6 STOCK RESERVOIR	STO	018N	091W	06	NE1/4 NE1/4	19.8	Bad Water Creek	41.569420	-107.683480
P9775.0S	09/27/1985	Complete		DETENTION 1392 #2 STOCK RESERVOIR		013N	092W	01	NW1/4 SW1/4	19.2	Cottonwood Creek	41.125440	-107.705930
P9780.0S	09/27/1985	Complete		TRAIL STOCK RESERVOIR		014N	092W	20	SW1/4 NW1/4	8.4	Little Robbers Gulch	41.173080	-107.781930
P9781.0S	09/27/1985	Complete		BLUE GAP STOCK RESERVOIR	STO	015N	092W	29	NE1/4 NW1/4	2.4	Blue Gap Draw	41.247500	-107.775040
P9782.0S	09/27/1985	Complete		UPPER SOAP HOLE STOCK RESERVOIR		018N	092W	34	SE1/4 NE1/4	7.2	Soap Hole Wash	41.493570	-107.742450
P9783.0S	09/27/1985	Complete		DAD LARSEN DETENTION 1593 #6 STOCK RESERVOIR		015N	093W	14	SE1/4 NE1/4	19.8	West Flattop Draw	41.272130	-107.826110
P9794.0S	10/28/1985	Complete		JOLLEY STOCK RESERVOIR	STO	019N	095W	28	SE1/4 SE1/4	1.5	Wells Bluff Draw	41.589983	-108.105925
P9795.0S	10/28/1985	Complete		LOWER RED DRAW STOCK RESERVOIR		019N	095W	18	NW1/4 NE1/4	5.9	Middle Red Draw	41.627980	-108.148500
CR CC26/440	07/20/1904			HAY RESERVOIR	DOM_SW; IRR_SW; STO	023N	097W	02	NW1/4 SW1/4	2480.0	Red Creek	41.993220	-108.356250
CR CC26/441	07/20/1904			HAY DITCH	DOM_SW; IRR_SW; STO	023N	097W	02	NW1/4 SW1/4	0.0	Red Creek	41.993220	-108.356250
CR CC37/024	03/29/1907	Fully Adjudicated		MUDDY DITCH	IRR_SW	016N	092W	20	SE1/4 NE1/4	0.0	Muddy Creek	41.343910	-107.765260
CR CC37/025	03/29/1907	Fully Adjudicated		MUDDY DITCH	IRR_SW	016N	092W	20	SE1/4 NE1/4	0.0	Muddy Creek	41.343910	-107.765260
CR CC38/113	01/19/1905	Fully Adjudicated		HAY SUPPLY DITCH	RES	024N	097W	14	NW1/4 NE1/4	0.0	Bush Creek	42.059328	-108.347758
CR CC38/114	10/17/1906			BUSH LAKE CUT DITCH	IRR_SW; STO	024N	096W	18	SE1/4 NW1/4	0.0	Bush Creek	42.054200	-108.310490
CR CC38/115	07/09/1912	Fully Adjudicated		HAY NO. 2 DITCH	IRR_SW	024N	097W	35	NE1/4 SE1/4	0.0	Red Creek	42.009039	-108.341369
CR CC38/116	08/28/1911	Fully Adjudicated		HAY NO. 1 DITCH	IRR_SW; STO	024N	097W	35	NE1/4 SE1/4	0.0	Red Creek	42.009039	-108.341369
CR CC38/117	07/09/1912			BUSH CREEK DITCH	RES	024N	096W	07	SW1/4 NW1/4	0.0	Bush Creek	42.068431	-108.314839
CR CC38/118	08/11/1911	Fully Adjudicated		ENL. HAY RESERVOIR	IRR_SW; STO	024N	097W	35	SE1/4 NE1/4	5846.6	Red Creek	42.009039	-108.341369
CR CC46/410	10/17/1906		SWEETWATER CATTLE COMPANY	BUSH LAKE CUT DITCH	DOM_SW; IRR_SW; STO	024N	096W	18	SE1/4 NW1/4	0.0	Bush Creek	42.054200	-108.310490

Table F-4. Surface water rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company / Individual	Facility Name	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Source Name	Latitude	Longitude
CR CC46/411	07/20/1904	Fully Adjudicated	SWEETWATER CATTLE COMPANY	HAY DITCH	IRR_SW; STKNDMS	023N	097W	02	NW1/4 SW1/4	0.0	Red Creek	41.995336	-108.354653
CR CC47/312	03/13/1925	Fully Adjudicated		DEW DITCH NO. 2	IRR_SW	016N	092W	05	SE1/4 SW1/4	0.0	Muddy Creek	41.382360	-107.775890
CR CC73/279	01/21/1977	Fully Adjudicated		ADAMS PORTABLE PUMP IRRIGATION SYSTEM #2	IRR_SW	017N	092W	15	SE1/4 NE1/4	0.0	Muddy Creek	41.449020	-107.740650
CR CC73/280	01/21/1977	Fully Adjudicated		ADAMS PORTABLE PUMP IRRIGATION SYSTEM NO. 3	IRR_SW	017N	092W	15	NW1/4 SE1/4	0.0	Muddy Creek	41.446370	-107.744670
CR CC73/281	01/21/1977	Fully Adjudicated		ADAMS PORTABLE PUMP IRRIGATION SYSTEM # 4	IRR_SW	017N	092W	15	SE1/4 SW1/4	0.0	Muddy Creek	41.443970	-107.750930
CR CC81/089	09/07/1995	Fully Adjudicated	LITTLE SNAKE RIVER CONSERVATION DISTRICT	MUDDY CREEK DUCK POND DITCH	RES	016N	092W	05	NE1/4 NW1/4	0.0	Muddy Creek	41.395130	-107.777550
CR CR01/012	07/20/1904	Fully Adjudicated	SWEETWATER CATTLE COMPANY	HAY RESERVOIR	DOM_SW; IRR_SW; STO	024N	097W	35	NE1/4 SE1/4	0.0	Red Creek	42.009039	-108.341369
CR CR10/213	09/25/1978	Fully Adjudicated		ADAMS NO. 1C STOCK RESERVOIR	STO	019N	094W	11	NW1/4 SE1/4	2.7	Esther Draw	41.634772	-107.956311
CR CR10/214	09/25/1978	Fully Adjudicated		ADAMS NO. 1B STOCK RESERVOIR	STO	019N	093W	31	SE1/4 NW1/4	2.7	Standard Draw	41.581639	-107.924461
CR CR10/215	09/25/1978	Fully Adjudicated		ADAMS NO. 1D STOCK RESERVOIR	STO	019N	094W	09	NE1/4 SW1/4	2.7	Cecil Draw	41.635575	-108.000878
CR CR10/216	09/25/1978	Fully Adjudicated		ADAMS NO. 1E STOCK RESERVOIR	STO	019N	094W	19	NW1/4 NE1/4	2.7	Jody Draw	41.612120	-108.035340
CR CR11/052	04/03/1979	Unadjudicated	TOWN OF WAMSUTTER	WAMSUTTER WASTEWATER TREATMENT RESERVOIR	IND_SW	020N	094W	26	SW1/4 SW1/4	0.0	Latham Draw	41.676947	-107.965322
CR CR11/083	09/27/1985	Fully Adjudicated	USDI - BLM	BLUE GAP STOCK RESERVOIR	STO	015N	092W	29	NE1/4 NW1/4	2.4	Blue Gap Draw	41.247560	-107.774720
CR CR11/084	03/25/1985	Fully Adjudicated	USDI - BLM	BLUE GAP PIT STOCK RESERVOIR	STO	015N	092W	23	NW1/4 NE1/4	3.5	Little Blue Gap Draw	41.262420	-107.714500
CR CR11/085	09/27/1985	Fully Adjudicated	USDI - BLM	UPPER SOAP HOLE STOCK RESERVOIR	STO	018N	092W	34	SE1/4 NE1/4	7.2	Soap Hole Wash	41.493230	-107.742320
CR CR11/086	09/12/1985	Fully Adjudicated	USDI - BLM	DOUBLE COVE STOCK RESERVOIR	STO	018N	092W	26	SW1/4 NE1/4	3.0	Double Cove	41.507490	-107.726490
CR CR11/087	09/12/1985		USDI - BLM	BADWATER #7 STOCK RESERVOIR	STO	018N	091W	18	NE1/4 SE1/4	2.3	Holler Draw	41.533300	-107.684530

Table F-4. Surface water rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company / Individual	Facility Name	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Source Name	Latitude	Longitude
CR CR11/088	09/27/1985	Fully Adjudicated	USDI - BLM	TRAIL STOCK RESERVOIR	STO	014N	092W	20	SW1/4 NW1/4	8.4	Little Robbers Gulch	41.173430	-107.781890
CR CR11/089	09/12/1985	Fully Adjudicated	USDI - BLM	RATTLESNAKE STOCK RESERVOIR	STO	014N	092W	23	NE1/4 NW1/4	14.7	Rattlesnake Draw	41.174280	-107.717230
CR CR11/090	03/25/1985		USDI - BLM	LONE PIT STOCK RESERVOIR	STO	016N	093W	25	SE1/4 SE1/4	3.2	Barrel Springs Draw	41.323430	-107.806160
CR CR11/091	09/27/1985	Fully Adjudicated	USDI - BLM	DAD LARSEN DETENTION 1593 #6 STOCK RESERVOIR	STO	015N	093W	14	SE1/4 NE1/4	19.8	West Flattop Draw	41.272030	-107.825890
CR CR11/092	03/25/1985	Fully Adjudicated	USDI - BLM	ADOBE COVE STOCK RESERVOIR	STO	016N	092W	30	SE1/4 NE1/4	0.8	Flats Draw	41.331250	-107.788290
CR CR11/093	03/25/1985		USDI - BLM	BARREL SPRINGS DRAW STOCK RESERVOIR	STO	016N	094W	12	SE1/4 SW1/4	0.7	Barrel Springs Draw	41.367720	-107.930520
CR CR11/094	03/25/1985		USDI - BLM	NO. BARREL SPRINGS STOCK RESERVOIR	STO	016N	093W	09	NW1/4 NW1/4	0.7	Red Draw	41.378944	-107.875725
CR CR11/096	09/27/1985	Fully Adjudicated	USDI - BLM	DETENTION 1392 #2 STOCK RESERVOIR	STO	013N	092W	01	NW1/4 SW1/4	19.2	Cottonwood Creek	41.126200	-107.705590
CR CR11/098	09/12/1985	Fully Adjudicated	USDI - BLM	DETENTION DAM 1492 #4 STOCK RESERVOIR	STO	014N	092W	34	NE1/4 NE1/4	10.0	Dike View Draw	41.146800	-107.729110
CR CR11/105	09/12/1985	Fully Adjudicated	USDI - BLM	LOST SHEEP STOCK RESERVOIR	STO	013N	093W	01	NW1/4 SE1/4	3.3	Lost Sheep Gulch	41.123670	-107.808610
CR CR11/457	10/28/1985	Fully Adjudicated	USDI - BLM	LOWER EAST RED DRAW STOCK RESERVOIR	STO	019N	095W	18	NW1/4 NE1/4	5.9	Middle Red Draw	41.629467	-108.150658
CR CR12/366	02/10/1940	Fully Adjudicated	USDI - BLM	GOVERNMENT NO. 1 RESERVOIR	STO	018N	093W	17	SE1/4 NE1/4	98.6	Government Draw No. 1	41.537553	-107.892433
CR CR13/055	09/22/1988	Fully Adjudicated	USDI - BLM	LITTLE ROBBER DETENTION DAM RESERVOIR	FIS; FLO; STO	014N	092W	14	NW1/4 NE1/4	550.6	Little Robbers Gulch	41.188930	-107.716640
CR CR13/190	09/09/1991	Fully Adjudicated	USDI - BLM	DRY LAKE STOCK RESERVOIR	STO	019N	094W	26	SE1/4 SE1/4	1.8	Spring Pit Draw	41.590360	-107.952150
CR CR13/191	09/09/1991		USDI - BLM	SOUTH WAMSUTTER STOCK RESERVOIR	STO	019N	094W	22	NE1/4 SW1/4	2.5	South Wamsutter Rim Draw	41.605975	-107.982117
CR CR13/214	11/01/1990	Fully Adjudicated		SALISBURY STOCK RESERVOIR	STO	017N	092W	25	SW1/4 NE1/4	3.3	Salisbury Draw	41.421890	-107.707120
CR CR13/215	11/01/1990		WEBER RANCH, INC.	TREE STOCK RESERVOIR	STO	017N	092W	19	SW1/4 NW1/4	4.4	Little Coal Gulch	41.434810	-107.811690
CR CR14/214	08/25/1994			SECTION 11 STOCK RESERVOIR	STO	019N	092W	11	NW1/4 NE1/4	0.1	Drill Chief Draw	41.642281	-107.726678
CR CR14/217	08/25/1994			SECTION 35 EAST STOCK RESERVOIR	STO	019N	092W	35	NE1/4 SE1/4	0.1	Low Point Draw	41.577381	-107.721139

Table F-4. Surface water rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company / Individual	Facility Name	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Source Name	Latitude	Longitude
CR CR14/218	08/25/1994			SECTION 35 WEST STOCK RESERVOIR	STO	019N	092W	35	SW1/4 NE1/4	0.1	Break Point Draw	41.580819	-107.726111
CR CR14/241	09/07/1995	Fully Adjudicated	USDI - BLM	UPPER DIKE RESERVOIR	STO; WET	016N	092W	05	NW1/4 NW1/4	2.0	Muddy Creek	41.391120	-107.779860
CR CR14/242	09/07/1995		USDI - BLM	MIDDLE DIKE RESERVOIR	STO; WET	016N	092W	05	SW1/4 NW1/4	2.0	Muddy Creek	41.387510	-107.782910
CR CR14/243	09/07/1995	Fully Adjudicated		LOWER DIKE RESERVOIR	STO; WET	016N	092W	05	SW1/4 SW1/4	4.0	Muddy Creek	41.380820	-107.783310
CR CR15/217	10/17/1997	Fully Adjudicated	PH LIVESTOCK	PH MAN AND BOY STOCK RESERVOIR	STO	018N	096W	35	SE1/4 NE1/4	4.0	Ph Draw	41.492910	-108.182870
CR CR15/218	10/17/1997	Fully Adjudicated	PH LIVESTOCK COMPANY	BARREL SPRINGS STOCK RESERVOIR	STO	018N	096W	25	SW1/4 NE1/4	4.0	Hansen Draw	41.509880	-108.166350
CR CR15/277	07/08/1997	Fully Adjudicated	CITY OF CHEYENNE, BOARD OF PUBLIC UTILITIES	RED WASH NO. 2 WETLAND RESERVOIR	FIS; STO; WET	016N	092W	32	SW1/4 NE1/4	143.4	Muddy Creek	41.317917	-107.774078
CR CR15/278	07/08/1997	Fully Adjudicated	CITY OF CHEYENNE, BOARD OF PUBLIC UTILITIES	RED WASH NO. 3 WETLAND RESERVOIR	FIS; STO; WET	016N	092W	32	SW1/4 NE1/4	8.1	Muddy Creek	41.315892	-107.773500
CR CR15/279	07/22/1997	Fully Adjudicated	CITY OF CHEYENNE, BOARD OF PUBLIC UTILITIES	RED WASH NO. 1 WETLAND RESERVOIR	FIS; STO; WET	016N	092W	29	SE1/4 SW1/4	39.7	Muddy Creek	41.322700	-107.775233
CR CR15/280	07/22/1997	Fully Adjudicated	CITY OF CHEYENNE, BOARD OF PUBLIC UTILITIES	RED WASH NO. 4 WETLAND RESERVOIR	FIS; STO; WET	016N	092W	31	NE1/4 NE1/4	21.4	Muddy Creek	41.320558	-107.787819
CR CR04/150	12/12/1966	Fully Adjudicated	LOUIS LARSEN SHEEP COMPANY	PRONGHORN STOCK	STO	022N	093W	05	NE1/4 NW1/4	1.9	East Fork Sourdough Gulch	41.914350	-107.944940
CR CR05/583	12/10/1969	Fully Adjudicated	U.S DEPT OF THE INTERIOR	TANGLED CHAIN PIT STOCK RESERVOIR	STO	014N	091W	28	SW1/4 NE1/4	2.0	Impossible Draw	41.156220	-107.638250
CR CR05/585	02/19/1970	Fully Adjudicated	U.S DEPT OF THE INTERIOR	HARDSHIP STOCK RESERVOIR	STO	014N	091W	21	SW1/4 NE1/4	4.4	Impossible Draw	41.171550	-107.635640
CR CR05/586	11/12/1969		U.S DEPT OF THE INTERIOR	PRICKLEY PEAR PIT STOCK RESERVOIR	STO	014N	091W	20	NE1/4 NE1/4	1.6	Prickley Pear Draw	41.176210	-107.651480
CR CR05/588	03/09/1970	Fully Adjudicated	U.S DEPT OF THE INTERIOR	BOTTLE STOCK RESERVOIR	STO	014N	091W	08	SE1/4 NE1/4	1.2	Bottle Draw	41.200770	-107.653020
CR CR05/589	03/09/1970	Fully Adjudicated	U.S DEPT OF THE INTERIOR	THUNDER STOCK RESERVOIR	STO	014N	091W	17	SW1/4 NE1/4	2.0	Thunder Draw	41.187980	-107.656610
CR CR05/591	12/10/1969	Fully Adjudicated	U.S DEPT OF THE INTERIOR	ROCKY RIDGE PIT STOCK RESERVOIR	STO	014N	091W	05	SW1/4 SE1/4	2.0	Reef Draw	41.207010	-107.656120

Table F-4. Surface water rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company / Individual	Facility Name	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Source Name	Latitude	Longitude
CR CR05/592	12/08/1969	Fully Adjudicated	U.S DEPT OF THE INTERIOR	POCKET STOCK RESERVOIR	STO	014N	092W	29	SW1/4 NE1/4	2.0	Pocket Draw	41.158940	-107.771110
CR CR05/593	12/08/1969	Fully Adjudicated	U.S DEPT OF THE INTERIOR	"V" SPREADER PIT STOCK RESERVOIR	STO	014N	092W	01	NW1/4 SE1/4	0.9	Tom Draw	41.211850	-107.693300
CR CR05/596	12/10/1969	Fully Adjudicated	U.S DEPT OF THE INTERIOR	MEXICAN FLATS NO. 1 STOCK RESERVOIR	STO	016N	093W	29	NE1/4 SE1/4	1.3	Beatle Draw	41.327460	-107.880410
CR CR05/597	12/10/1969	Fully Adjudicated	U.S DEPT OF THE INTERIOR	MEXICAN FLATS NO. 3 STOCK RESERVOIR	STO	016N	093W	22	NE1/4 NE1/4	1.7	Tick Draw	41.350920	-107.842890
CR CR06/132	04/27/1970	Fully Adjudicated	USDI - BLM	EAST ECHO STOCK RESERVOIR	STO	019N	093W	14	SE1/4 SE1/4	2.8	Echo Springs Draw	41.616644	-107.838461
CR CR06/133	04/27/1970	Fully Adjudicated	USDI - BLM	WEST ECHO STOCK RESERVOIR	STO	019N	093W	20	SE1/4 SE1/4	3.0	Echo Springs Draw	41.604592	-107.895147
CR CR06/134	04/27/1970	Fully Adjudicated	USDI - BLM	NORTHWEST ECHO STOCK RESERVOIR	STO	019N	093W	06	NW1/4 NE1/4	3.2	Dry Lake Bed (closed basin)	41.657461	-107.919611
CR CR06/160	01/25/1971	Fully Adjudicated	U.S DEPT OF THE INTERIOR	MEXICAN FLATS NO. 2 STOCK RESERVOIR	STO	016N	093W	17	NW1/4 NE1/4	1.3	Herder Draw	41.363710	-107.886000
CR CR07/240	01/25/1971	Fully Adjudicated	U.S DEPT OF THE INTERIOR	CEDAR STOCK RESERVOIR	STO	016N	092W	09	NE1/4 NE1/4	0.9	South Cedar Draw	41.377370	-107.749560
CR CR08/075	06/26/1974	Fully Adjudicated	USDI - BLM	ROCKY POINT (INDEX #4348) STOCK RESERVOIR	STO	018N	096W	30	SW1/4 SE1/4	3.0	Laney Wash	41.503561	-108.261661
CR CR08/076	06/26/1974	Fully Adjudicated	USDI - BLM	UPPER RED DRAW (INDEX #4351) STOCK RESERVOIR	STO	019N	097W	36	SW1/4 NE1/4	3.6	Red Wash Draw	41.580328	-108.281794
CR CR08/077	06/26/1974	Fully Adjudicated	USDI - BLM	EAST RED DRAW (INDEX #4345) STOCK RESERVOIR	STO	019N	095W	18	NE1/4 NW1/4	3.2	Middle Red Draw	41.629497	-108.151311
CR CR08/078	06/26/1974	Fully Adjudicated	USDI - BLM	TORTILLA (INDEX #4344) STOCK RESERVOIR	STO	019N	095W	30	NW1/4 NW1/4	2.0	Tortilla Draw	41.599058	-108.158450
CR CR08/079	06/26/1974	Fully Adjudicated	USDI - BLM	WEST RED DRAW (INDEX #4347) STOCK RESERVOIR	STO	019N	096W	22	SE1/4 SE1/4	3.6	West Red Draw	41.604106	-108.203075
CR CR08/080	06/26/1974	Fully Adjudicated	U.S DEPT OF THE INTERIOR	RED LAKE (INDEX #4342) STOCK RESERVOIR	STO	018N	094W	08	NE1/4 NE1/4	3.2	Corral Draw	41.555970	-108.009360
CR CR08/081	06/26/1974	Fully Adjudicated	U.S DEPT OF THE INTERIOR	RED FLAT (INDEX #4341) STOCK RESERVOIR	STO	019N	095W	36	NW1/4 SW1/4	3.0	Confusion Draw	41.578990	-108.063950
CR CR08/316	06/26/1974	Fully Adjudicated	USDI - BLM	NORTHEAST POINT (INDEX #4343) STOCK RESERVOIR	STO	019N	095W	20	NW1/4 SW1/4	4.3	West Fork Northeast Wash	41.605436	-108.139150

Table F-4. Surface water rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company / Individual	Facility Name	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Source Name	Latitude	Longitude
CR CR08/317	06/26/1974	Fully Adjudicated	USDI - BLM	MIDDLE RED DRAW (INDEX #4346) STOCK RESERVOIR	STO	019N	096W	24	SW1/4 NE1/4	3.6	Middle Red Draw	41.609931	-108.169511
CR CR08/433	10/16/1975			RED LAKE STOCK RESERVOIR	STO	019N	095W	15	NE1/4 SE1/4	2.7	Red Draw	41.620417	-108.084219
CR CR08/434	10/16/1975	Fully Adjudicated		WAMSUTTER RIM STOCK RESERVOIR	STO	019N	095W	11	NW1/4 SE1/4	2.7	Wamsutter Rim Lake	41.633878	-108.069719
CR CR08/435	10/16/1975	Fully Adjudicated	UNION LAND RESOURCES	WAMSUTTER STOCK RESERVOIR	STO	019N	094W	03	NE1/4 SW1/4	2.3	Latham Draw	41.651636	-107.980769
CR CR08/478	10/16/1975	Fully Adjudicated	UNION LAND RESOURCES	FREWEN STOCK RESERVOIR	STO	019N	094W	05	NW1/4 SW1/4	2.7	Frewen Draw	41.649986	-108.022378
CR CR08/479	06/26/1974	Fully Adjudicated	USDI - BLM	EIGHTMILE (INDEX #4317) STOCK RESERVOIR	STO	018N	093W	06	NE1/4 SE1/4	3.8	Coal Bank Wash	41.564642	-107.915414
CR CR08/480	06/26/1974	Fully Adjudicated	USDI - BLM	TWELVEMILE (INDEX #4318) STOCK RESERVOIR	STO	018N	093W	30	NW1/4 NE1/4	3.6	Coal Bank Lake Draw	41.514175	-107.918311
CR CR08/504	06/26/1974	Fully Adjudicated	U.S DEPT OF THE INTERIOR	TOAD STOOL (INDEX #4321) STOCK RESERVOIR	STO	013N	091W	04	NW1/4 SW1/4	7.2	Toad Stool Draw	41.125260	-107.646720
CR CR08/518	06/26/1974	Fully Adjudicated	U.S DEPT OF THE INTERIOR	BLUE GAP (INDEX #4319) STOCK RESERVOIR	STO	015N	092W	23	NW1/4 NE1/4	3.8	Little Blue Gap Draw	41.262970	-107.714240
CR CR08/520	06/26/1974	Fully Adjudicated	U.S DEPT OF THE INTERIOR	WEST FLATTOP (INDEX #4358) STOCK RESERVOIR	STO	014N	093W	03	SE1/4 NW1/4	3.0	South Fork West Flattop Draw	41.214710	-107.852180
CR CR08/521	06/26/1974	Fully Adjudicated	U.S DEPT OF THE INTERIOR	UPPER TWIN (INDEX #4355) STOCK RESERVOIR	STO	015N	093W	33	SE1/4 NE1/4	3.0	Twin Draw	41.230250	-107.864490
CR CR08/522	06/26/1974	Fully Adjudicated	U.S DEPT OF THE INTERIOR	UPPER PAINTED (INDEX #4354) STOCK RESERVOIR	STO	015N	093W	22	SW1/4 SE1/4	2.7	Upper Painted Draw	41.253300	-107.847220
CR CR08/523	06/26/1974	Fully Adjudicated	U.S DEPT OF THE INTERIOR	LOWER PAINTED (INDEX #4353) STOCK RESERVOIR	STO	015N	093W	22	NW1/4 NW1/4	3.0	Lower Painted Draw	41.263750	-107.858370
CR CR08/524	06/26/1974	Fully Adjudicated	U.S DEPT OF THE INTERIOR	FIVE COYOTE (INDEX #4352) STOCK RESERVOIR	STO	015N	093W	21	NW1/4 SE1/4	5.1	Five Coyote Draw	41.255880	-107.868180
CR CR08/525	06/26/1974	Fully Adjudicated	U.S DEPT OF THE INTERIOR	BARREL (INDEX #4370) STOCK RESERVOIR	STO	017N	095W	02	NW1/4 NE1/4	4.4	North Barrel Springs Draw	41.482350	-108.069630
CR CR08/526	06/26/1974	Fully Adjudicated	U.S DEPT OF THE INTERIOR	TWO DRAW (INDEX #4366) STOCK RESERVOIR	STO	018N	095W	08	SW1/4 SE1/4	19.5	Upper Rim Draw	41.545310	-108.129910

Table F-4. Surface water rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company / Individual	Facility Name	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Source Name	Latitude	Longitude
CR CR08/527	06/26/1974	Fully Adjudicated	U.S DEPT OF THE INTERIOR	STRATTON NW (INDEX #4365) STOCK RESERVOIR	STO	018N	095W	06	SW1/4 NW1/4	3.5	Upper Rim Draw	41.566030	-108.156410
CR CR08/528	06/26/1974	Fully Adjudicated	U.S DEPT OF THE INTERIOR	LITTLE DRAW (INDEX #4368) STOCK RESERVOIR	STO	017N	095W	36	SW1/4 NW1/4	2.8	Mulligan Draw	41.408510	-108.060450
CR CR08/529	06/26/1974	Fully Adjudicated	U.S DEPT OF THE INTERIOR	BOY (INDEX #4367) STOCK RESERVOIR	STO	017N	095W	16	NE1/4 NW1/4	5.5	Wild Rose Draw	41.455020	-108.113720
CR CR08/530	06/26/1974	Fully Adjudicated	U.S DEPT OF THE INTERIOR	DELANEY RIM (INDEX #4369) STOCK RESERVOIR	STO	018N	095W	26	SW1/4 NW1/4	2.4	East Wash	41.510170	-108.080730
CR CR08/531	06/26/1974	Fully Adjudicated	U.S DEPT OF THE INTERIOR	MAN AND THE BOY (INDEX #4350) STOCK RESERVOIR	STO	018N	096W	36	NW1/4 NE1/4	3.0	Man and the Boy Draw	41.498290	-108.169790
CR CR08/532	06/26/1974	Fully Adjudicated	U.S DEPT OF THE INTERIOR	RABBIT BRUSH (INDEX #4349) STOCK RESERVOIR	STO	018N	096W	10	NE1/4 SE1/4	3.0	Rabbit Brush Draw	41.548290	-108.200860
CR CR08/612	09/12/1978	Fully Adjudicated		ELWOOD STOCK RESERVOIR	STO	018N	093W	21	NE1/4 NE1/4	2.6	Government Draw No. 1	41.525880	-107.872160
CR CR09/274	10/16/1981	Fully Adjudicated	DOM ECHEVERRIA TRUST	11-18-93 NO. 1 STOCK RESERVOIR	STO	018N	093W	11	SW1/4 NE1/4	1.0	Coal Bank Wash	41.552494	-107.840300
CR CR09/292	10/16/1981	Fully Adjudicated	DOM ECHEVERRIA TRUST	29-18-92 NO. 1 STOCK RESERVOIR	STO	018N	092W	29	SE1/4 SW1/4	0.4	Sage Chicken Draw	41.502900	-107.789770
CR CR09/293	10/16/1981	Fully Adjudicated	DOM ECHEVERRIA TRUST	21-18-92 NO. 1 STOCK RESERVOIR	STO	018N	092W	21	SW1/4 NW1/4	0.2	South Fork Coal Gulch	41.521760	-107.775490
CR CR09/294	10/16/1981	Fully Adjudicated	DOM ECHEVERRIA TRUST	15-18-92 NO. 1 STOCK RESERVOIR	STO	018N	092W	15	SE1/4 SE1/4	2.8	South Fork Coal Gulch	41.531270	-107.739060
CR CR09/295	10/16/1981	Fully Adjudicated	DOM ECHEVERRIA TRUST	15-18-92 NO. 2 STOCK RESERVOIR	STO	018N	092W	15	SW1/4 NW1/4	1.3	Echeverria Draw	41.535940	-107.756140
CR CR09/296	10/16/1981	Fully Adjudicated	DOM ECHEVERRIA TRUST	25-18-93 NO. 1 STOCK RESERVOIR	STO	018N	093W	25	SW1/4 SE1/4	0.5	Sheephead Draw	41.500440	-107.819540
CR CR09/297	10/16/1981	Fully Adjudicated	DOM ECHEVERRIA TRUST	13-18-92 NO. 1 STOCK RESERVOIR	STO	018N	092W	13	SW1/4 NW1/4	0.8	West Fork Holler Draw	41.536630	-107.718080
CR CR09/495	08/20/1980	Fully Adjudicated	P. H. LIVESTOCK COMPANY	HANSEN STOCK RESERVOIR	STO	020N	093W	29	SE1/4 SE1/4	1.0	Hansen Draw	41.676506	-107.893647

Notes for non-mining-related surface water rights within 1 mile of the CD-C project area:

Search Conducted July 09, 2014

Water rights were searched to the nearest quarter-quarter of each section listed above. Any part of a quarter-quarter section that lies within one mile of the CD-C project area is included. A double dash (--) indicates no information is available.

Record suffixes are denoted as follows:

"A" Adjudicated (finalized) rights; unless the right is a territorial appropriation, there will be a match in the reference column from one of the following permit types for the unadjudicated portion
"D" Ditch or pipeline permit
"E" Enlargement of a ditch or pipeline permit
"R" Reservoir permit
"S" Stock reservoir permit

Use Codes

COMBBU	Combined Beneficial Use
DOM	Domestic
FIS	Fish Propagation
FLO	Flood Control
FTH	Flow-through Non-consumptive
IND	Industrial
IRR	Irrigation
MIS	Miscellaneous
OIL	Oil Refining/Production
REC	Recreation
RES	Reservoir supply
STO	Stock
TEM	Temporary
WET	Wetlands
WL	Wildlife

Separate water rights with a status code of ABA, A&C, AME, CAN, ELI, EXP, REJ, or TRA were eliminated from the search area listing provided above (including those belonging to the mining companies), as none of these use codes represent a valid current right.

Table F-5. WDEQ use classifications[1]

Class of Water	Outstanding Values	Drinking Water	Game Fish	Non-Game Fish	Fish Consumption	Other Aquatic Life	Recreation	Wildlife	Agriculture	Industry	Scenic Value
2AB	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2C	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3A	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3B	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
4B	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
4C	No	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes

[1] Only those classifications used in the CD-C project area are included in this list.

[2] "Yes" means that it is protected for the use specified, and "No" means that it is not.

Source: WDEQ 2001

Table F-6. WDEQ use-classified water bodies near and in the CD-C project area

Reservoirs, Lakes, and Ponds (Use Classification)	Source Water	Acres	Surface Ownership
Alkali Lake (3A)	Spring Fed	24	BLM/WGFD
Bush Lake (3B)	Bear Creek	334	BLM
Chain Lakes (3A)	Spring Fed	1,000	BLM/WGFD
Circle Bar Lake (3A)	Spring Fed	240	WGFD
Eightmile Lake (3A)	Spring Fed	75	BLM/PRIVATE
Hansen Lake (3B)	Spring Fed	52	WGFD
Hay Reservoir (3B)	Red Creek	1,000	BLM/STATE
Lost Creek Lake (3B)	Lost Creek	824	BLM/STATE
Mud Lake (3A)	Spring Fed	98	BLM
Robber's Gulch Reservoir (2AB)	Robber's Gulch	50	BLM
Streams and Springs	**WDEQ Water Quality Assessment**	**WDEQ Impairment or Threat**	**Classification**
Upper Green/White-Yampa			
Little Snake River[1]	Yes	Yes	2AB
Muddy Creek (mouth to Section 29, T17N, R89W) [1,2]	Yes	Yes	2C
Barrel Springs Draw[2]	No	N/A	3B
Windmill Draw[2]	No	N/A	3B
North Barrel Springs Draw[2]	No	N/A	3B
North Prong Red Wash[2]	No	N/A	3B
Robber's Gulch[1,2]	No	N/A	3B
Bitter Creek[1,2]	Yes	Yes	2C
Great Divide Basin			
Dugout Draw[1,2]	No	N/A	3B
Fivemile Ditch[2]	No	N/A	3B
Echo Springs[2]	No	N/A	3B
Separation Creek[1]	No	N/A	4C
Fillmore Creek[2]	No	N/A	3B
Creston Draw[1,2]	No	N/A	3B
Buck Draw[1,2]	No	N/A	3B
Mud Springs[2]	No	N/A	3B
Lost Creek[1,2]	No	N/A	3B
Red Creek[1,2]	No	N/A	4B
Bear Creek[1,2]	No	N/A	3B

[1] *Located near CD-C project area.*

[2] *Located within CD-C project area.*

Sources for reservoirs, lakes, and ponds: WDEQ 2001, and WGFD 2007b

Sources for streams and springs: WDEQ 2010, WDEQ 2012

Table F-7. Surface water quality at selected sites within and adjacent to the CD-C project area

	SURFACE WATER QUALITY STATION										
	USGS										WDEQ
	Little Snake River		Muddy Creek				Lower Barrel Springs Draw	Bitter Creek	Upper Filmore Creek	Separation Creek	Chain Lakes, Hansen Lake
Station Number	**09257000**	**09259050**	**09258050**	**09258900**	**09259000**	**09258980**	**09216310**	**09216545**	**09219240**	**09216527**	**481**
Located in CD-C project area	No	No	No	No	No	No	Yes	No	Yes	No	Yes
Sample period	1957–1988	1980–1997	June 2010–Feb. 2014	1976–1978	1957–1991	April 2006–present[1]	1978–1979	1975–1981	4/18/1979	1975 – 1981	1974–1980
Number of samples[2]	107	100	44	3	41	64	7	155	1	45	15
pH	8.1	8.1	8.2	8.6	8.2	8.3	8.4	8.4	7.7	8.2	9.1
WDEQ SW Standard	6.5-9.0	6.5-9.0	6.5-9.0	6.5-9.0	6.5-9.0	6.5-9.0	6.5-9.0	6.5-9.0	6.5-9.0	6.5-9.0	6.5-9.0
Conductance, µmhos/cm (mean)	259$_{(34)}$	366$_{(90)}$	873(42)	1,350$_{(2)}$	966$_{(35)}$	1,812$_{(64)}$	533$_{(4)}$	1,755$_{(149)}$	700$_{(1)}$	1,089$_{(39)}$	4,502$_{(7)}$
Conductance, µmhos/cm (min)	82	87	416	600	529	448	340	280	700	220	1,800
Conductance, µmhos/cm (max)	460	855	1,320	2,100	1,790	3,990	1,000	4,500	700	2,390	11,350
TDS (mean)	158$_{(9)}$	243$_{(17)}$	615(40)	913$_{(2)}$	346$_{(1)}$	1,249$_{(55)}$	619$_{(1)}$	1,289$_{(78)}$	495$_{(1)}$	200$_{(1)}$	4,465$_{(8)}$
TDS(min)	46	87	257	396	346	267	619	295	495	200	1,304
TDS (max)	260	540	987	1,430	346	2,810	619	2,740	495	200	11,289
Suspended solids[3] (mean)	154$_{(101)}$	228$_{(25)}$	124(35)	6,198$_{(2)}$	3,191$_{(41)}$	300$_{(55)}$	nm	1,843$_{(105)}$	141$_{(1)}$	490$_{(1)}$	423
Suspended solids[3] (min)	4	6	10	195	7	13	nm	22	141	490	15
Suspended solids[3] (max)	1,180	852	1,370	12,200	22,500	2,530	nm	21,900	141	490	956
Turbidity, NTU	13	167	56	1,260	nm	55	17	305	98[4]	131	nm
Calcium	30	34	93	54	42	79	28	40	32	74	13
Magnesium	8	12	39	44	40	50	2	27	68	69	8
Potassium	2	2	4	7	9	4	5	3	7	6	13
Sodium	11	26	49	200	286	274	205	348	22	80	1,604
Bicarbonate	159	190	nm	373	308	nm	500	369	68	277	1,400
Sulfate	25	54	280	380	320	515	100	590	320	385	1,139
Chloride	3	2		65	32	126	12	39	12	13	342
WDEQ SW Standard	230	230	230	230	230	230	N/A	230	N/A	N/A	N/A
Iron	0.07	0.16	0.01	0.11	nm	0.03	nm	0.10	0.20	0.08	17.1
WDEQ SW Standard	0.3	0.3	1	1	1	1	1	1	1	N/A	1
Hardness (CaCO3)	111	151	394	315	270	404	80	211	nm	467	67
Dissolved oxygen	9	10	9.5	11	10	10	5.2	9.7	5	8.2	6.4
WDEQ SW Standard	5	5	5	5	5	5	N/A	5	N/A	N/A	N/A

[1] Daily mean values analyzed April 18, 2006 to February 2, 2011.
[2] Total number of grab samples analyzed; not every parameter was analyzed in every sample.
[3] Total concentration; except as noted here, all reported values represent dissolved concentrations.
[4] JTU - Jackson turbidity units.
nm - Not measured.
$_{(34)}$ - Number of samples analyzed for this parameter.
All units are mg/L except as noted.

Source: WDEQ 2001, WRDS 2007, USGS 2011a

Table F-8. Muddy Creek water quality[1]

Parameter	Unit	Count	Mean[2]	Maximum	Minimum	WDEQ Surface Water Standard
Specific Conductance	µmhos	98	1,416.9	3,990.0	0.3	N/A
Total dissolved solids	mg/L	59	1,236.0	2,810.0	267	N/A
Total suspended solids	mg/L	59	2,595.2	22,500.0	7.0	N/A
Turbidity	NTU	22	240.8	2,500.0	10.0	N/A
pH	standard units	88	8.4	9.5	7.6	6.5-9.0
Dissolved oxygen	mg/L	78	9.7	17.6	6.1	5
Hardness as CaCO3	mg/L	75	371.7	744.0	54.6	N/A
Alkalinity as CaCO3	mg/L	55	311.0	478.0	117.0	N/A
Calcium	mg/L	20	68.8	130.0	22.0	N/A
Magnesium	mg/L	74	43.8	97.1	3.9	N/A
Sodium	mg/L	75	222.0	693.0	3.6	N/A
Potassium	mg/L	76	4.5	9.8	1.3	N/A
Sodium adsorption ratio	none	60	5.6	11.4	0.1	N/A
Sulfate	mg/L	75	437.8	1,210.0	21.0	N/A
Chloride	mg/L	75	95.7	417.0	0.7	230
Bicarbonate	mg/L	20	227.1	565.0	121.0	N/A
Carbonate	mg/L	14	11.2	114.0	0.0	N/A
Fluoride	mg/L	65	0.9	11.0	0.2	N/A
Silica	mg/L	60	12.6	39.0	3.7	N/A
Coliform, fecal	count/100 mL	8	131.3	420.0	20.0	126[3]
Aluminum, dissolved	µg/L	1	< 100.0	< 100.0	< 100.0	87
Arsenic, dissolved	µg/L	57	2.0	3.2	0.8	10
Barium, dissolved	µg/L	2	76.5	< 100.0	53.0	N/A
Beryllium, dissolved	µg/L	1	< 0.01	< 0.01	< 0.01	N/A
Boron, dissolved	µg/L	3	153.3	360.0	20.0	N/A
Cadmium, dissolved	µg/L	2	0.02	0.04	0.0	0.25
Chromium, dissolved	µg/L	1	0.5	< 1.0	< 1.0	N/A
Copper, dissolved	µg/L	2	2.1	2.2	< 2.0	9
Iron, dissolved	µg/L	10	253.6	876.0	20.0	1000
Lead, dissolved	µg/L	1	0.1	0.1	0.1	2.5
Manganese, dissolved	µg/L	5	65.8	218.0	< 10	1462
Mercury, dissolved	µg/L	1	< 0.5	< 0.5	< 0.5	0.051
Molybdenum, dissolved	µg/L	1	8.0	8.0	8.0	N/A

Parameter	Unit	Count	Mean[2]	Maximum	Minimum	WDEQ Surface Water Standard
Selenium, dissolved	µg/L	3	4.3	8.0	2.0	4.61
Silver, dissolved	µg/L	2	0.0	0.0	0.0	3.4
Uranium, dissolved	µg/L	3	10.1	16.0	6.9	N/A
Zinc, dissolved	µg/L	2	12.9	< 20	5.7	118.1
Radium 226	pCi/L	2	0.5	1.2	0.17	60
Gross alpha	pCi/L	2	22.5	23.0	22.0	N/A
Gross beta	pCi/L	2	6.8	7.0	< 6.5	N/A

[1] Based on Sampling Sites 09217220, 09258900, 09258980, 09259000, MCR3, MCDAD, 412325107244101, 412614107452101
[2] Geometric mean
[3] Geometric mean of 5 or more samples for a 30-day period during the summer recreation season (May 1 through Sept. 30)
µmhos = micromhos
mg/L = milligrams per liter
µg/L = micrograms per liter
pCi/L = picocuries per liter
Source: USGS 2011a, WDEQ 2001

Table F-9. 2010 303(d) water bodies in the CD-C project area with impairments or threats

Surface Water	Impairments or Threats	Location	Impairments/ Threats	Use Impaired/ Threatened	Date	Priority
Little Snake River Basin (HUC 14050003 and HUC 14050004)						
Muddy Creek	Threats	West of State Hwy 789	Habitat degradation	Non-game fish; aquatic life	1996	Moderate
Muddy Creek	Threats	Above Alamosa Gulch to Littlefield Creek	Habitat degradation	Cold fish, aquatic life	1996	Moderate
Muddy Creek	Threats	Below Youngs Draw upstream to Deep Creek	Chloride, Selenium	Aquatic Life	2010	Not Identified In Report

Source: WDEQ 2010

Table F-10. Water-bearing characteristics of geologic formations in the Washakie and Great Divide structural basins

Era	Period	Geologic Unit	Thickness	HYDROLOGIC PROPERTIES		
				Well Yield (gpm)	Transmissivity (gpd/ft)	Permeability (gpd/ft^2)
Cenozoic	Quaternary		0–70	<30	168-560	21-62
	Tertiary	Washakie Formation (Uinta & Bridger Formations)	0–3,200			
		Laney Member of Green River Fm.	0–1,500	<200	100 - 300	10
		Wasatch Fm.	0–4,000+	30–50	150–10,000	0.04–18.2
		Battle Springs Fm.	0–4,700	1–157	29–3,157	NM
		Fort Union Fm.	0–2,700+	3-300	<2,500	<1
Mesozoic	Upper Cretaceous	Lance Fm.	0–4,500+	<25	<20	0.007–8.2
		Fox Hills Sandstone	0–400	NM	10-20	0.9
		Lewis Shale	0–2,700+	2–252	0.03–50	0.002–0.9
		Mesaverde Group (excl. Almond Fm.)	0–2,800	<100	<3,000	NM
		Baxter Shale (incl. Steele Shale and Niobrara Fm.)	2,000–5,000+	Major regional aquitard between Mesaverde and Frontier aquifers. Hydrologic data unavailable.		
		Frontier Fm.	190–900+	1–100+	<100–6,500	NM
	Lower Cretaceous	Mowry Shale	150–525	Regional aquitard. Hydrologic data unavailable.		
		Thermopolis Shale (incl. Muddy sandstone)	40–235 (20–155)	Considered a leaking confining unit. Hydrologic data unavailable.		
		Cloverly Fm.	45–240	25–120	340–1,700	1–177
	Upper Jurassic	Morrison Fm.	170–450+	Confining unit between Cloverly and Sundance-Nugget aquifers. Hydrologic data unavailable.		
		Sundance Fm.	130–450+	27–35	12–3,500	NM
	Lower Jurassic-Upper Triassic	Nugget Sandstone	0–650+	35–200	<2,166	NM
	Triassic	Chugwater Fm.	900–1,500+	Confining unit between Sundance-Nugget and Paleozoic aquifers. Hydrologic data unavailable.		
Mesozoic-Paleozoic	Lower Triassic Permian	Phosphoria Fm.(incl. Goose Egg Fm.)	170–460	Probable poor water-bearing capabilities due tallow permeability. Hydrologic data unavailable.		
Paleozoic	Permian-Pennsylvanian	Tensleep Fm.	0–840+	24–400	1–374	NM
	Middle and Lower Pennsylvanian	Amsden Fm.	2–260+	Probable poor water-bearing capabilities due to predominance of fine-grained sediments.		
	Mississippian	Madison Limestone	5–325+	<400	Variable	NM
Paleozoic	Cambrian	Indef. rocks	0–800+	4–250	NM	NM
Precambrian	N/A	Igneous and metamorphic rocks	Unknown	10–20	1<1,000	Generally high in upper 200 ft of unit

Adapted from Table V-1 in Collentine et al. (1981). Formations not encountered in CD-C project area have been omitted.

Table F-11. Existing groundwater rights within 1 mile of the CD-C project area, July 2014

SEO Use Designation (As Assigned)	Groundwater Rights
Monitoring	324
Stock	255
Miscellaneous	206
Coalbed Methane (Coalbed methane natural gas)	98
Domestic	34
Domestic; Stock	31
Industrial	7
Miscellaneous; Monitoring	6
Municipal	6
Miscellaneous; Stock	5
Domestic; Miscellaneous	3
Industrial; Miscellaneous	3
Domestic; Miscellaneous; Stock	2
Domestic; Irrigation; Stock	2
Industrial; Stock	1
Domestic; Industrial; Irrigation; Miscellaneous	1
Domestic; Irrigation	1
Coalbed Methane; Stock	1
Test well	1
Total	**987**
Use Included in SEO Designation	**Groundwater Rights**
Monitoring	330
Stock	297
Miscellaneous	226
Coalbed Methane (Coalbed methane natural gas)	99
Domestic	74
Industrial	12
Municipal	6
Irrigation	4
Test Well	1
Total[1]	**1,049**

[1] *Total (1,038) exceeds the number of permitted groundwater rights (988) since individual rights may have multiple uses*

Source: SEO 2014

Table F-12. Groundwater rights within 1 mile of the CD-C project area

WR Number	Priority Date	Status	Company/Individual	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Total Depth	Lat	Long
P117.0C	12/31/1898	INC	Union Pacific Railroad		20	94	34	NENE	20	1,590	41.672000	-107.970900
P118.0C	5/4/1902	INC	Town of Wamsutter	MUN_GW	20	94	34	SWNE	10	1,365	41.668370	-107.975700
P119.0C	1/15/1912	INC	Town of Wamsutter	MUN_GW	20	94	34	NWNE	15	1,905	41.671970	-107.975700
P6382.0P	12/31/1916	Complete	Rochelle Curtis	DOM_GW; STK	22	93	32	NENE	10	200	41.840480	-107.933800
P6658.0P	12/31/1916	Complete	DEW GEORGE W.	DOM_GW; STK	16	92	7	SENE	10	440	41.374730	-107.786400
P120.0C	8/20/1921	INC	Town of Wamsutter	MUN_GW	20	94	34	NWNE	67	1,801	41.671970	-107.975700
P6383.0P	12/31/1924	Complete	Rochelle Curtis	STK	22	93	21	SWSW	10	190	41.858440	-107.928900
P6390.0P	12/31/1925	Complete	Rochelle Curtis	STK	21	93	11	SWNW	20	-1	41.807990	-107.890300
P7543.0P	12/31/1929	Complete	QUEALY EDNA M. / QUEALY L. STUART	STK	20	95	33	SWSW	15	380	41.660680	-108.119800
P7544.0P	12/31/1929	Complete	QUEALY EDNA M. / QUEALY L. STUART	STK	20	94	19	NWSE	15	100	41.693440	-108.033200
P6386.0P	12/31/1930	Complete	Rochelle Curtis	DOM_GW; STK	22	94	18	SWSW	20	700	41.873340	-108.083400
P6391.0P	12/31/1930	Complete	Rochelle Curtis	STK	21	93	9	NENW	25	-1	41.811660	-107.924000
P6384.0P	12/31/1933	Complete	Union Pacific Railroad / Rochelle Curtis	STK	21	93	1	NWSW	20	230	41.818780	-107.871000
P6385.0P	12/31/1935	Complete	Union Pacific Railroad / Rochelle Curtis	STK	21	94	23	NWSE	15	-1	41.775520	-107.996500
P7538.0P	12/31/1939	Complete	U.S. GOVERNMENT / QUEALY EDNA M. / QUEALY L. STUART	STK	21	95	34	SWNW	10	185	41.750510	-108.141500
P7542.0P	12/31/1939	Complete	Wyo State Board of Land Commissioners / QUEALY EDNA M. / QUEALY L. STUART	STK	25	96	36	SWSW	20	150	42.090780	-108.239300
P7954.0P	12/31/1939	Complete	Wyo State Board of Land Commissioners / QUEALY EDNA M. / QUEALY L. STUART	STK	25	96	36	SWSW	15	150	42.090780	-108.239300
P6387.0P	12/31/1940	Complete	Rochelle Curtis	STK	23	94	19	NWNW	12	-1	41.956680	-108.083200
P6388.0P	12/31/1941	Complete	Union Pacific Railroad / Rochelle Curtis	STK	23	94	13	NWNW	20	-1	41.970730	-107.986500
P7539.0P	12/31/1944	Complete	QUEALY EDNA M. / QUEALY L. STUART	STK	21	95	23	SESE	20	160	41.772150	-108.107700

Table F-12. Groundwater rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company/Individual	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Total Depth	Lat	Long
P11.0C	10/3/1945	INC	THE TEXAS COMPANY	IND_GW	18	98	1	NWNW	14	572	41.571200	-108.405400
P10695.0P	7/1/1948	Complete	Bureau of Land Management	STK	24	97	17	NENE	17	255	42.059320	-108.401200
P7541.0P	12/31/1949	Complete	QUEALY EDNA M. / QUEALY L. STUART	STK	21	94	33	SESW	15	260	41.743010	-108.040000
P8458.0P	6/7/1953	Complete	SUN LAND & CATTLE COMPANY	DOM_GW; STK	22	91	27	NWSW	25	-1	41.847500	-107.677000
P14957.0P	9/25/1954	Complete	Wyo State Game & Fish Dept.	STK	23	92	25	NENE	25	230	41.941490	-107.739200
P14959.0P	8/28/1957	Complete	Wyo State Game & Fish Dept.	STK	23	93	3	NESE	25	201	41.992240	-107.895300
P14956.0P	8/31/1957	Complete	Wyo State Game & Fish Dept.	STK	24	92	33	NESE	25	300	42.006650	-107.796800
P17024.0P	10/24/1958	Complete	Wyo State Dept. of Transportation	DOM_GW	20	94	34	NENW	20	1045	41.671940	-107.980500
P263.0W	11/12/1959	Complete	RASMUSSON ARTHUR H.	STK	20	94	15	SESE	28	810	41.704610	-107.970800
P14958.0P	12/29/1959	Complete	Wyo State Game & Fish Dept.	STK	23	92	31	NESW	25	406	41.919990	-107.846300
P695.0W	3/28/1961	INC	HENEAGE DAVID S & NAOMI L	DOM_GW; IND_GW; IRR_GW; MIS	20	94	34	NWNW	250	1,046	41.671920	-107.985400
P17372.0P	12/12/1961	Complete	USDI - BLM	STK	14	92	12	SWNE	5	110	41.200870	-107.695200
P6413.0P	5/31/1962	Complete	GRIEVE L. U. / GRIEVE E. R.	STK	20	91	35	SWNE	8	270	41.666630	-107.612800
P6416.0P	5/31/1962	Complete	GRIEVE E. R. / GRIEVE L. U.	STK	19	91	11	SENW	8	250	41.637710	-107.615800
P6419.0P	5/31/1962	Complete	GRIEVE E. R. / GRIEVE L. U.	STK	19	91	5	NWNW	8	180	41.656440	-107.680000
P7545.0P	3/23/1963	Complete	U.S. GOVERNMENT / QUEALY EDNA M. / QUEALY L. STUART	STK	20	94	22	NWSW	10	240	41.693730	-107.985400
P6414.0P	5/31/1963	Complete	GRIEVE E. R. / GRIEVE L. U.	DOM_GW; STK	20	91	18	NESW	8	180	41.707010	-107.694700
P6420.0P	5/31/1963	Complete	GRIEVE E. R. / GRIEVE L. U.	STK	20	91	33	NENW	8	105	41.670670	-107.656200

Table F-12. Groundwater rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company/Individual	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Total Depth	Lat	Long
P11766.0P	7/31/1964	Complete	HAY LEONARD	DOM_GW; STK	19	97	11	NWSW	25	900	41.636200	-108.308900
P11767.0P	7/31/1964	Complete	HAY LEONARD	DOM_GW; STK	19	97	3	NESE	25	840	41.650680	-108.313700
P7540.0P	6/3/1965	Complete	QUEALY EDNA M. / QUEALY L. STUART	STK	21	94	19	SENE	15	476	41.779260	-108.069000
P18226.0P	9/15/1965	Complete	U.S. DEPARTMENT OF INTERIOR GRAZING SERVICE	STK	20	93	20	NWNW	15	-1	41.700600	-107.909100
P17365.0P	1/31/1966	Complete	USDI - BLM	STK	16	93	14	NWNW	5	240	41.364420	-107.838200
P1883.0W	3/23/1967	INC	ANADARKO E & P COMPANY LP	IND_GW	18	99	1	NWSE	468	4,040	41.564050	-108.511000
P8459.0P	6/23/1967	Complete	SUN LAND & CATTLE COMPANY	STK	22	91	15	NESE	10	178	41.876330	-107.662400
P17366.0P	10/26/1967	Complete	USDI - BLM	STK	16	94	12	NENE	5	140	41.379330	-107.919300
P17367.0P	10/26/1967	Complete	USDI - BLM	STK	16	94	24	SESE	5	207	41.339370	-107.919300
P17370.0P	10/26/1967	Complete	USDI - BLM	STK	17	94	4	NWNW	5	252	41.483940	-108.004000
P17371.0P	10/26/1967	Complete	USDI - BLM	STK	17	94	26	NENE	5	200	41.426000	-107.950700
P17373.0P	10/26/1967	Complete	USDI - BLM	STK	18	94	22	SESE	5	150	41.516310	-107.970700
P17496.0P	10/26/1967	Complete	USDI - BLM	STK	19	94	34	SWSW	5	306	41.574240	-107.985200
P17497.0P	10/26/1967	Complete	USDI - BLM	STK	19	95	24	SESE	5	300	41.603020	-108.047600
P6415.0P	11/9/1967	Complete	GRIEVE LEELAND U.	STK	14	91	32	SESE	10	140	41.135640	-107.652200
P2170.0P	3/16/1968	Complete	Wyo State Game & Fish Dept. / Wyo State Game & Fish Dept.	STK	23	93	16	SESW	25	900	41.959720	-107.924100
P8466.0P	5/20/1968	Complete	SUN LAND & CATTLE COMPANY	STK	23	91	3	NWNW	10	150	41.999330	-107.676400
P8467.0P	5/25/1968	Complete	SUN LAND & CATTLE COMPANY	STK	23	91	15	NWNW	10	160	41.970410	-107.676600
P5987.0W	7/10/1970	Complete	Rochelle Curtis	STK	22	93	19	SWNE	10	260	41.865820	-107.957800
P6093.0W	7/16/1970	Complete	SUN LAND & CATTLE COMPANY	DOM_GW; STK	23	91	33	NESW	10	160	41.919790	-107.691200
P6209.0W	7/29/1970	Complete	CUIN L.B.	DOM_GW	19	95	5	SENE	10	400	41.653380	-108.124600
P7349.0W	11/4/1970	Complete	USDI - BLM	STK	23	91	10	SWNE	15	1,000	41.981300	-107.667000
P7821.0W	12/15/1970	Complete	Bureau of Land Management	STK	21	95	30	NESW	25	9,406	41.761420	-108.194700
P7823.0W	12/15/1970	Complete	USDI - BLM	STK	23	92	2	SESW	6	1,013	41.988530	-107.767900

Table F-12. Groundwater rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company/Individual	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Total Depth	Lat	Long
P7824.0W	12/15/1970	Complete	USDI - BLM	STK	23	93	24	NESW	5	1,005	41.948860	-107.866000
P7825.0W	12/15/1970	Complete	USDI - BLM	STK	23	94	14	SESE	8	980	41.959950	-107.991400
P7831.0W	1/26/1971	Complete	SAPOUNAKIS DIANE M	STK	20	95	18	NESW	25	9,337	41.707380	-108.153700
P9626.0W	7/1/1971	Complete	Union Pacific Railroad	DOM_GW	19	96	18	NWNE	7	380	41.628000	-108.264700
P9627.0W	7/1/1971	Complete	Union Pacific Railroad	DOM_GW	19	96	18	SENW	8	455	41.624390	-108.269500
P9630.0W	7/1/1971	Complete	Union Pacific Railroad	DOM_GW	19	97	19	NWNW	5	270	41.614660	-108.386100
P9742.0W	7/15/1971	Fully Adjudicated	Kennecott Uranium Co.	IND_GW; STK	24	94	34	NENE	25	170	42.014200	-108.010600
P9820.0W	7/19/1971	Complete	USDI - BLM	STK	22	93	10	NESW	25	990	41.890970	-107.904700
P9963.0W	8/4/1971	Complete	QUEALY LIVESTOCK CO.	STK	20	95	21	NESE	20	280	41.693360	-108.105300
P14185.0W	6/1/1972	INC	CONSUMERS GASOLINE CO.	MIS	20	92	11	SWNW	25	0	41.725350	-107.736900
P14278.0W	6/7/1972	Complete	Rochelle Curtis	DOM_GW; STK	21	95	5	NWNW	7	400	41.826540	-108.179900
P14942.0W	7/10/1972	Fully Adjudicated	MOYER'S SERVICE INC.	MIS	19	95	4	SWNW	10	210	41.653410	-108.119800
P14749.0W	7/21/1972	Complete	QUEALY L. STUART & EDNA M.	STK	21	94	31	NENW	5	300	41.753940	-108.078700
P14750.0W	7/21/1972	Complete	USDI - BLM / QUEALY L. STUART & EDNA M.	STK	20	94	8	NWSW	10	300	41.722520	-108.023500
P15643.0W	8/28/1972	Complete	QUEALY L. STUART & EDNA M.	STK	20	95	35	SWNE	10	400	41.668090	-108.071800
P15644.0W	8/28/1972	Complete	QUEALY L. STUART / USDI - BLM	STK	20	94	30	SWSE	10	400	41.675380	-108.033100
P16769.0W	11/29/1972	Complete	USDI - BLM	STK	22	93	36	NENE	25	300	41.840470	-107.856500
P22968.0W	12/7/1972	Complete	USDI - BLM	STK	20	96	10	SWNW	25	2,850	41.725490	-108.217100
P17358.0W	12/20/1972	Complete	USDI - BLM	STK	15	93	6	SWSW	5	315	41.295790	-107.914800
P17359.0W	12/20/1972	Complete	USDI - BLM	STK	16	92	31	NESW	5	365	41.313070	-107.795900
P17360.0W	12/20/1972	Complete	USDI - BLM	STK	17	92	8	SENW	5	100	41.464270	-107.789700
P17492.0W	12/20/1972	Complete	USDI - BLM	STK	19	95	22	SENW	5	445	41.610230	-108.095400
P22748.0W	6/25/1973	Complete	Rochelle Curtis	DOM_GW; STK	22	95	7	NENW	5	250	41.898950	-108.194200
P25053.0W	11/19/1973	Complete	QUEALY L. STUART & EDNA M.	STK	21	95	17	SESE	10	380	41.786700	-108.165600

Table F-12. Groundwater rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company/Individual	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Total Depth	Lat	Long
P25189.0P	12/13/1973	Complete	Wyo State Game & Fish Dept.	STK	24	91	31	NWNW	25	-1	42.013890	-107.734000
P26031.0W	1/22/1974	Fully Adjudicated	Texaco Production Dept.	MIS	18	98	1	NWNE	13	657	41.571190	-108.395800
P26024.0W	2/27/1974	INC	QUEALY L. STUART & EDNA M.	DOM_GW; IRR_GW	19	95	1	NWNW	10	300	41.657260	-108.062200
P26025.0W	2/27/1974	Complete	QUEALY L. STUART & EDNA M.	STK	20	95	11	SWSW	10	610	41.718750	-108.081400
P26026.0W	2/27/1974	Complete	QUEALY L. STUART & EDNA M.	STK	21	94	21	SWSE	10	500	41.772000	-108.035200
P26615.0W	4/30/1974	Complete	Rochelle Curtis	STK	21	95	9	NENE	5	300	41.812030	-108.146100
P27102.0W	6/26/1974	Complete	USDI - BLM	STK	21	91	30	NENE	10	1,002	41.767880	-107.720700
P27847.0W	9/17/1974	Complete	SALISBURY GEORGE R.	DOM_GW; STK	17	92	14	NWNW	3	250	41.453280	-107.736700
P29065.0W	1/29/1975	Complete	QUEALY L. STUART & EDNA M.	STK	20	94	11	SWSE	10	500	41.719050	-107.956300
P29066.0W	1/29/1975	Complete	QUEALY L. STUART & EDNA M.	STK	19	94	5	NWNW	10	360	41.657290	-108.023600
P30390.0W	7/7/1975	Complete	MOORE VIRGINIA J. / MOORE LOWELL GLENN	DOM_GW	22	96	1	NENE	10	200	41.913350	-108.203700
P31006.0W	9/10/1975	Complete	Rochelle Curtis	DOM_GW; STK	23	95	29	SESW	10	160	41.931460	-108.174700
P32764.0W	4/2/1976	Complete	P H Livestock Co.	STK	19	96	17	SWNW	3	500	41.624410	-108.255100
P33168.0W	5/7/1976	Complete	Rochelle Curtis	DOM_GW	22	95	35	SESE	5	400	41.830100	-108.107200
P33169.0W	5/7/1976	Complete	Rochelle Curtis	DOM_GW; STK	22	95	21	SENE	5	260	41.866510	-108.145700
P33378.0W	5/12/1976	Complete	Adams Stephen L.	STK	19	95	11	NENE	15	500	41.642750	-108.067200
P34378.0W	5/12/1976	Complete	Adams Steve F.	STK	19	94	19	SENE	10	500	41.610200	-108.028400
P33697.0W	6/1/1976	Complete	CHAPMAN MARK W. & SHERRIE	DOM_GW; STK	20	95	17	NENW	35	150	41.714900	-108.134400
P33605.0W	6/9/1976	Complete	QUEALY EDNA M. & L. STUART	STK	21	94	31	SESE	10	700	41.743060	-108.069000
P34057.0W	6/9/1976	Complete	BROOKS MERLE	DOM_GW	20	96	36	SENW	20	120	41.667650	-108.173600
P34809.0W	8/19/1976	Complete	LINGER SID N. AND-OR MARLENE	DOM_GW	19	96	2	NWSE	12	220	41.649660	-108.187800

Table F-12. Groundwater rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company/Individual	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Total Depth	Lat	Long
P34816.0W	8/23/1976	Fully Adjudicated	ROCK SPRINGS GRAZING ASSOCIATION / COLORADO INTERSTATE GAS CO.	IND_GW; MIS	19	98	23	SWNE	50	601	41.611040	-108.415000
P35720.0W	12/7/1976	Complete	USDI - BLM	STK	23	96	25	NWNW	25	1,160	41.942220	-108.218100
P35724.0W	12/17/1976	Complete	USDI - BLM / QUEALY LIVESTOCK CO.	STK	20	94	24	NWSW	6	500	41.693820	-107.946700
P35939.0W	1/19/1977	Complete	P H LIVESTOCK COMPANY	STK	21	92	1	SESW	5	240	41.815030	-107.749500
P37180.0W	3/17/1977	INC	LINGER SID N. & MARLENE R.	MIS	19	96	2	NWSE	20	300	41.649660	-108.187800
P37252.0W	3/31/1977	Fully Adjudicated	ROCK SPRINGS GRAZING ASSOCIATION / COLORADO INTERSTATE GAS CO.	MIS	19	98	23	NWSE	30	603	41.607420	-108.415000
P38301.0W	6/9/1977	Complete	Rochelle Curtis	DOM_GW; STK	23	95	25	SWSW	15	300	41.931410	-108.102300
P38302.0W	6/9/1977	Complete	Rochelle Curtis	DOM_GW; STK	21	93	29	NWSW	12	300	41.761000	-107.948100
P39016.0W	6/20/1977	Complete	CONNERS JAMES R. & SARAH D.	DOM_GW	19	95	6	SWSE	12	120	41.646020	-108.148600
P38929.0W	6/22/1977	INC	USDI - BLM / Amoco Production Co.	MIS	21	91	21	SESW	0	460	41.771460	-107.691600
P38913.0W	6/28/1977	Complete	MEYER TRENTON R AND JODY L	DOM_GW	19	95	6	SENW	10	87	41.653220	-108.153500
P38499.0W	6/30/1977	Fully Adjudicated	Union Pacific Railroad	MIS	20	92	15	SWSW	5	265	41.703650	-107.756200
P38641.0W	7/5/1977	Complete	P H LIVESTOCK COMPANY	STK	19	98	35	NWNE	10	350	41.585690	-108.415000
P39826.0W	7/15/1977	Complete	Lawrence Taylor	STK	20	90	31	SWNW	5	150	41.666370	-107.583900
P40245.0W	8/30/1977	Fully Adjudicated	Union Pacific Railroad	MIS	20	92	15	SWSW	5	265	41.703650	-107.756200

Table F-12. Groundwater rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company/Individual	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Total Depth	Lat	Long
P40644.0P	10/25/1977	Complete	NILAND JOHN & GLADYS / MCDONOUGH CATHERINE	STK	22	92	15	SESE	1	200	41.872950	-107.778400
P40645.0P	10/25/1977	Complete	NILAND JOHN & GLADYS / MCDONOUGH CATHERINE	STK	22	92	27	SESW	1	200	41.844050	-107.788000
P40646.0P	10/25/1977	Complete	NILAND JOHN & GLADYS / MCDONOUGH CATHERINE	STK	22	93	29	SWSW	1	200	41.844150	-107.948300
P40647.0P	10/25/1977	Complete	NILAND JOHN & GLADYS / MCDONOUGH CATHERINE	STK	22	93	25	NWSE	1	200	41.847670	-107.861300
P42290.0W	10/26/1977	Fully Adjudicated	HAY LEONARD	DOM_GW; IRR_GW; STK	20	97	1	NWSW	400	1,600	41.737610	-108.289500
P40865.0W	11/10/1977	Fully Adjudicated	PANHANDLE EASTERN PIPELINE CO.	MIS	19	96	7	NWNE	5	400	41.642440	-108.264700
P41724.0W	2/6/1978	Fully Adjudicated	DOWLIN DOUG & DARLENE	MIS	20	94	34	NESE	100	1,040	41.664790	-107.970900
P42533.0W	3/20/1978	Complete	HARKER RICHARD	DOM_GW; STK	20	95	8	NENE	5	300	41.729450	-108.124700
P42749.0W	4/6/1978	INC	WALL HERBERT LEE	DOM_GW; STK	22	96	17	NWSE	25	0	41.877010	-108.286300
P43000.0W	4/28/1978	INC	HARRINGTON MAX J & JOYCE	DOM_GW; MIS; STK	20	95	20	SWNW	8	80	41.696740	-108.139200
P43515.0W	5/24/1978	Complete	HOLLER DIXIE K.	DOM_GW	19	95	6	SWNW	12	100	41.653200	-108.158700
P44604.0W	8/10/1978	Complete	PLUMMER LYLE W. & VIRGINIA LEE	DOM_GW	20	95	20	SENW	12	141	41.696770	-108.134400
P45264.0W	9/26/1978	Complete	P H Livestock Co.	STK	21	92	13	NESW	4	200	41.789660	-107.749600
P47788.0W	5/2/1979	INC	MCWILLIAMS DAVID & PEGGY / ROSE EDGAR & SHEREE	MIS	20	94	34	SESE	50	1,020	41.661190	-107.970900

Table F-12. Groundwater rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company/Individual	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Total Depth	Lat	Long
P48097.0W	5/2/1979	INC	HYLAND ENTERPRISES, INC.	MIS	20	94	34	NESE	46	1,020	41.664790	-107.970900
P48074.0W	5/14/1979	INC	Kennecott Uranium Co.	MIS; MON	24	93	35	NWSW	0	150	42.006810	-107.890400
P48075.0W	5/14/1979	INC	Kennecott Uranium Co.	MIS; MON	24	93	32	NWNW	0	200	42.014080	-107.948400
P48076.0W	5/14/1979	INC	Kennecott Uranium Co.	MIS; MON	24	93	32	SESE	0	150	42.003250	-107.934100
P48078.0W	5/14/1979	INC	Kennecott Uranium Co.	MIS; MON	23	92	5	SESE	0	100	41.988520	-107.816700
P48079.0W	5/14/1979	INC	Kennecott Uranium Co.	MIS; MON	23	92	6	NENW	0	100	41.999470	-107.845600
P48080.0W	5/14/1979	INC	Kennecott Uranium Co.	MIS; MON	24	93	33	SESE	0	150	42.003210	-107.914700
P56206.0W	6/8/1979	INC	LYTLE WILLIAM	DOM_GW; MIS	20	94	34	SESE	60	1,035	41.661190	-107.970900
P48828.0W	6/27/1979	Complete	P H Livestock Co.	STK	19	96	31	NENE	2	220	41.584530	-108.259900
P55206.0W	7/5/1979	Complete	DIVIDE SHEEP COMPANY	STK	22	93	13	NWSW	25	550	41.876560	-107.870900
P55207.0W	7/5/1979	Complete	DIVIDE SHEEP COMPANY	STK	22	92	35	SESW	25	940	41.829580	-107.768800
P55208.0W	7/5/1979	Complete	DIVIDE SHEEP COMPANY	STK	22	92	29	NESW	25	500	41.847720	-107.826800
P49765.0W	8/13/1979	INC	H B & R INC.	MIS	20	94	34	SESE	20	1,040	41.661190	-107.970900
P49641.0W	8/27/1979	Complete	TRIAD RANCHES INC.	DOM_GW	19	95	6	NESE	20	100	41.649640	-108.143800
P49642.0W	8/27/1979	Complete	TRIAD RANCHES INC. / BROOKS C. MERLE	STK	20	96	13	SWNE	25	160	41.710880	-108.169200
P49643.0W	8/27/1979	Complete	NULL	STK	20	96	25	NWNE	25	260	41.685690	-108.168900
P49644.0W	8/27/1979	Complete	BUTLER JAMES	DOM_GW	20	96	26	SWNW	25	750	41.682170	-108.197800
P50385.0W	10/22/1979	Complete	P H Livestock Co.	STK	19	96	21	NESE	12	260	41.606310	-108.221300
P50386.0W	10/22/1979	Complete	P H Livestock Co.	STK	18	96	23	SWSW	15	200	41.516310	-108.196700
P50387.0W	10/22/1979	Complete	P H Livestock Co.	STK	19	97	19	SWNE	10	200	41.611010	-108.376500
P50389.0W	10/22/1979	Complete	P H Livestock Co.	STK	20	93	23	SENE	2	250	41.696450	-107.836500
P50390.0W	10/22/1979	Complete	P H Livestock Co.	STK	20	93	35	NENE	15	350	41.671260	-107.836700

Table F-12. Groundwater rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company/Individual	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Total Depth	Lat	Long
P50797.0W	12/19/1979	Complete	Union Pacific Railroad / P H Livestock Co.	STK	20	92	19	NENE	10	0	41.700010	-107.799300
P50798.0W	12/19/1979	Complete	P H Livestock Co.	STK	20	93	29	NESE	5	300	41.678940	-107.894000
P50799.0W	12/19/1979	Complete	P H Livestock Co.	STK	19	96	19	NESE	3	300	41.606240	-108.259900
P51482.0W	3/11/1980	Complete	HOLLER DIXIE K.	DOM_GW; STK	19	95	6	SWNW	20	875	41.653200	-108.158700
P52803.0W	6/25/1980	Fully Adjudicated	CHEVRON USA INC	IND_GW	19	98	23	SWNE	50	610	41.611040	-108.415000
P52858.0W	7/1/1980	Fully Adjudicated	SCURLOCK PERMIAN CORPORATION	DOM_GW; MIS	20	94	34	SESE	10	660	41.661190	-107.970900
P53634.0W	9/2/1980	Complete	CHEROKEE COAL COMPANY	MON	20	92	25	NWSW	0	90	41.678250	-107.717600
P53637.0W	9/2/1980	Complete	USDI - BLM / CHEROKEE COAL COMPANY	MON	19	92	11	NWSW	0	130	41.634990	-107.736300
P53638.0W	9/2/1980	Complete	USDI - BLM / CHEROKEE COAL COMPANY	MON	20	92	27	SESE	0	378	41.674650	-107.741600
P53644.0W	9/2/1980	Complete	CHEROKEE COAL COMPANY	MON	19	92	13	SWSE	0	40	41.616950	-107.707300
P53645.0W	9/2/1980	Complete	CHEROKEE COAL COMPANY	MON	20	91	19	SENW	0	50	41.696240	-107.694600
P53648.0W	9/2/1980	Complete	CHEROKEE COAL COMPANY	MON	20	92	35	SWSE	0	145	41.660210	-107.727100
P53649.0W	9/2/1980	Complete	CHEROKEE COAL COMPANY	MON	19	92	21	NENE	0	130	41.613050	-107.760200
P53651.0W	9/2/1980	Complete	CHEROKEE COAL COMPANY	MON	19	92	21	NENE	0	180	41.613050	-107.760200
P53652.0W	9/2/1980	Complete	CHEROKEE COAL COMPANY	MON	19	92	21	NENE	0	292	41.613050	-107.760200
P53653.0W	9/2/1980	Complete	USDI - BLM / CHEROKEE COAL COMPANY	MON	19	92	15	SESE	0	86	41.616740	-107.741000
P53654.0W	9/2/1980	Complete	USDI - BLM / CHEROKEE COAL COMPANY	MON	19	92	15	SESE	0	122	41.616740	-107.741000

Table F-12. Groundwater rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company/Individual	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Total Depth	Lat	Long
P53655.0W	9/2/1980	Complete	USDI - BLM / CHEROKEE COAL COMPANY	MON	19	92	15	SESE	0	142	41.616740	-107.741000
P53656.0W	9/2/1980	Complete	USDI - BLM / CHEROKEE COAL COMPANY	MON	19	92	15	SESE	0	85	41.616740	-107.741000
P53659.0W	9/2/1980	Complete	CHEROKEE COAL COMPANY	MON	19	92	11	NWSW	0	223	41.634990	-107.736300
P53660.0W	9/2/1980	Complete	CHEROKEE COAL COMPANY	MON	19	92	11	SWNW	0	273	41.638620	-107.736300
P53663.0W	9/2/1980	Complete	CHEROKEE COAL COMPANY	MON	19	92	9	NENE	0	423	41.642070	-107.760300
P53665.0W	9/2/1980	Complete	CHEROKEE COAL COMPANY	MON	19	92	27	NENW	0	245	41.598570	-107.750500
P53666.0W	9/2/1980	Complete	CHEROKEE COAL COMPANY	MON	19	92	27	NENW	0	135	41.598570	-107.750500
P53667.0W	9/2/1980	Complete	CHEROKEE COAL COMPANY	MON	19	92	27	NENW	0	155	41.598570	-107.750500
P53668.0W	9/2/1980	Complete	CHEROKEE COAL COMPANY	MON	19	92	27	NENW	0	188	41.598570	-107.750500
P53669.0W	9/2/1980	Complete	CHEROKEE COAL COMPANY	MON	20	92	33	SESE	0	232	41.660230	-107.760800
P53671.0W	9/2/1980	Complete	CHEROKEE COAL COMPANY	MON	20	92	33	SESE	0	87	41.660230	-107.760800
P53672.0W	9/2/1980	Complete	CHEROKEE COAL COMPANY	MON	19	92	9	NENE	0	85	41.642070	-107.760300
P53678.0W	9/2/1980	Complete	CHEROKEE COAL COMPANY	MON	19	92	9	NENE	0	270	41.642070	-107.760300
P53679.0W	9/2/1980	Complete	CHEROKEE COAL COMPANY	MON	19	92	9	NENE	0	145	41.642070	-107.760300
P53680.0W	9/2/1980	Complete	CHEROKEE COAL COMPANY	MON	20	92	25	NWSW	0	140	41.678250	-107.717600
P53681.0W	9/2/1980	Complete	CHEROKEE COAL COMPANY	MON	19	92	9	NENE	0	115	41.642070	-107.760300
P53682.0W	9/2/1980	Complete	CHEROKEE COAL COMPANY	MON	19	92	11	NWSW	0	35	41.634990	-107.736300
P53684.0W	9/2/1980	Complete	CHEROKEE COAL COMPANY	MON	19	92	3	SWSW	0	91	41.645700	-107.755600

Table F-12. Groundwater rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company/Individual	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Total Depth	Lat	Long
P53687.0W	9/2/1980	Complete	CHEROKEE COAL COMPANY	MON	19	92	9	NENE	0	160	41.642070	-107.760300
P53688.0W	9/2/1980	Complete	CHEROKEE COAL COMPANY	MON	20	92	35	SWSE	0	203	41.660210	-107.727100
P53689.0W	9/2/1980	Complete	CHEROKEE COAL COMPANY	MON	20	92	27	SESE	0	130	41.674650	-107.741600
P53690.0W	9/2/1980	Complete	CHEROKEE COAL COMPANY	MON	20	92	27	SESE	0	158	41.674650	-107.741600
P53691.0W	9/2/1980	Complete	CHEROKEE COAL COMPANY	MON	20	92	27	SESE	0	302	41.674650	-107.741600
P53692.0W	9/2/1980	Complete	CHEROKEE COAL COMPANY	MON	20	92	35	SWSE	0	95	41.660210	-107.727100
P53693.0W	9/2/1980	Complete	CHEROKEE COAL COMPANY	MON	20	92	25	NWSW	0	230	41.678250	-107.717600
P53695.0W	9/2/1980	Complete	CHEROKEE COAL COMPANY	MON	20	92	27	SESE	0	464	41.674650	-107.741600
P53698.0W	9/2/1980	Complete	CHEROKEE COAL COMPANY	MON	20	92	25	NWSW	0	86	41.678250	-107.717600
P53699.0W	9/2/1980	Complete	CHEROKEE COAL COMPANY	MON	20	92	25	NWSW	0	170	41.678250	-107.717600
P53700.0W	9/2/1980	Complete	CHEROKEE COAL COMPANY	MON	19	92	3	NESW	0	160	41.649370	-107.750800
P54034.0W	10/6/1980	Complete	Wyo State Office of Lands & Investments / Adams Stephen L.	STK	19	94	16	SWNW	2	6	41.624750	-108.004500
P54035.0W	10/6/1980	Complete	Wyo State Office of Lands & Investments / Adams Stephen L.	STK	19	94	16	SWSW	1	6	41.617530	-108.004500
P55030.0W	11/26/1980	INC	BRYSON ALVIS S. OR ROSE	DOM_GW	20	95	7	SWNE	25	140	41.725580	-108.148900
P55107.0W	12/24/1980	Complete	USDI - BLM	STK	23	97	13	SESE	20	100	41.961540	-108.320300
P55109.0W	12/24/1980	Complete	USDI - BLM	STK	24	96	13	SESE	5	300	42.047100	-108.203200
P55110.0W	12/24/1980	Complete	USDI - BLM	STK	24	96	18	SWNE	10	100	42.054170	-108.305500
P55868.0W	3/5/1981	Complete	P H Livestock Co.	STK	19	91	35	SWSE	20	100	41.572610	-107.611700
P56414.0W	4/10/1981	Complete	P. H. LIVESTOCK CO.	STK	21	92	1	SESW	10	650	41.815030	-107.749500
P56791.0W	5/5/1981	Complete	Adams Steve F.	STK	17	92	15	SESW	25	2,600	41.442500	-107.751100

Table F-12. Groundwater rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company/Individual	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Total Depth	Lat	Long
P56977.0W	6/2/1981	Complete	GARWOOD ERIC & SALLY	DOM_GW	19	96	1	SWNW	15	150	41.653270	-108.178300
P57110.0W	6/2/1981	Complete	BILYEU DANIEL L.	DOM_GW; STK	20	96	36	SENW	20	138	41.667650	-108.173600
P57681.0W	7/24/1981	Complete	1ST NATIONAL BANK OF GREELEY, CO	STK	19	93	21	NENE	25	7	41.613730	-107.875300
P57683.0W	7/24/1981	Complete	1ST NATIONAL BANK OF GREELEY, CO	STK	19	93	3	NESW	25	325	41.649690	-107.865700
P57685.0W	7/24/1981	Complete	1ST NATIONAL BANK OF GREELEY, CO	STK	19	93	15	SESW	25	300	41.617200	-107.865700
P57686.0W	7/24/1981	Complete	1ST NATIONAL BANK OF GREELEY, CO	STK	19	93	11	SWSW	25	528	41.631540	-107.851000
P59057.0W	9/24/1981	Complete	TRIAD RANCHES INC.	STK	19	96	2	NENE	25	500	41.656850	-108.183200
P59662.0W	11/10/1981	INC	Kennecott Uranium Co.	MON	23	94	3	NWSE	0	170	41.992520	-108.015600
P59663.0W	11/10/1981	INC	Kennecott Uranium Co.	MON	23	94	3	NWSE	0	170	41.992520	-108.015600
P59664.0W	11/10/1981	INC	Kennecott Uranium Co.	MON	23	94	10	SENE	0	160	41.981710	-108.010700
P59665.0W	11/10/1981	INC	Kennecott Uranium Co.	MON	23	94	10	SENE	0	92	41.981710	-108.010700
P59666.0W	11/10/1981	INC	Kennecott Uranium Co.	MON	23	94	10	SENE	0	40	41.981710	-108.010700
P59667.0W	11/10/1981	INC	Kennecott Uranium Co.	MON	23	94	3	NWSE	0	120	41.992520	-108.015600
P59668.0W	11/10/1981	INC	Kennecott Uranium Co.	MON	23	94	3	NESE	0	140	41.992510	-108.010700
P59669.0W	11/10/1981	INC	Kennecott Uranium Co.	MON	23	94	3	NESE	0	170	41.992510	-108.010700
P59670.0W	11/10/1981	INC	Kennecott Uranium Co.	MON	23	94	3	NESE	0	170	41.992510	-108.010700
P59673.0W	11/10/1981	INC	Kennecott Uranium Co.	MON	23	94	3	NESE	0	50	41.992510	-108.010700
P59677.0W	11/10/1981	INC	Kennecott Uranium Co.	MON	23	94	10	NWNE	0	70	41.985320	-108.015500

Table F-12. Groundwater rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company/Individual	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Total Depth	Lat	Long
P59678.0W	11/10/1981	INC	Kennecott Uranium Co.	MON	23	94	10	NWNE	0	160	41.985320	-108.015500
P59679.0W	11/10/1981	INC	Kennecott Uranium Co.	MON	23	94	3	NWSE	0	170	41.992520	-108.015600
P59682.0W	11/10/1981	Complete	Kennecott Uranium Co.	MON	23	94	3	NWSE	0	170	41.992520	-108.015600
P59683.0W	11/10/1981	INC	Kennecott Uranium Co.	MON	23	94	3	SWSE	0	170	41.988920	-108.015500
P60649.0W	11/30/1981	Fully Adjudicated	WAMSUTTER TRAILER COURT LLC	MIS	20	94	34	SWSE	150	1100	41.661170	-107.975700
P59378.0W	1/4/1982	Fully Adjudicated	CHEVRON USA INC	IND_GW	19	98	23	SWNE	55	634	41.611040	-108.415000
P59218.0W	1/5/1982	Complete	Upland Industries / QUEALY L. STUART	STK	20	94	33	SENW	12	360	41.668320	-107.999700
P59219.0W	1/5/1982	Complete	Upland Industries / QUEALY L. STUART	STK	20	94	9	NWSE	15	740	41.722620	-107.994800
P59220.0W	1/5/1982	Complete	QUEALY L. STUART	STK	20	95	27	NESE	15	780	41.678920	-108.086200
P59387.0W	1/27/1982	Complete	USDI - BLM	STK	23	91	10	SWNE	0	1,000	41.981300	-107.667000
P60980.0W	4/16/1982	Complete	HARTER HAROLD	DOM_GW	19	96	1	NWNE	10	148	41.656820	-108.168800
P60892.0W	5/20/1982	Complete	GIBBS KATHLEE A.	DOM_GW	20	96	26	NWNW	10	350	41.685800	-108.197800
P61410.0W	7/19/1982	Complete	P H Livestock Co.	STK	19	96	23	SESW	5	240	41.602690	-108.192400
P62636.0W	12/1/1982	Complete	PIERCE JERRY	DOM_GW	20	95	19	NWSW	10	150	41.692860	-108.159000
P62810.0W	12/21/1982	Complete	WHEELER WALTER A.	DOM_GW	20	96	24	NWSW	10	280	41.692960	-108.178500
P63187.0W	2/1/1983	Complete	USDI - BLM	STK	21	92	32	NESW	20	1,040	41.746340	-107.827300
P63520.0W	3/1/1983	Complete	ERICKSON JIMMIE E. & OR BARBARA JO	DOM_GW	20	96	26	NWSE	7	290	41.678540	-108.188200
P63761.0W	3/3/1983	Complete	UNION PACIFIC LAND RESOURCES CORP. / P.H. Livestock	STK	20	93	13	NWSW	10	620	41.707250	-107.831900
P63762.0W	3/3/1983	Complete	P. H. LIVESTOCK COMPANY	STK	18	96	13	NESW	2	800	41.534330	-108.172600
P63763.0W	3/3/1983	Complete	P. H. LIVESTOCK COMPANY	STK	19	96	15	NWNW	20	580	41.628030	-108.216400
P63378.0W	3/8/1983	Complete	SMITH PAUL AND KATHY	DOM_GW	20	96	24	NENW	10	167	41.700100	-108.173900

Table F-12. Groundwater rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company/Individual	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Total Depth	Lat	Long
P64759.0W	4/1/1983	INC	Colorado Interstate Gas	MIS	19	98	23	SWNE	0	601	41.611040	-108.415000
P64760.0W	4/1/1983	Fully Adjudicated	Colorado Interstate Gas	MIS	19	98	23	NWSE	0	603	41.607420	-108.415000
P64762.0W	4/1/1983	Fully Adjudicated	Colorado Interstate Gas	MIS	19	98	23	SWNE	0	610	41.611040	-108.415000
P64763.0W	4/1/1983	Fully Adjudicated	Colorado Interstate Gas	MIS	19	98	23	SWNE	0	634	41.611040	-108.415000
P64146.0W	5/23/1983	Complete	Rochelle Curtis	STK	22	95	29	NWNW	18	400	41.855470	-108.179700
P64300.0W	6/7/1983	Complete	ELLIS W. S.	DOM_GW	20	96	36	NENW	18	170	41.671260	-108.173700
P64310.0W	6/9/1983	Complete	UNION PACIFIC LAND RESOURCES CORP.	STK	17	93	15	SWNW	7	1,040	41.450830	-107.869600
P64311.0W	6/9/1983	Complete	UNION PACIFIC LAND RESOURCES CORP.	STK	17	93	35	SWSW	7	1,200	41.400210	-107.850100
P64536.0W	6/24/1983	Complete	UNION PACIFIC LAND RESOURCES CORP.	STK	18	93	21	SESW	20	780	41.516240	-107.884000
P64537.0W	6/24/1983	Complete	UNION PACIFIC LAND RESOURCES CORP.	STK	18	93	17	SWSW	10	440	41.531010	-107.908300
P64538.0W	6/24/1983	Complete	UNION PACIFIC LAND RESOURCES CORP.	STK	18	93	9	NWSW	5	560	41.548930	-107.889000
P65191.0W	6/24/1983	Complete	UNION PACIFIC LAND RESOURCES CORP.	STK	19	93	31	NESW	10	520	41.577960	-107.922900
P65306.0W	8/16/1983	Complete	WOOLDRIDGE SHERRY K.	DOM_GW	19	95	6	NENW	10	120	41.656840	-108.153500
P66216.0W	1/9/1984	Complete	USDI - BLM / Kennecott Uranium Co.	MON	23	94	10	SESW	0	75	41.974540	-108.020400
P66393.0W	2/15/1984	Complete	UNION PACIFIC LAND RESOURCES CORP.	STK	18	93	5	NWSW	10	740	41.563660	-107.908500

Table F-12. Groundwater rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company/Individual	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Total Depth	Lat	Long
P66578.0W	3/15/1984	Complete	UNION PACIFIC LAND RESOURCES CORP.	STK	18	93	29	SWSW	8	620	41.501970	-107.908100
P66579.0W	3/15/1984	Complete	UNION PACIFIC LAND RESOURCES CORP.	STK	18	93	27	SWSW	8	680	41.501570	-107.869300
P66580.0W	3/15/1984	Complete	UNION PACIFIC LAND RESOURCES CORP.	STK	18	93	33	NWSW	6	720	41.490980	-107.888800
P66930.0W	4/9/1984	Fully Adjudicated	CITIES SERVICE CO. / NORTHERN GAS PRODUCTS CO. / PANHANDLE EASTERN PIPE LINE CO.	MIS	19	96	7	NWNE	0	400	41.642440	-108.264700
P68912.0W	10/30/1984	Complete	QUEALY L. STUART & EDNA M.	STK	21	94	31	NENW	14	480	41.753940	-108.078700
P69128.0W	12/6/1984	Complete	HAY LEONARD	STK	19	97	1	NESW	25	550	41.650640	-108.284700
P69555.0W	1/7/1985	Complete	KILLIAN MARVIN D. & OR CHARLOTTE	DOM_GW; STK	20	95	17	SESW	25	180	41.704010	-108.134400
P70302.0W	2/28/1985	INC	WHITE C. A.	DOM_GW; MIS	20	94	34	NESE	25	1,180	41.664790	-107.970900
P69993.0W	5/10/1985	Complete	USDI - BLM	MON	15	92	3	NENW	0	26	41.305870	-107.738300
P69994.0W	5/10/1985	Complete	USDI - BLM	MON	15	92	3	SENW	0	22	41.302300	-107.738300
P69996.0W	5/10/1985	Complete	Wyo State Office of Lands & Investments	MON	15	92	3	SWNW	0	75	41.302300	-107.743100
P69997.0W	5/10/1985	Complete	Wyo State Office of Lands & Investments	MON	15	92	3	SWNW	0	17	41.302300	-107.743100
P69998.0W	5/10/1985	Complete	Wyo State Office of Lands & Investments	MON	15	92	3	SWNW	0	34	41.302300	-107.743100
P69999.0W	5/10/1985	Complete	USDI - BLM	MON	15	92	3	NWSW	0	19	41.298680	-107.743100
P70000.0W	5/10/1985	Complete	USDI - BLM	MON	15	92	3	NWSW	0	75	41.298680	-107.743100
P70002.0W	5/10/1985	Complete	USDI - BLM	MON	15	92	3	SWNW	0	40	41.302300	-107.743100
P70003.0W	5/10/1985	Complete	USDI - BLM	MON	15	92	4	NESE	0	37	41.298690	-107.747900
P70005.0W	5/10/1985	Complete	USDI - BLM	MON	15	92	4	SESE	0	32	41.295070	-107.748000
P70006.0W	5/10/1985	Complete	USDI - BLM	MON	16	92	33	SWNE	0	39	41.316700	-107.752700
P70007.0W	5/10/1985	Complete	USDI - BLM	MON	16	92	33	NESW	0	41	41.313080	-107.757500

Table F-12. Groundwater rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company/Individual	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Total Depth	Lat	Long
P70008.0W	5/10/1985	Complete	USDI - BLM	MON	16	92	33	NESW	0	51	41.313080	-107.757500
P70009.0W	5/10/1985	Complete	USDI - BLM	MON	16	92	33	NWSW	0	66	41.313080	-107.762300
P70010.0W	5/10/1985	Complete	USDI - BLM	MON	16	92	33	NWSW	0	80	41.313080	-107.762300
P70011.0W	5/10/1985	Complete	USDI - BLM	MON	16	92	33	NWSW	0	38	41.313080	-107.762300
P70012.0W	5/10/1985	Complete	USDI - BLM	MON	16	92	33	SWNW	0	43	41.316700	-107.762300
P70014.0W	5/10/1985	Complete	USDI - BLM	MON	16	92	33	SWSW	0	67	41.309450	-107.762300
P70015.0W	5/10/1985	Complete	USDI - BLM	MON	16	92	33	SWSW	0	9	41.309450	-107.762300
P70016.0W	5/10/1985	Complete	USDI - BLM	MON	15	92	5	NENE	0	72	41.305890	-107.767100
P70017.0W	5/10/1985	Complete	USDI - BLM	MON	15	92	5	NENE	0	34	41.305890	-107.767100
P70018.0W	5/10/1985	Complete	USDI - BLM	MON	15	92	4	SENE	0	40	41.302310	-107.747900
P70019.0W	5/10/1985	Complete	USDI - BLM	MON	15	92	4	SENE	0	39	41.302310	-107.747900
P70020.0W	5/10/1985	Complete	USDI - BLM	MON	15	92	4	SWNE	0	40	41.302320	-107.752700
P70021.0W	5/10/1985	Complete	USDI - BLM	MON	15	92	5	SWNE	0	27	41.302350	-107.771900
P70022.0W	5/10/1985	Complete	USDI - BLM	MON	15	92	4	NWNE	0	43	41.305880	-107.752700
P70023.0W	5/10/1985	Complete	USDI - BLM	MON	15	92	4	NWNE	0	39	41.305880	-107.752700
P70024.0W	5/10/1985	Complete	USDI - BLM	MON	15	92	4	NWNE	0	34	41.305880	-107.752700
P70027.0W	5/10/1985	Complete	USDI - BLM	MON	17	92	22	SENW	0	40	41.435310	-107.751100
P70028.0W	5/10/1985	Complete	USDI - BLM	MON	17	92	22	NWNW	0	42	41.438880	-107.755900
P70031.0W	5/10/1985	Complete	USDI - BLM	MON	17	92	22	NWNW	0	82	41.438880	-107.755900
P70032.0W	5/10/1985	Complete	USDI - BLM	MON	17	92	22	NWNW	0	62	41.438880	-107.755900
P70033.0W	5/10/1985	Complete	USDI - BLM	MON	17	92	22	NWNW	0	32	41.438880	-107.755900
P70034.0W	5/10/1985	Complete	USDI - BLM	MON	17	92	22	NWNW	0	42	41.438880	-107.755900
P70035.0W	5/10/1985	Complete	USDI - BLM	MON	17	92	15	SESW	0	20	41.442500	-107.751100
P70036.0W	5/10/1985	Complete	USDI - BLM	MON	17	92	22	NWNW	0	42	41.438880	-107.755900
P70037.0W	5/10/1985	Complete	USDI - BLM	MON	17	92	16	SESE	0	45	41.442500	-107.760700
P70038.0W	5/10/1985	Complete	USDI - BLM	MON	17	92	16	SESE	0	45	41.442500	-107.760700
P70039.0W	5/10/1985	Complete	USDI - BLM	MON	17	92	22	NWNW	0	32	41.438880	-107.755900
P70040.0W	5/10/1985	Complete	AL LAND & CATTLE COMPANY	MON	17	92	15	SWSW	0	20	41.442500	-107.755900
P70041.0W	5/10/1985	Complete	AL LAND & CATTLE COMPANY	MON	17	92	15	SESW	0	47	41.442500	-107.751100
P70042.0W	5/10/1985	Complete	AL LAND & CATTLE COMPANY	MON	17	92	15	SESW	0	20	41.442500	-107.751100
P70043.0W	5/10/1985	Complete	AL LAND & CATTLE COMPANY	MON	17	92	15	SESW	0	20	41.442500	-107.751100

Table F-12. Groundwater rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company/Individual	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Total Depth	Lat	Long
P70044.0W	5/10/1985	Complete	AL LAND & CATTLE COMPANY	MON	17	92	15	NESW	0	82	41.446120	-107.751100
P70045.0W	5/10/1985	Complete	AL LAND & CATTLE COMPANY	MON	17	92	15	NWSE	0	42	41.446100	-107.746300
P70046.0W	5/10/1985	Complete	AL LAND & CATTLE COMPANY	MON	17	92	15	NWSE	0	32	41.446100	-107.746300
P70047.0W	5/10/1985	Complete	AL LAND & CATTLE COMPANY	MON	17	92	14	SWSW	0	95	41.442500	-107.736700
P70048.0W	5/10/1985	Complete	AL LAND & CATTLE COMPANY	MON	17	92	15	NESE	0	49	41.446080	-107.741500
P70049.0W	5/10/1985	Complete	AL LAND & CATTLE COMPANY	MON	17	92	15	NESW	0	40	41.446120	-107.751100
P70050.0W	5/10/1985	Complete	AL LAND & CATTLE COMPANY	MON	17	92	15	NWSE	0	15	41.446100	-107.746300
P70051.0W	5/10/1985	Complete	AL LAND & CATTLE COMPANY	MON	17	92	15	NESE	0	82	41.446080	-107.741500
P70052.0W	5/10/1985	Complete	AL LAND & CATTLE COMPANY	MON	17	92	15	NESE	0	72	41.446080	-107.741500
P70053.0W	5/10/1985	Complete	AL LAND & CATTLE COMPANY	MON	17	92	15	NESE	0	55	41.446080	-107.741500
P70054.0W	5/10/1985	Complete	AL LAND & CATTLE COMPANY	MON	17	92	15	NESE	0	35	41.446080	-107.741500
P70055.0W	5/10/1985	Complete	AL LAND & CATTLE COMPANY	MON	17	92	15	NESE	0	82	41.446080	-107.741500
P70056.0W	5/10/1985	Complete	AL LAND & CATTLE COMPANY	MON	17	92	15	NESE	0	75	41.446080	-107.741500
P70057.0W	5/10/1985	Complete	AL LAND & CATTLE COMPANY	MON	17	92	15	SWNE	0	42	41.449730	-107.746300
P70059.0W	5/10/1985	Complete	AL LAND & CATTLE COMPANY	MON	17	92	15	NWNE	0	40	41.453390	-107.746300
P70061.0W	5/10/1985	Complete	USDI - BLM	MON	16	92	28	SWSW	0	45	41.323960	-107.762300
P70063.0W	5/10/1985	Complete	USDI - BLM	MON	16	92	29	SESE	0	55	41.323960	-107.767100
P70066.0W	5/10/1985	Complete	USDI - BLM	MON	16	92	29	SESE	0	80	41.323960	-107.767100
P70067.0W	5/10/1985	Complete	USDI - BLM	MON	16	92	29	SESE	0	65	41.323960	-107.767100
P70068.0W	5/10/1985	Complete	USDI - BLM	MON	16	92	29	SESE	0	15	41.323960	-107.767100
P70069.0W	5/10/1985	Complete	USDI - BLM	MON	16	92	29	SESE	0	52	41.323960	-107.767100
P70070.0W	5/10/1985	Complete	USDI - BLM	MON	16	92	29	NWSE	0	80	41.327580	-107.771900

Table F-12. Groundwater rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company/Individual	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Total Depth	Lat	Long
P70072.0W	5/10/1985	Complete	USDI - BLM	MON	16	92	29	NESW	0	60	41.327580	-107.776700
P70077.0W	5/10/1985	Complete	USDI - BLM	MON	16	92	32	NENE	0	55	41.320330	-107.767100
P70078.0W	5/10/1985	Complete	USDI - BLM	MON	16	92	29	SESE	0	55	41.323960	-107.767100
P70476.0W	6/13/1985	Complete	ROST HERCHEL W. & SOLEDAD I	DOM_GW	19	95	6	NENE	25	135	41.656880	-108.143900
P70693.0W	7/5/1985	Complete	Snyder Oil Co.	MON	15	92	17	SENW	0	20	41.272260	-107.776700
P70694.0W	7/5/1985	Complete	Snyder Oil Co.	MON	15	92	17	SWNW	0	11	41.273420	-107.781500
P70695.0W	7/5/1985	Complete	Snyder Oil Co.	MON	15	92	17	NENW	0	20	41.277760	-107.776700
P70696.0W	7/5/1985	Complete	Snyder Oil Co.	MON	15	92	17	SENW	0	16	41.272260	-107.776700
P70697.0W	7/5/1985	Complete	Snyder Oil Co.	MON	15	92	17	SENW	0	11	41.272260	-107.776700
P70698.0W	7/5/1985	Complete	Snyder Oil Co.	MON	15	92	17	SESW	0	11	41.266170	-107.776700
P70757.0W	7/29/1985	Complete	INTRAWEST BANK OF GREELEY, TRUSTEE	STK	18	93	3	SWSW	25	300	41.559610	-107.869700
P70758.0W	7/29/1985	Complete	INTRAWEST BANK OF GREELEY, TRUSTEE	STK	18	93	11	SESW	12	330	41.545130	-107.845500
P70759.0W	7/29/1985	Complete	INTRAWEST BANK OF GREELEY, TRUSTEE	STK	18	93	23	SWSW	12	620	41.516110	-107.850200
P71969.0W	10/23/1985	Complete	STRATTON SHEEP COMPANY	STK	17	94	21	SESW	25	400	41.429530	-107.998900
P71927.0W	2/3/1986	Complete	UNION PACIFIC LAND RESOURCES CORP.	STK	19	94	23	NWSW	10	340	41.606850	-107.966000
P74517.0W	4/23/1987	Complete	P H Livestock Co.	STK	19	98	33	NWNW	5	340	41.585740	-108.463200
P74518.0W	4/23/1987	Complete	P H Livestock Co.	STK	19	97	21	SENE	2	380	41.610910	-108.333000
P74763.0W	6/9/1987	Complete	USDI - BLM	MON	17	92	28	SESW	0	25	41.413620	-107.770100
P74765.0W	6/9/1987	Complete	AL LAND & CATTLE COMPANY	MON	16	92	5	SWSE	0	32	41.381980	-107.771900
P74767.0W	6/9/1987	Complete	AL LAND & CATTLE COMPANY	MON	16	92	8	SESE	0	22	41.369120	-107.767100
P74768.0W	6/9/1987	Complete	USDI - BLM	MON	16	92	20	NESE	0	22	41.342120	-107.767100
P74971.0W	6/19/1987	INC	USDI - BLM / Kennecott Uranium Co.	MON	23	94	14	SWSW	0	60	41.960100	-108.006000

Table F-12. Groundwater rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company/Individual	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Total Depth	Lat	Long
P75633.0W	10/1/1987	INC	USDI - BLM / Snyder Oil Co.	MIS	16	93	32	SENW	50	500	41.317460	-107.890900
P84596.0W	6/29/1988	INC	Hyland Enterprises, Inc.	MIS	20	94	34	NESE	150	1,000	41.664790	-107.970900
P78955.0W	1/17/1989	Complete	USDI - BLM	MON	17	92	22	NWNW	0	28	41.438880	-107.755900
P78956.0W	1/17/1989	Complete	USDI - BLM	MON	17	92	28	SESW	0	28	41.413620	-107.770100
P78957.0W	1/17/1989	Complete	USDI - BLM	MON	17	92	28	SWSW	0	62	41.413600	-107.774900
P78958.0W	1/17/1989	Complete	USDI - BLM	MON	16	92	28	SESW	0	47	41.323960	-107.757500
P78959.0W	1/17/1989	Complete	USDI - BLM	MON	16	92	32	SENE	0	45	41.316700	-107.767100
P78960.0W	1/17/1989	Complete	USDI - BLM	MON	16	92	33	SWNW	0	42	41.316700	-107.762300
P78961.0W	1/17/1989	Complete	USDI - BLM	MON	16	92	33	NWNW	0	41	41.320330	-107.762300
P78962.0W	1/17/1989	Complete	USDI - BLM	MON	16	92	33	NWNW	0	40	41.320330	-107.762300
P78963.0W	1/17/1989	Complete	USDI - BLM	MON	16	92	33	SWSW	0	39	41.309450	-107.762300
P78964.0W	1/17/1989	Complete	USDI - BLM	MON	16	92	33	SWSW	0	41	41.309450	-107.762300
P80506.0W	8/17/1989	Complete	TRIAD RANCHES INC.	DOM_GW	19	96	2	NENE	0	500	41.656850	-108.183200
P80716.0W	9/18/1989	Complete	W. V. T. SERVICE INC.	DOM_GW; STK	22	91	27	NESE	16	130	41.847470	-107.662400
P82127.0W	4/9/1990	INC	J. C. KILBURN CO.	MIS	20	92	11	SWNE	15	240	41.725280	-107.727300
P82536.0W	5/24/1990	Complete	BARRETT KENNETH RAY	STK	20	96	36	NWSE	7	196	41.664030	-108.168800
P83544.0W	9/10/1990	Complete	JONES JACK / DELAMBERT BIRDIE	STK	22	92	12	SWSW	5	6	41.887410	-107.754200
P83907.0W	11/1/1990	Complete	WEBER RANCH INC.	STK	17	92	33	SENE	6	384	41.406460	-107.760400
P84124.0W	12/10/1990	Complete	USDI - BLM / QUEALY LIVESTOCK CO.	STK	21	95	26	SESW	15	730	41.757700	-108.117400
P84281.0W	1/15/1991	Complete	DIBBLE RANDY M/LINDA J	MON	19	95	5	SENE	0	50	41.653380	-108.124600
P84282.0W	1/15/1991	Complete	DIBBLE RANDY M/LINDA J	MON	19	95	5	SENE	0	52	41.653380	-108.124600
P84283.0W	1/15/1991	Complete	DIBBLE RANDY M/LINDA J	MON	19	95	5	SENE	0	48	41.653380	-108.124600
P86244.0W	3/11/1991	INC	DOWLIN DOUG	MIS	20	94	34	NESE	25	1,180	41.664790	-107.970900
P84603.0W	3/12/1991	Complete	BILYEU GAIL L.	DOM_GW; STK	19	96	2	NENE	20	500	41.656850	-108.183200

Table F-12. Groundwater rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company/Individual	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Total Depth	Lat	Long
P86107.0W	9/12/1991	Complete	UNION PACIFIC RESOURCES	MON	19	99	25	NWSE	0	56	41.593040	-108.511000
P86109.0W	9/12/1991	Complete	UNION PACIFIC RESOURCES	MON	19	99	25	NWSE	0	60	41.593040	-108.511000
P86110.0W	9/12/1991	Complete	UNION PACIFIC RESOURCES	MON	19	99	25	NWSE	0	50	41.593040	-108.511000
P86111.0W	9/12/1991	Complete	UNION PACIFIC RESOURCES	MON	19	99	25	NWSE	0	50	41.593040	-108.511000
P86112.0W	9/12/1991	Complete	UNION PACIFIC RESOURCES	MON	19	99	25	NWSE	0	60	41.593040	-108.511000
P86113.0W	9/12/1991	Complete	UNION PACIFIC RESOURCES	MON	19	99	25	NWSE	0	50	41.593040	-108.511000
P86114.0W	9/12/1991	Complete	UNION PACIFIC RESOURCES	MON	19	99	25	NWSE	0	60	41.593040	-108.511000
P86115.0W	9/12/1991	Complete	UNION PACIFIC RESOURCES	MON	19	99	25	NWSE	0	58	41.593040	-108.511000
P86703.0W	12/5/1991	Complete	UNION PACIFIC RESOURCES	MON	19	99	25	NWSE	0	60	41.593040	-108.511000
P86704.0W	12/5/1991	Complete	UNION PACIFIC RESOURCES	MON	19	99	25	NWSE	0	60	41.593040	-108.511000
P86705.0W	12/5/1991	Complete	UNION PACIFIC RESOURCES	MON	19	99	25	NWSE	0	46	41.593040	-108.511000
P86706.0W	12/5/1991	Complete	UNION PACIFIC RESOURCES	MON	19	99	25	NWSE	0	19	41.593040	-108.511000
P86707.0W	12/5/1991	Complete	UNION PACIFIC RESOURCES	MON	19	99	25	NWSE	0	40	41.593040	-108.511000
P86708.0W	12/5/1991	Complete	UNION PACIFIC RESOURCES	MON	19	99	25	NWSE	0	59	41.593040	-108.511000
P86709.0W	12/5/1991	Complete	UNION PACIFIC RESOURCES	MON	19	99	25	NWSE	0	31	41.593040	-108.511000
P86710.0W	12/5/1991	Complete	UNION PACIFIC RESOURCES	MON	19	99	25	NWSE	0	35	41.593040	-108.511000
P86711.0W	12/5/1991	Complete	UNION PACIFIC RESOURCES	MON	19	99	25	NWSE	0	57	41.593040	-108.511000
P89063.0W	4/14/1992	Complete	LEWIS THURMAN J.	DOM_GW	17	94	27	NENE	10	120	41.426010	-107.970000
P91787.0W	5/21/1993	INC	Town of Wamsutter	MON	19	94	14	SWNE	0	113	41.625120	-107.956400
P91788.0W	5/21/1993	INC	Town of Wamsutter	MON	19	94	14	NWNE	0	96	41.628730	-107.956400

Table F-12. Groundwater rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company/Individual	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Total Depth	Lat	Long
P91789.0W	5/21/1993	INC	Town of Wamsutter	MON	19	94	14	NENE	0	0	41.628780	-107.951600
P92382.0W	7/16/1993	INC	USDI - BLM / Snyder Oil Corp.	MIS	14	92	10	SENE	120	0	41.200880	-107.728800
P101390.0W	3/10/1994	INC	RODEWALD DUANE	MIS	19	92	2	NWSE	300	3,755	41.649480	-107.726800
P94775.0W	3/24/1994	INC	QUEALY STUART / Union Pacific Resources Minerals	MIS; STK	20	94	7	SESE	60	10,021	41.718870	-108.028400
P95232.0W	4/20/1994	Complete	UNION PACIFIC RESOURCES	MON	19	99	25	NWSE	0	58	41.593040	-108.511000
P95233.0W	4/20/1994	Complete	UNION PACIFIC RESOURCES	MON	19	99	25	NWSE	0	78	41.593040	-108.511000
P95234.0W	4/20/1994	Complete	UNION PACIFIC RESOURCES	MON	19	99	25	NWSE	0	44	41.593040	-108.511000
P95235.0W	4/20/1994	Complete	UNION PACIFIC RESOURCES	MON	19	99	25	NWSE	0	66	41.593040	-108.511000
P95307.0W	5/2/1994	Complete	UNION PACIFIC RESOURCES	MON	19	99	25	NWSE	0	32	41.593040	-108.511000
P95308.0W	5/2/1994	Complete	UNION PACIFIC RESOURCES	MON	19	99	25	NWSE	0	58	41.593040	-108.511000
P95309.0W	5/2/1994	Complete	UNION PACIFIC RESOURCES	MON	19	99	25	NWSE	0	39	41.593040	-108.511000
P95447.0W	5/24/1994	INC	BP AMERICA PRODUCTION COMPANY	MIS	16	93	7	SENW	0	0	41.375670	-107.910300
P95594.0W	5/26/1994	Complete	Town of Wamsutter	MON	19	94	14	NENE	0	84	41.628780	-107.951600
P95595.0W	5/26/1994	Complete	Town of Wamsutter	MON	19	94	14	NWNE	0	84	41.628730	-107.956400
P95596.0W	5/26/1994	Complete	Town of Wamsutter	MON	19	94	14	NENE	0	75	41.628780	-107.951600
P96912.0W	9/1/1994	INC	USDI - BLM / BP AMERICA PRODUCTION COMPANY	MIS	20	93	4	SWSW	0	0	41.732800	-107.890000
P97297.0W	10/6/1994	INC	WILLIAMS FIELD SERVICES CO.	IND_GW; MIS	19	93	1	NWSE	20	460	41.649580	-107.822400
P97449.0W	10/12/1994	INC	USDI - BLM	STK	17	92	26	NESE	0	475	41.417160	-107.722300
P97699.0W	11/3/1994	Complete	SCURLOCK PERMIAN CORPORATION	MON	20	94	34	SESE	0	25	41.661190	-107.970900

Table F-12. Groundwater rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company/Individual	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Total Depth	Lat	Long
P97700.0W	11/3/1994	Complete	SCURLOCK PERMIAN CORPORATION	MON	20	94	34	SESE	0	25	41.661190	-107.970900
P97701.0W	11/3/1994	Complete	SCURLOCK PERMIAN CORPORATION	MON	20	94	34	SESE	0	25	41.661190	-107.970900
P97702.0W	11/3/1994	Complete	SCURLOCK PERMIAN CORPORATION	MON	20	94	34	SESE	0	25	41.661190	-107.970900
P97703.0W	11/3/1994	Complete	SCURLOCK PERMIAN CORPORATION	MON	20	94	34	SESE	0	30	41.661190	-107.970900
P97904.0W	11/9/1994	INC	BP AMERICA PRODUCTION COMPANY	MIS	21	93	5	SWSW	50	0	41.815210	-107.948300
P98187.0W	1/10/1995	Complete	Wyo State Board of Land Commissioners / Adams Stephen L.	STK	19	94	16	SWNE	25	1,000	41.624790	-107.994900
P98626.0W	3/31/1995	Complete	USDI - BLM / LIVESTOCK ROCHELLE	STK	22	94	18	SWSW	5	500	41.873340	-108.083400
P99499.0W	6/9/1995	Complete	Rodewald Duane & Deborah	STK	20	91	18	SWSW	20	237	41.703500	-107.698900
P99764.0W	7/21/1995	Complete	HARRINGTON MAX J & JOYCE	DOM_GW	20	95	20	NWNW	8	120	41.700360	-108.139200
P99887.0W	7/27/1995	INC	HUNT OIL CO	MIS	22	94	34	SWSW	50	710	41.829770	-108.025500
P100202.0W	9/5/1995	Complete	NORWEST BANK OF COLORADO	STK	18	92	31	SWSW	25	520	41.487150	-107.811900
P100203.0W	9/5/1995	Complete	NORWEST BANK OF COLORADO	STK	19	93	35	SWSW	25	340	41.573880	-107.850700
P100204.0W	9/5/1995	Complete	NORWEST BANK OF COLORADO	STK	19	93	9	NWSW	25	350	41.635480	-107.889700
P100205.0W	9/5/1995	Complete	NORWEST BANK OF COLORADO	STK	19	93	29	NESW	25	300	41.592250	-107.903700
P100206.0W	9/5/1995	Complete	NORWEST BANK OF COLORADO	STK	19	93	29	NESW	25	340	41.592250	-107.903700
P101324.0W	11/29/1995	Complete	NORWEST BANK OF COLORADO	STK	18	93	13	SESE	25	555	41.530480	-107.816800

Table F-12. Groundwater rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company/Individual	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Total Depth	Lat	Long
P101325.0W	11/29/1995	Complete	NORWEST BANK OF COLORADO	STK	19	93	7	SESW	25	545	41.632210	-107.923200
P101326.0W	11/29/1995	Complete	NORWEST BANK OF COLORADO	STK	19	93	1	NWNE	6	500	41.656740	-107.822400
P101327.0W	11/29/1995	Complete	NORWEST BANK OF COLORADO	STK	18	92	25	SWSE	6	450	41.501450	-107.706700
P101328.0W	11/29/1995	Complete	NORWEST BANK OF COLORADO	STK	18	93	1	SWSW	6	420	41.559620	-107.830900
P101329.0W	11/29/1995	Complete	NORWEST BANK OF COLORADO	STK	18	93	15	NESW	5	306	41.534140	-107.864700
P101330.0W	11/29/1995	Complete	NORWEST BANK OF COLORADO	STK	19	93	17	SESW	6	400	41.617510	-107.904100
P101008.0W	12/1/1995	Complete	LAZY Y-S RANCH	STK	19	92	7	SWSW	25	560	41.631380	-107.812800
P101009.0W	12/1/1995	Complete	LAZY Y-S RANCH	STK	19	92	5	NWSW	25	840	41.649300	-107.794200
P102711.0W	5/16/1996	Complete	USDI - BLM / REVOCABLE TRUST EDNA M QUEALY / REVOCABLE TRUST L STUART QUEALY	STK	20	94	22	NWSW	15	400	41.693730	-107.985400
P102712.0W	5/16/1996	Complete	REVOCABLE TRUST EDNA M QUEALY / REVOCABLE TRUST L STUART QUEALY	STK	20	95	21	NWSE	15	665	41.693320	-108.110200
P102713.0W	5/16/1996	Complete	REVOCABLE TRUST EDNA M QUEALY / REVOCABLE TRUST L STUART QUEALY	STK	21	95	19	SESW	15	660	41.772270	-108.194600
P102804.0W	6/21/1996	Complete	REVOCABLE TRUST EDNA M QUEALY / REVOCABLE TRUST L STUART QUEALY	STK	20	95	23	NWSE	20	760	41.693440	-108.071700
P103904.0W	9/24/1996	Complete	Snyder Oil Corp.	MON	15	92	17	SENW	0	14	41.272260	-107.776700
P103905.0W	9/24/1996	Complete	Snyder Oil Corp.	MON	15	92	17	SENW	0	20	41.272260	-107.776700
P103906.0W	9/24/1996	Complete	Snyder Oil Corp.	MON	15	92	17	SENW	0	17	41.272260	-107.776700
P104358.0W	10/21/1996	INC	HAY LEONARD / UNION PACIFIC RESOURCES	MIS	20	97	27	NWNE	60	800	41.686940	-108.318500

Table F-12. Groundwater rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company/Individual	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Total Depth	Lat	Long
P104655.0W	12/6/1996	INC	SNYDER OIL CORPORATION	MIS	15	92	17	SENW	5	29	41.272260	-107.776700
P105068.0W	2/20/1997	Complete	Adams Steve F.	STK	19	94	13	SESW	25	540	41.617930	-107.942000
P105058.0W	2/21/1997	Complete	P H Livestock Co.	STK	18	96	27	SWSE	1	330	41.501810	-108.206200
P105059.0W	2/21/1997	Complete	P H Livestock Co.	STK	18	96	1	NWNW	15	440	41.570410	-108.177900
P105976.0W	5/29/1997	INC	THOMPSON THERESA F/WILLIAM M	DOM_GW	23	96	33	SWSW	25	0	41.916790	-108.276600
P106869.0W	7/16/1997	INC	Wyo State Board of Land Commissioners / YATES PETROLEUM CORPORATION	MIS	20	95	16	SESE	25	575	41.704210	-108.105400
P106883.0W	8/6/1997	Complete	USDI - BLM / JONS LEE/DONNA	STK	14	91	30	NWNE	5	280	41.161020	-107.676100
P107541.0W	9/18/1997	Complete	BP-Amoco Production Co.	MON	19	94	13	NENW	0	50	41.628780	-107.942000
P107542.0W	9/18/1997	Complete	BP-Amoco Production Co.	MON	19	94	13	NWNW	0	50	41.628800	-107.946800
P107543.0W	9/18/1997	Complete	BP-Amoco Production Co.	MON	19	94	13	NWNW	0	50	41.628800	-107.946800
P107544.0W	9/18/1997	Complete	BP-Amoco Production Co.	MON	19	94	13	NWNW	0	50	41.628800	-107.946800
P107545.0W	9/18/1997	Complete	BP-Amoco Production Co.	MON	19	94	13	NWNW	0	50	41.628800	-107.946800
P107546.0W	9/18/1997	Complete	BP-Amoco Production Co.	MON	22	94	35	SWNW	0	50	41.836890	-108.006100
P107547.0W	9/18/1997	Complete	BP-Amoco Production Co.	MON	22	94	35	SENW	0	50	41.836890	-108.001300
P107548.0W	9/18/1997	Complete	BP-Amoco Production Co.	MON	22	94	35	SENW	0	50	41.836890	-108.001300
P107549.0W	9/18/1997	Complete	BP-Amoco Production Co.	MON	22	94	35	SWNW	0	50	41.836890	-108.006100
P108008.0W	11/3/1997	Complete	UNION PACIFIC RESOURCES	MON	19	99	25	NWSE	0	32	41.593040	-108.511000
P108009.0W	11/3/1997	Complete	UNION PACIFIC RESOURCES	MON	19	99	25	NWSE	0	30	41.593040	-108.511000

Table F-12. Groundwater rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company/Individual	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Total Depth	Lat	Long
P108010.0W	11/3/1997	Complete	UNION PACIFIC RESOURCES	MON	19	99	25	NWSE	0	28	41.593040	-108.511000
P108011.0W	11/3/1997	Complete	UNION PACIFIC RESOURCES	MON	19	99	25	NWSE	0	30	41.593040	-108.511000
P108012.0W	11/3/1997	Complete	UNION PACIFIC RESOURCES	MON	19	99	25	NWSE	0	21	41.593040	-108.511000
P108013.0W	11/3/1997	Complete	UNION PACIFIC RESOURCES	MON	19	99	25	NESE	0	36	41.593030	-108.506200
P108014.0W	11/3/1997	Complete	UNION PACIFIC RESOURCES	MON	19	99	25	NESE	0	35	41.593030	-108.506200
P108015.0W	11/3/1997	Complete	UNION PACIFIC RESOURCES	MON	19	99	25	NESE	0	62	41.593030	-108.506200
P109956.0W	5/4/1998	INC	BP AMERICA PRODUCTION COMPANY	MIS	22	95	11	NWSE	50	0	41.891840	-108.111800
P110553.0W	6/15/1998	INC	DIBBLE RANDY M/LINDA J	DOM_GW; STK	19	95	5	NENE	25	0	41.657020	-108.124600
P111248.0W	7/23/1998	INC	USDI - BLM / SNYDER OIL CORPORATION	MIS	18	92	34	NWSE	0	0	41.490560	-107.745000
P111868.0W	9/21/1998	Complete	RODEWALD DUANE	STK	20	91	19	SENE	4	190	41.696140	-107.685000
P112143.0W	9/30/1998	Complete	Snyder Oil Co.	MON	15	92	17	SENW	0	13	41.272260	-107.776700
P113188.0W	11/25/1998	INC	USDI - BLM / Town of Wamsutter	MUN_GW	20	94	22	SWSE	200	2,010	41.688500	-107.977400
P113242.0W	12/3/1998	INC	SHEEHAN RANCHES	STK	15	93	3	NWNE	0	0	41.306440	-107.847800
P113569.0W	1/20/1999	Complete	TRC COMPANIES, INC.	MON	19	99	25	SWSE	0	30	41.589420	-108.511000
P113570.0W	1/20/1999	Complete	TRC COMPANIES, INC.	MON	19	99	25	SWSE	0	50	41.589420	-108.511000
P113571.0W	1/20/1999	Complete	TRC COMPANIES, INC.	MON	19	99	25	SWSE	0	28	41.589420	-108.511000
P113572.0W	1/20/1999	Complete	TRC COMPANIES, INC.	MON	19	99	25	SWSE	0	40	41.589420	-108.511000
P113573.0W	1/20/1999	Complete	TRC COMPANIES, INC.	MON	19	99	25	SWSE	0	45	41.589420	-108.511000
P113574.0W	1/20/1999	Complete	TRC COMPANIES, INC.	MON	19	99	25	SWSE	0	30	41.589420	-108.511000

Table F-12. Groundwater rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company/Individual	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Total Depth	Lat	Long
P113575.0W	1/20/1999	Complete	TRC COMPANIES, INC.	MON	19	99	25	SWSE	0	30	41.589420	-108.511000
P113576.0W	1/20/1999	Complete	TRC COMPANIES, INC.	MON	19	99	25	SWSE	0	25	41.589420	-108.511000
P113577.0W	1/20/1999	Complete	TRC COMPANIES, INC.	MON	19	99	25	SWSE	0	55	41.589420	-108.511000
P113578.0W	1/20/1999	Complete	TRC COMPANIES, INC.	MON	19	99	25	SWSE	0	31	41.589420	-108.511000
P113579.0W	1/20/1999	Complete	TRC COMPANIES, INC.	MON	19	99	25	SWSE	0	20	41.589420	-108.511000
P113580.0W	1/20/1999	Complete	TRC COMPANIES, INC.	MON	19	99	25	SWSE	0	28	41.589420	-108.511000
P113589.0W	1/20/1999	Complete	TRC COMPANIES, INC.	MON	19	99	25	SWSE	0	50	41.589420	-108.511000
P113590.0W	1/20/1999	Complete	TRC COMPANIES, INC.	MON	19	99	25	SWSE	0	28	41.589420	-108.511000
P113592.0W	1/20/1999	Complete	TRC COMPANIES, INC.	MON	19	99	25	SWSE	0	40	41.589420	-108.511000
P113596.0W	1/20/1999	Complete	TRC COMPANIES, INC.	MON	19	99	25	SWSE	0	30	41.589420	-108.511000
P113597.0W	1/20/1999	Complete	TRC COMPANIES, INC.	MON	19	99	25	SWSE	0	20	41.589420	-108.511000
P113598.0W	1/20/1999	Complete	TRC COMPANIES, INC.	MON	19	99	25	SWSE	0	30	41.589420	-108.511000
P113599.0W	1/20/1999	Complete	TRC COMPANIES, INC.	MON	19	99	25	SWSE	0	35	41.589420	-108.511000
P113600.0W	1/20/1999	Complete	TRC COMPANIES, INC.	MON	19	99	25	SWSE	0	33	41.589420	-108.511000
P113601.0W	1/20/1999	Complete	TRC COMPANIES, INC.	MON	19	99	25	SWSE	0	50	41.589420	-108.511000
P113603.0W	1/20/1999	Complete	TRC COMPANIES, INC.	MON	19	99	25	SWSE	0	50	41.589420	-108.511000
P116942.0W	7/6/1999	Complete	TRC COMPANIES, INC.	MON	19	99	25	SWSE	0	22	41.589420	-108.511000
P116943.0W	7/6/1999	Complete	TRC COMPANIES, INC.	MON	19	99	25	SWSE	0	22	41.589420	-108.511000

Table F-12. Groundwater rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company/Individual	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Total Depth	Lat	Long
P116944.0W	7/6/1999	Complete	TRC COMPANIES, INC.	MON	19	99	25	SWSE	0	23	41.589420	-108.511000
P116945.0W	7/6/1999	Complete	TRC COMPANIES, INC.	MON	19	99	25	SWSE	0	23	41.589420	-108.511000
P116946.0W	7/6/1999	Complete	TRC COMPANIES, INC.	MON	19	99	25	SWSE	0	23	41.589420	-108.511000
P116947.0W	7/6/1999	Complete	TRC COMPANIES, INC.	MON	19	99	25	SWSE	0	23	41.589420	-108.511000
P116948.0W	7/6/1999	Complete	TRC COMPANIES, INC.	MON	19	99	25	SWSE	0	23	41.589420	-108.511000
P116949.0W	7/6/1999	Complete	TRC COMPANIES, INC.	MON	19	99	25	SWSE	0	29	41.589420	-108.511000
P116950.0W	7/6/1999	Complete	TRC COMPANIES, INC.	MON	19	99	25	NWSE	0	20	41.593040	-108.511000
P116951.0W	7/6/1999	Complete	TRC COMPANIES, INC.	MON	19	99	25	SWSE	0	23	41.589420	-108.511000
P116952.0W	7/6/1999	Complete	TRC COMPANIES, INC.	MON	19	99	25	SWSE	0	30	41.589420	-108.511000
P116953.0W	7/6/1999	Complete	TRC COMPANIES, INC.	MON	19	99	25	SWSE	0	35	41.589420	-108.511000
P116954.0W	7/6/1999	Complete	TRC COMPANIES, INC.	MON	19	99	25	SWSE	0	30	41.589420	-108.511000
P116955.0W	7/6/1999	Complete	TRC COMPANIES, INC.	MON	19	99	25	SWSE	0	31	41.589420	-108.511000
P116956.0W	7/6/1999	Complete	TRC COMPANIES, INC.	MON	19	99	25	SWSE	0	27	41.589420	-108.511000
P116957.0W	7/6/1999	Complete	TRC COMPANIES, INC.	MON	19	99	25	SWSE	0	21	41.589420	-108.511000
P116958.0W	7/6/1999	Complete	TRC COMPANIES, INC.	MON	19	99	25	SWSE	0	22	41.589420	-108.511000
P116959.0W	7/6/1999	Complete	TRC COMPANIES, INC.	MON	19	99	25	SWSE	0	20	41.589420	-108.511000
P116960.0W	7/6/1999	Complete	TRC COMPANIES, INC.	MON	19	99	25	SWSE	0	27	41.589420	-108.511000
P116961.0W	7/6/1999	Complete	TRC COMPANIES, INC.	MON	19	99	25	NESE	0	25	41.593030	-108.506200

Table F-12. Groundwater rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company/Individual	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Total Depth	Lat	Long
P116962.0W	7/6/1999	Complete	TRC COMPANIES, INC.	MON	19	99	25	NESE	0	26	41.593030	-108.506200
P116963.0W	7/6/1999	Complete	TRC COMPANIES, INC.	MON	19	99	25	NWSE	0	30	41.593040	-108.511000
P116964.0W	7/6/1999	Complete	TRC COMPANIES, INC.	MON	19	99	25	NWSE	0	55	41.593040	-108.511000
P116965.0W	7/6/1999	Complete	TRC COMPANIES, INC.	MON	19	99	25	NWSE	0	21	41.593040	-108.511000
P116966.0W	7/6/1999	Complete	TRC COMPANIES, INC.	MON	19	99	25	NWSE	0	30	41.593040	-108.511000
P116968.0W	7/6/1999	Complete	TRC COMPANIES, INC.	MON	19	99	25	NWSE	0	30	41.593040	-108.511000
P116969.0W	7/6/1999	Complete	TRC COMPANIES, INC.	MON	19	99	25	NWSE	0	30	41.593040	-108.511000
P116970.0W	7/6/1999	Complete	TRC COMPANIES, INC.	MON	19	99	25	NWSE	0	30	41.593040	-108.511000
P116973.0W	7/6/1999	Complete	TRC COMPANIES, INC.	MON	19	99	25	NWSE	0	31	41.593040	-108.511000
P116974.0W	7/6/1999	Complete	TRC COMPANIES, INC.	MON	19	99	25	NWSE	0	30	41.593040	-108.511000
P116975.0W	7/6/1999	Complete	TRC COMPANIES, INC.	MON	19	99	25	SWSE	0	45	41.589420	-108.511000
P116976.0W	7/6/1999	Complete	TRC COMPANIES, INC.	MON	19	99	25	SWSE	0	55	41.589420	-108.511000
P120114.0W	11/3/1999	INC	BP America Production Co.	MIS	16	94	1	NWSW	150	0	41.386670	-107.933700
P126180.0W	6/9/2000	Complete	TRC ENVIRONMENTAL CORPORATION	MON	19	99	25	SESE	0	25	41.589410	-108.506200
P126181.0W	6/9/2000	Complete	TRC ENVIRONMENTAL CORPORATION	MON	19	99	25	SWSE	0	40	41.589420	-108.511000
P126182.0W	6/9/2000	Complete	TRC ENVIRONMENTAL CORPORATION	MON	19	99	25	SESE	0	45	41.589410	-108.506200
P126183.0W	6/9/2000	Complete	TRC ENVIRONMENTAL CORPORATION	MON	19	99	25	SWSE	0	46	41.589420	-108.511000

Table F-12. Groundwater rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company/Individual	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Total Depth	Lat	Long
P126184.0W	6/9/2000	Complete	TRC ENVIRONMENTAL CORPORATION	MON	19	99	25	SESE	0	22	41.589410	-108.506200
P126185.0W	6/9/2000	Complete	TRC ENVIRONMENTAL CORPORATION	MON	19	99	25	SESE	0	26	41.589410	-108.506200
P126186.0W	6/9/2000	Complete	TRC ENVIRONMENTAL CORPORATION	MON	19	99	25	SESE	0	40	41.589410	-108.506200
P126187.0W	6/9/2000	Complete	TRC ENVIRONMENTAL CORPORATION	MON	19	99	25	SESE	0	30	41.589410	-108.506200
P126188.0W	6/9/2000	Complete	TRC ENVIRONMENTAL CORPORATION	MON	19	99	25	NESE	0	48	41.593030	-108.506200
P126189.0W	6/9/2000	Complete	TRC ENVIRONMENTAL CORPORATION	MON	19	99	25	SWSE	0	48	41.589420	-108.511000
P126190.0W	6/9/2000	Complete	TRC ENVIRONMENTAL CORPORATION	MON	19	99	25	SESE	0	52	41.589410	-108.506200
P126191.0W	6/9/2000	Complete	TRC ENVIRONMENTAL CORPORATION	MON	19	99	25	SESE	0	60	41.589410	-108.506200
P126192.0W	6/9/2000	Complete	TRC ENVIRONMENTAL CORPORATION	MON	19	99	25	SESE	0	65	41.589410	-108.506200
P126193.0W	6/9/2000	Complete	TRC ENVIRONMENTAL CORPORATION	MON	19	99	25	SESE	0	57	41.589410	-108.506200
P126194.0W	6/9/2000	Complete	TRC ENVIRONMENTAL CORPORATION	MON	19	99	25	SESE	0	32	41.589410	-108.506200
P126751.0W	7/5/2000	INC	Samson Resources Co. / USDI - BLM	MIS	19	93	14	NESW	40	0	41.620770	-107.846400
P126752.0W	7/5/2000	INC	Samson Resources Co. / USDI - BLM	MIS	19	93	10	SWSW	40	0	41.631680	-107.870400

Table F-12. Groundwater rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company/Individual	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Total Depth	Lat	Long
P127204.0W	7/20/2000	INC	JOLLEY WILLIAM H. & SALLY / USDI - BLM	STK	24	97	22	NWSW	25	0	42.037620	-108.376900
P127205.0W	7/20/2000	Complete	JOLLEY WILLIAM H. & SALLY / USDI - BLM	STK	24	96	35	SESW	25	160	42.003660	-108.232600
P127532.0W	8/3/2000	Complete	TRC Environmental Corp.	MON	19	99	25	SESE	0	26	41.589410	-108.506200
P128402.0W	8/21/2000	Complete	TRC ENVIRONMENTAL CORP.	MON	19	99	25	SESE	0	51	41.589410	-108.506200
P128403.0W	8/21/2000	Complete	TRC ENVIRONMENTAL CORP.	MON	19	99	25	SESE	0	51	41.589410	-108.506200
P128404.0W	8/21/2000	Complete	TRC ENVIRONMENTAL CORP.	MON	19	99	25	SESE	0	39	41.589410	-108.506200
P128405.0W	8/21/2000	Complete	TRC ENVIRONMENTAL CORP.	MON	19	99	25	SESE	0	37	41.589410	-108.506200
P128687.0W	9/5/2000	Complete	RODEWALD DUANE OR DEBORAH	STK	19	91	7	NWNW	25	260	41.642130	-107.698400
P129280.0W	9/25/2000	Complete	PH LIVESTOCK & UNION PACIFIC RESOURCES	STK	20	92	7	NWNE	25	500	41.728920	-107.804200
P129945.0W	10/12/2000	Complete	TRC ENVIRONMENTAL CORP.	MON	19	99	36	NWNE	0	21	41.585790	-108.511000
P129946.0W	10/12/2000	Complete	TRC ENVIRONMENTAL CORP.	MON	19	99	36	NWNE	0	21	41.585790	-108.511000
P129947.0W	10/12/2000	Complete	TRC ENVIRONMENTAL CORP.	MON	19	99	36	NWNE	0	40	41.585790	-108.511000
P129948.0W	10/12/2000	Complete	TRC ENVIRONMENTAL CORP.	MON	19	99	36	NWNE	0	21	41.585790	-108.511000
P129949.0W	10/12/2000	Complete	TRC ENVIRONMENTAL CORP.	MON	19	99	36	NWNE	0	20	41.585790	-108.511000

Table F-12. Groundwater rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company/Individual	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Total Depth	Lat	Long
P129950.0W	10/12/2000	Complete	TRC ENVIRONMENTAL CORP.	MON	19	99	36	NWNE	0	20	41.585790	-108.511000
P129951.0W	10/12/2000	Complete	TRC ENVIRONMENTAL CORP.	MON	19	99	36	NWNE	0	21	41.585790	-108.511000
P129952.0W	10/12/2000	Complete	TRC ENVIRONMENTAL CORP.	MON	19	99	36	NWNE	0	30	41.585790	-108.511000
P129953.0W	10/12/2000	Complete	TRC ENVIRONMENTAL CORP.	MON	19	99	36	NWNE	0	45	41.585790	-108.511000
P129954.0W	10/12/2000	Complete	TRC ENVIRONMENTAL CORP.	MON	19	99	36	NWNE	0	20	41.585790	-108.511000
P129955.0W	10/12/2000	Complete	TRC ENVIRONMENTAL CORP.	MON	19	99	36	NWNE	0	21	41.585790	-108.511000
P129956.0W	10/12/2000	Complete	TRC ENVIRONMENTAL CORP.	MON	19	99	36	NWNE	0	29	41.585790	-108.511000
P129957.0W	10/12/2000	Complete	TRC ENVIRONMENTAL CORP.	MON	19	99	36	NWNE	0	93	41.585790	-108.511000
P129958.0W	10/12/2000	Complete	TRC ENVIRONMENTAL CORP.	MON	19	99	36	NWNE	0	48	41.585790	-108.511000
P131973.0W	1/16/2001	INC	BP America Production Co.	MIS	18	93	15	SENW	0	0	41.537790	-107.864800
P132295.0W	1/19/2001	INC	Wyo State Dept. of Environmental Quality	MON	20	94	34	NENW	0	-1	41.671940	-107.980500
P132296.0W	1/19/2001	INC	Wyo State Dept. of Environmental Quality	MON	20	94	27	SESW	0	-1	41.675570	-107.980500
P132297.0W	1/19/2001	INC	Wyo State Dept. of Environmental Quality	MON	20	94	34	NENW	0	-1	41.671940	-107.980500
P134628.0W	5/2/2001	Complete	Weber Matthew L. or Sherry L.	STK	14	91	19	NWSE	0	900	41.168260	-107.676100

Table F-12. Groundwater rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company/Individual	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Total Depth	Lat	Long
P135632.0W	6/6/2001	INC	BP America Production Co.	MIS	18	92	9	SENW	50	0	41.552040	-107.769100
P135750.0W	6/14/2001	Complete	BP AMOCO	MON	22	94	35	SENW	0	45	41.836890	-108.001300
P135751.0W	6/14/2001	Complete	BP AMOCO	MON	22	94	35	SENW	0	45	41.836890	-108.001300
P136935.0W	7/24/2001	Fully Adjudicated	SAMSON RESOURCES COMPANY	MIS	19	93	19	SWSE	20	425	41.603200	-107.918200
P138367.0W	8/22/2001	Complete	USDI - BLM / TRC ENVIRONMENTAL CORPORATION	MON	19	99	36	SWNE	0	24	41.582170	-108.511000
P138368.0W	8/22/2001	Complete	USDI - BLM / TRC ENVIRONMENTAL CORPORATION	MON	19	99	36	NWNE	0	16	41.585790	-108.511000
P138467.0W	8/29/2001	Complete	RODEWALD DUANE/DEBORAH	STK	19	91	7	NWNW	5	260	41.642130	-107.698400
P138675.0W	8/31/2001	Complete	Devon Energy Production Co., LP	MIS	15	92	17	SENW	2	22	41.272260	-107.776700
P140255.0W	10/18/2001	Complete	USDI - BLM / CHAMBERS PAT	MIS	21	92	32	NESW	20	1,040	41.746340	-107.827300
P140256.0W	10/18/2001	Complete	CHAMBERS PAT / USDI - BLM	MIS	21	92	19	SENW	20	780	41.778960	-107.846500
P140257.0W	10/18/2001	Complete	USDI - BLM / CHAMBERS PAT	STK	21	92	9	SWSW	9	803	41.800610	-107.812500
P142768.0W	10/26/2001	Complete	TEXACO EXPLORATION & PRODUCTION, INC.	MIS	18	98	1	NWNW	180	2,831	41.571200	-108.405400
P141758.0W	1/7/2002	Complete	RODEWALD DUANE/DEBORAH C	STK	19	91	9	NENE	4	400	41.641640	-107.644800
P142884.0W	2/26/2002	Complete	P H LIVESTOCK CO.	STK	21	92	11	SESE	5	300	41.800540	-107.759300
P142885.0W	2/26/2002	INC	RME LAND CORP.	STK	20	92	1	SWNW	25	220	41.739300	-107.717700
P143131.0W	3/15/2002	Complete	SAMSON RESOURCES COMPANY	MON	19	93	19	SWSE	0	40	41.603200	-107.918200
P143132.0W	3/15/2002	Complete	SAMSON RESOURCES COMPANY	MON	19	93	19	NWSE	0	40	41.606820	-107.918200

Table F-12. Groundwater rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company/Individual	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Total Depth	Lat	Long
P143133.0W	3/15/2002	Complete	SAMSON RESOURCES COMPANY	MON	19	93	19	SESE	0	46	41.603130	-107.913300
P144036.0W	4/23/2002	INC	BP America Production Co.	MIS	22	94	17	SWSW	50	0	41.873010	-108.064400
P144149.0W	4/23/2002	Complete	HARKER EMMETT R.	DOM_GW; STK	20	95	8	NWSE	14	210	41.722180	-108.129500
P144331.0W	5/6/2002	Complete	HARKER CHRIS C.	DOM_GW; STK	20	95	8	NESE	14	210	41.722200	-108.124700
P144612.0W	5/23/2002	Complete	PH LIVESTOCK CO.	STK	21	92	35	SESW	10	340	41.742550	-107.769200
P145959.0W	7/15/2002	INC	USDI - BLM / Devon Energy Production Co., LP	MIS	15	92	17	SENW	0	23	41.272260	-107.776700
P146198.0W	7/30/2002	Complete	NULL	MON	19	99	36	NENW	0	27	41.585800	-108.515800
P146199.0W	7/30/2002	Complete	NULL	MON	19	99	36	SENE	0	25	41.582170	-108.506200
P146200.0W	7/30/2002	Complete	NULL	MON	19	99	36	SENW	0	25	41.582180	-108.515800
P146654.0W	8/30/2002	Complete	Wyo State Dept. of Environmental Quality	MON	20	94	34	NENW	0	81	41.671940	-107.980500
P146655.0W	8/30/2002	Complete	Wyo State Dept. of Environmental Quality	MON	20	94	27	SWSE	0	78	41.675590	-107.975700
P146657.0W	8/30/2002	Complete	Wyo State Dept. of Environmental Quality	MON	20	94	27	NWSW	0	66	41.679190	-107.985400
P146658.0W	8/30/2002	Complete	NULL	MON	19	95	4	SENW	0	37	41.653440	-108.115000
P146664.0W	8/30/2002	Complete	Wyo State Dept. of Environmental Quality	MON	19	95	5	SENE	0	57	41.653380	-108.124600
P149393.0W	11/25/2002	INC	Yates Petroleum Corp.	MIS	19	92	24	NWSW	100	0	41.606080	-107.716900
P148445.0W	12/11/2002	Complete	Anadarko Petroleum Co.	MON	19	98	23	SWNW	0	25	41.611040	-108.424700
P148446.0W	12/11/2002	Complete	Anadarko Petroleum Co.	MON	19	98	23	SWNE	0	35	41.611040	-108.415000
P148447.0W	12/11/2002	Complete	Anadarko Petroleum Co.	MON	19	98	23	NWSE	0	35	41.607420	-108.415000
P148448.0W	12/11/2002	Complete	Anadarko Petroleum Co.	MON	19	98	23	NESW	0	27	41.607420	-108.419900
P148449.0W	12/11/2002	Complete	Anadarko Petroleum Co.	MON	19	98	23	SENW	0	35	41.611040	-108.419900
P191830.0W	1/7/2003	Complete	WEBER MATT	MIS	14	91	19	NWSE	0	0	41.167790	-107.676100

Table F-12. Groundwater rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company/Individual	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Total Depth	Lat	Long
P152301.0W	1/9/2003	Complete	DEVON ENERGY PRODUCTION COMPANY, L.P.	MIS	14	91	19	NWSE	15	900	41.168260	-107.676100
P149036.0W	1/29/2003	Complete	USDI - BLM / DEVON ENERGY PRODUCTION COMPANY, L.P.	MIS	16	93	8	NWSE	84	783	41.371930	-107.886200
P149037.0W	1/29/2003	Complete	DEVON ENERGY PRODUCTION COMPANY, L.P. / USDI - BLM	MIS	16	93	14	SWSE	120	9,223	41.353480	-107.828700
P149038.0W	1/29/2003	Complete	USDI - BLM / DEVON ENERGY PRODUCTION COMPANY, L.P.	MIS	18	92	30	SWSE	70	820	41.501220	-107.802400
P150183.0W	3/10/2003	INC	CHEVRON USA INC / P & H LIVESTOCK / Anadarko E & P CO, LP	MIS	19	97	19	NWSW	80	540	41.607410	-108.386100
P155768.0W	4/30/2003	Complete	USDI - BLM / JOLLY WILLIAM H. OR SALLY K.	STK	24	96	8	NWSE	20	480	42.065110	-108.285700
P155770.0W	4/30/2003	Complete	USDI - BLM / JOLLY WILLIAM H. OR SALLY K.	STK	23	96	18	SENW	20	400	41.967740	-108.309400
P155771.0W	4/30/2003	Complete	USDI - BLM / JOLLY WILLIAM OR SALLY	STK	23	96	17	SENW	25	400	41.967440	-108.290900
P155772.0W	4/30/2003	Complete	USDI - BLM / JOLLY WILLIAM H. OR SALLY K.	STK	24	96	24	SWNE	20	375	42.039870	-108.208100
P156170.0W	4/30/2003	Complete	USDI - BLM / JOLLY WILLIAM H. OR SALLY K.	STK	23	96	21	SENW	20	480	41.952960	-108.271600
P155774.0W	5/6/2003	Complete	USDI - BLM / JOLLEY WILLIAM H. & SALLY	STK	23	96	5	NWSE	15	380	41.992770	-108.285900
P156171.0W	5/6/2003	Complete	JOLLEY WILLIAM H. & SALLY	STK	23	96	1	SWNW	20	80	41.996530	-108.218000

Table F-12. Groundwater rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company/Individual	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Total Depth	Lat	Long
P156174.0W	5/6/2003	Complete	Wyo State Board of Land Commissioners / JOLLEY WILLIAM H. & SALLY	STK	23	97	11	NWNE	20	250	41.985580	-108.344500
P156175.0W	5/6/2003	Complete	USDI - BLM / JOLLEY WILLIAM AND SALLY	MIS	24	97	26	NESW	70	600	42.023110	-108.352500
P152233.0W	7/9/2003	Complete	USDI - BLM / LAZY YJ, LLC	STK	22	93	36	NENE	25	0	41.840750	-107.856600
P152753.0W	7/30/2003	Complete	Statton Sheep Co.	STK	17	94	19	SWSW	12	500	41.429600	-108.042600
P152940.0W	8/4/2003	Complete	USDI - BLM / Devon Energy Production Co., LP	MIS	14	92	12	NENE	30	1,050	41.204500	-107.690300
P153419.0W	8/20/2003	Complete	PH LIVESTOCK COMPANY	STK	18	96	31	SWSW	10	308	41.487380	-108.273100
P153420.0W	8/20/2003	Complete	PH LIVESTOCK COMPANY	STK	19	96	13	SENW	10	405	41.624320	-108.173300
P153992.0W	9/5/2003	INC	USDI - BLM / Statton Sheep Co.	STK	23	96	34	SWSW	25	0	41.916840	-108.257200
P153993.0W	9/5/2003	Complete	Statton Sheep Co. / USDI - BLM	STK	23	96	13	NWSE	6	200	41.963960	-108.208400
P153994.0W	9/5/2003	Complete	Statton Sheep Co.	STK	22	96	11	SWSW	12	880	41.887940	-108.238000
P153996.0W	9/5/2003	Complete	USDI - BLM / Statton Sheep Co.	STK	23	96	17	SENW	14	486	41.967420	-108.290900
P153997.0W	9/5/2003	INC	Statton Sheep Co.	STK	23	95	31	NWSW	25	0	41.920600	-108.198900
P154096.0W	9/17/2003	Complete	Statton Sheep Co.	STK	16	95	11	SENW	6	830	41.376040	-108.062200
P155406.0W	12/8/2003	INC	BP America Production Co.	MIS	19	92	17	NWSW	150	0	41.620160	-107.794000
P155915.0W	1/13/2004	INC	Statton Sheep Co.	STK	24	96	24	NWSE	25	0	42.036250	-108.208100
P156486.0W	1/27/2004	Complete	Adams Steve F. / USDI - BLM	STK	18	93	10	SWNW	5	300	41.552330	-107.869700
P156487.0W	1/27/2004	Complete	Adams Steve F.	STK	18	93	2	SWNW	5	300	41.566860	-107.850400
P157884.0W	2/2/2004	Complete	Stratton Sheep Co.	STK	23	94	35	SWNE	14	250	41.923850	-107.996400
P157885.0W	2/2/2004	Complete	Stratton Sheep Co.	STK	23	94	31	SESW	14	800	41.916890	-108.078800
P157244.0W	2/24/2004	INC	BP America Production Co.	MIS	21	93	23	SESW	50	0	41.771890	-107.885300
P158015.0W	4/13/2004	Complete	Statton Sheep Co.	STK	18	95	1	SESW	14	940	41.559660	-108.057400
P158016.0W	4/13/2004	Complete	Statton Sheep Co.	STK	18	95	11	SESW	12	600	41.545190	-108.076700

Table F-12. Groundwater rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company/Individual	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Total Depth	Lat	Long
P158018.0W	4/13/2004	Complete	Statton Sheep Co. / Anadarko Land Corp.	STK	23	94	15	SESW	7	300	41.960130	-108.020500
P158019.0W	4/13/2004	Complete	Statton Sheep Co. / USDI - BLM	STK	22	95	28	SENE	13	880	41.852050	-108.145700
P158271.0W	4/23/2004	Complete	Statton Sheep Co.	STK	23	94	29	NESW	25	640	41.934970	-108.059300
P158801.0W	4/30/2004	Complete	RED DESERT CATTLE CO.	STK	20	97	15	NWSE	6	490	41.708370	-108.318400
P158802.0W	4/30/2004	Complete	USDI - BUREAU OF LAND MANAGEMENT / RED DESERT CATTLE CO.	STK	19	97	14	NENW	12	500	41.628620	-108.304100
P159305.0W	6/1/2004	Complete	Stratton Sheep Co.	STK	23	94	28	SESW	15	300	41.931260	-108.040000
P160772.0W	6/21/2004	Complete	DUKE ENERGY FIELD SERVICES, LP	IND_GW; MIS	19	99	25	SWSE	50	490	41.589490	-108.509100
P160524.0W	7/15/2004	Complete	GMT ENERGY CORP / USDI - BLM	MIS	24	96	28	NENW	120	710	42.028950	-108.271200
P160584.0W	7/19/2004	INC	USDI - BLM	MIS	14	91	18	NWNW	10	880	41.190010	-107.685600
P161187.0W	8/4/2004	INC	Yates Petroleum Corp. / Bureau of Land Management	MIS	23	96	2	SESW	200	0	41.989210	-108.232600
P163770.0W	11/17/2004	INC	CIG-COLORADO INTERSTATE GAS CO	MON	19	98	23	SWNE	0	49	41.611040	-108.415000
P163771.0W	11/17/2004	INC	CIG-COLORADO INTERSTATE GAS CO	MON	19	98	23	NENE	0	64	41.614660	-108.410200
P163772.0W	11/17/2004	INC	CIG-COLORADO INTERSTATE GAS CO	MON	19	98	23	NWNE	0	48	41.614660	-108.415000
P163773.0W	11/17/2004	INC	CIG-COLORADO INTERSTATE GAS CO	MON	19	98	23	SENW	0	49	41.611040	-108.419900
P163774.0W	11/17/2004	INC	CIG-COLORADO INTERSTATE GAS CO	MON	19	98	23	NENW	0	38	41.614660	-108.419900
P163775.0W	11/17/2004	INC	CIG-COLORADO INTERSTATE GAS CO	MON	19	98	23	NWNE	0	43	41.614660	-108.415000

Table F-12. Groundwater rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company/Individual	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Total Depth	Lat	Long
P163776.0W	11/17/2004	INC	CIG-COLORADO INTERSTATE GAS CO	MON	19	98	23	SWNE	0	49	41.611040	-108.415000
P163777.0W	11/17/2004	INC	CIG-COLORADO INTERSTATE GAS CO	MON	19	98	22	SENE	0	45	41.611040	-108.429500
P164756.0W	1/25/2005	Complete	BP AMERICA PRODUCTION CO.	MIS	20	94	7	SWNE	50	700	41.726090	-108.033100
P165337.0W	2/10/2005	INC	BP America Production Co. / USDI - BLM	MIS	18	94	33	NESW	50	0	41.491090	-107.999400
P165537.0W	2/23/2005	INC	BP America Production Co.	MIS	18	94	31	NWNE	50	0	41.498060	-108.033400
P165873.0W	3/25/2005	INC	USDI - BLM / Nance Petroleum Corp.	MIS	23	94	13	NWNW	40	0	41.970730	-107.986500
P168348.0W	5/10/2005	INC	BP America Production Co.	MIS	19	93	19	NESW	150	0	41.606900	-107.923000
P168155.0W	6/8/2005	Complete	BOTNAN TED AND LOUISE	DOM_GW	19	96	1	NENW	3	73	41.656830	-108.173600
P169453.0W	7/13/2005	Complete	Adams Steve F.	DOM_GW; MIS; STK	17	92	15	SWSW	20	880	41.442500	-107.755900
P169650.0W	7/13/2005	INC	BP America Production Co.	MIS	19	93	33	SWSW	50	340	41.574130	-107.889200
P170496.0W	9/2/2005	INC	Double Eagle Petroleum Company	CBM	16	92	2	NENW	58	0	41.396390	-107.719100
P170500.0W	9/2/2005	INC	Double Eagle Petroleum Company	CBM	16	92	2	SWNW	58	0	41.389190	-107.723900
P170506.0W	9/2/2005	INC	Double Eagle Petroleum Company	CBM	16	92	3	NENW	58	0	41.396380	-107.738300
P170507.0W	9/2/2005	INC	Double Eagle Petroleum Company	CBM	16	92	3	NENE	58	0	41.396370	-107.728700
P170508.0W	9/2/2005	INC	Double Eagle Petroleum Company	CBM	16	92	3	SWNE	58	0	41.389180	-107.733500
P170509.0W	9/2/2005	INC	Double Eagle Petroleum Company	CBM	16	92	3	SENE	58	0	41.389190	-107.728700
P170510.0W	9/2/2005	INC	Double Eagle Petroleum Company	CBM	16	92	3	SWNW	58	0	41.389180	-107.743100
P170511.0W	9/2/2005	INC	Double Eagle Petroleum Company	CBM	16	92	3	SENW	58	0	41.389180	-107.738300

Table F-12. Groundwater rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company/Individual	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Total Depth	Lat	Long
P170512.0W	9/2/2005	INC	Double Eagle Petroleum Company	CBM	16	92	3	NWSW	58	0	41.385560	-107.743100
P170513.0W	9/2/2005	INC	Double Eagle Petroleum Company	CBM	16	92	3	SESW	58	0	41.381940	-107.738300
P170514.0W	9/2/2005	INC	Double Eagle Petroleum Company	CBM	16	92	3	NWSE	58	0	41.385570	-107.733500
P170515.0W	9/2/2005	INC	Double Eagle Petroleum Company	CBM	16	92	3	SESE	58	0	41.381940	-107.728700
P170516.0W	9/2/2005	INC	Double Eagle Petroleum Company	CBM	17	92	26	NWNE	58	0	41.424460	-107.727200
P170517.0W	9/2/2005	INC	Double Eagle Petroleum Company	CBM	17	92	26	NWNW	58	0	41.424490	-107.736800
P170518.0W	9/2/2005	INC	Double Eagle Petroleum Company	CBM	17	92	26	SENW	58	0	41.420840	-107.732000
P170519.0W	9/2/2005	INC	Double Eagle Petroleum Company	CBM	17	92	26	NWSW	58	0	41.417220	-107.736800
P170520.0W	9/2/2005	INC	Double Eagle Petroleum Company	CBM	17	92	26	SESW	58	0	41.413560	-107.732000
P170521.0W	9/2/2005	INC	Double Eagle Petroleum Company	CBM	17	92	26	NWSE	58	0	41.417180	-107.727200
P170522.0W	9/2/2005	INC	Double Eagle Petroleum Company	CBM	17	92	34	NWNE	58	0	41.409980	-107.746200
P170523.0W	9/2/2005	INC	Double Eagle Petroleum Company	CBM	17	92	34	SENE	58	0	41.406320	-107.741500
P170524.0W	9/2/2005	INC	Double Eagle Petroleum Company	CBM	17	92	34	NWSE	58	0	41.402960	-107.745300
P170525.0W	9/2/2005	INC	Double Eagle Petroleum Company	CBM	17	92	34	SESE	58	0	41.399770	-107.740200
P170527.0W	9/2/2005	INC	Double Eagle Petroleum Company	CBM	17	92	35	SESW	58	0	41.399720	-107.730700
P170528.0W	9/2/2005	INC	Double Eagle Petroleum Company	CBM	17	92	35	NWSE	58	0	41.402880	-107.726300
P170529.0W	9/2/2005	INC	Double Eagle Petroleum Company	CBM	17	92	35	SESE	58	0	41.399720	-107.721100
P170540.0W	9/2/2005	INC	Double Eagle Petroleum Company	CBM	17	92	26	SENE	58	0	41.420800	-107.722300

Table F-12. Groundwater rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company/Individual	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Total Depth	Lat	Long
P170541.0W	9/2/2005	INC	Double Eagle Petroleum Company	CBM	17	92	26	SESE	58	0	41.413520	-107.722300
P169635.0W	9/6/2005	Unadjudicated	CHEVRON U.S.A. INC	MIS	19	98	23	SENW	60	620	41.610590	-108.419900
P170844.0W	10/14/2005	INC	Double Eagle Petroleum Company	CBM	16	92	10	NWNE	58	0	41.378320	-107.733500
P170845.0W	10/14/2005	INC	Double Eagle Petroleum Company	CBM	16	92	10	SENE	58	0	41.374700	-107.728700
P170846.0W	10/14/2005	INC	Double Eagle Petroleum Company	CBM	16	92	10	NWNW	58	0	41.378320	-107.743100
P170847.0W	10/14/2005	INC	Double Eagle Petroleum Company	CBM	16	92	10	SENW	58	0	41.374700	-107.738300
P170848.0W	10/14/2005	INC	Double Eagle Petroleum Company	CBM	16	92	10	NWSE	58	0	41.371070	-107.733500
P170850.0W	10/14/2005	INC	Double Eagle Petroleum Company	CBM	16	92	10	NWSW	58	0	41.371080	-107.743100
P170851.0W	10/14/2005	INC	Double Eagle Petroleum Company	CBM	16	92	10	SESW	58	0	41.367450	-107.738300
P170875.0W	10/14/2005	INC	Double Eagle Petroleum Company / Double Eagle Petroleum Company	CBM	17	92	24	NWSE	58	0	41.432210	-107.707100
P170876.0W	10/14/2005	INC	Double Eagle Petroleum & Mining Co.	CBM	17	92	24	SESE	58	0	41.428770	-107.702000
P170877.0W	10/14/2005	INC	Double Eagle Petroleum Company	CBM	17	92	24	NWSW	58	0	41.431810	-107.717400
P170878.0W	10/14/2005	INC	Double Eagle Petroleum Company	CBM	17	92	24	SESW	58	0	41.428370	-107.712200
P170879.0W	10/14/2005	INC	Double Eagle Petroleum Company	CBM	17	92	25	NWNE	58	0	41.424930	-107.707100
P170881.0W	10/14/2005	INC	Double Eagle Petroleum Company	CBM	17	92	25	NWNW	58	0	41.424530	-107.717400
P170882.0W	10/14/2005	INC	Double Eagle Petroleum Company	CBM	17	92	25	SENW	58	0	41.421090	-107.712200
P170883.0W	10/14/2005	INC	Double Eagle Petroleum Company	CBM	17	92	25	NWSE	58	0	41.417660	-107.707100
P170885.0W	10/14/2005	INC	Double Eagle Petroleum Company	CBM	17	92	25	NWSW	58	0	41.417250	-107.717400

Table F-12. Groundwater rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company/Individual	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Total Depth	Lat	Long
P170886.0W	10/14/2005	INC	Double Eagle Petroleum Company	CBM	17	92	25	SESW	58	0	41.413840	-107.712200
P170887.0W	10/14/2005	INC	Double Eagle Petroleum Company	CBM	17	92	35	NWNE	58	0	41.409910	-107.727000
P170888.0W	10/14/2005	INC	Double Eagle Petroleum Company	CBM	17	92	35	SENE	58	0	41.406270	-107.722200
P170889.0W	10/14/2005	INC	Double Eagle Petroleum Company	CBM	17	92	35	NWNW	58	0	41.409940	-107.736700
P170890.0W	10/14/2005	INC	Double Eagle Petroleum Company	CBM	17	92	35	SENW	58	0	41.406290	-107.731500
P170900.0W	10/14/2005	INC	Double Eagle Petroleum Company	CBM	16	92	21	NWNW	58	0	41.349340	-107.762300
P170901.0W	10/14/2005	INC	Double Eagle Petroleum Company	CBM	16	92	21	SENW	58	0	41.345710	-107.757500
P170902.0W	10/14/2005	INC	Double Eagle Petroleum Company	CBM	16	92	21	NWSE	58	0	41.342090	-107.752700
P170903.0W	10/14/2005	INC	Double Eagle Petroleum Company	CBM	16	92	21	SESE	58	0	41.338460	-107.747900
P170904.0W	10/14/2005	INC	Double Eagle Petroleum Company	CBM	16	92	21	NWSW	58	0	41.342210	-107.762300
P170905.0W	10/14/2005	INC	Double Eagle Petroleum Company	CBM	16	92	21	SESW	58	0	41.338460	-107.757500
P170922.0W	10/14/2005	INC	Double Eagle Petroleum Company	CBM	16	92	27	NWNW	58	0	41.334830	-107.743100
P170923.0W	10/14/2005	INC	Double Eagle Petroleum Company	CBM	16	92	27	SENW	58	0	41.331210	-107.738300
P170924.0W	10/14/2005	INC	Double Eagle Petroleum Company	CBM	16	92	27	NWSE	58	0	41.327580	-107.733500
P170925.0W	10/14/2005	INC	Double Eagle Petroleum Company	CBM	16	92	27	SESE	58	0	41.323960	-107.728700
P170926.0W	10/14/2005	INC	Double Eagle Petroleum Company	CBM	16	92	27	NWSW	58	0	41.327580	-107.743100
P170927.0W	10/14/2005	INC	Double Eagle Petroleum Company	CBM	16	92	27	SESW	58	0	41.323960	-107.738300
P170928.0W	10/14/2005	INC	Double Eagle Petroleum Company	CBM	16	92	28	NWNE	58	0	41.334840	-107.752700

Table F-12. Groundwater rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company/Individual	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Total Depth	Lat	Long
P170929.0W	10/14/2005	INC	Double Eagle Petroleum Company	CBM	16	92	28	SENE	58	0	41.331210	-107.747900
P170930.0W	10/14/2005	INC	Double Eagle Petroleum Company	CBM	16	92	28	SENW	58	0	41.331210	-107.757500
P170931.0W	10/14/2005	INC	Double Eagle Petroleum Company	CBM	16	92	28	NWSE	58	0	41.327580	-107.752700
P170932.0W	10/14/2005	INC	Double Eagle Petroleum Company	CBM	16	92	28	SESE	58	0	41.323960	-107.747900
P170933.0W	10/14/2005	INC	Double Eagle Petroleum Company	CBM	16	92	28	SESW	58	0	41.323960	-107.757500
P170934.0W	10/14/2005	INC	Double Eagle Petroleum Company	CBM	16	92	34	NWNE	58	0	41.320330	-107.733500
P170935.0W	10/14/2005	INC	Double Eagle Petroleum Company	CBM	16	92	34	SENE	58	0	41.316710	-107.728700
P170936.0W	10/14/2005	INC	Double Eagle Petroleum Company	CBM	16	92	34	NWNW	58	0	41.320330	-107.743100
P170937.0W	10/14/2005	INC	Double Eagle Petroleum Company	CBM	16	92	34	SENW	58	0	41.316710	-107.738300
P170938.0W	10/14/2005	INC	Double Eagle Petroleum Company	CBM	16	92	34	NWSE	58	0	41.313080	-107.733500
P170939.0W	10/14/2005	INC	Double Eagle Petroleum Company	CBM	16	92	34	SESE	58	0	41.309460	-107.728700
P170940.0W	10/14/2005	INC	Double Eagle Petroleum Company	CBM	16	92	34	NWSW	58	0	41.313080	-107.743100
P170941.0W	10/14/2005	INC	Double Eagle Petroleum Company	CBM	16	92	34	SESW	58	0	41.309450	-107.738300
P170944.0W	10/14/2005	INC	Double Eagle Petroleum Company	CBM	16	92	35	NWNW	58	0	41.320330	-107.723900
P170945.0W	10/14/2005	INC	Double Eagle Petroleum Company	CBM	16	92	35	SENW	58	0	41.316710	-107.719100
P170946.0W	10/14/2005	INC	Double Eagle Petroleum Company	CBM	16	92	35	NWSE	58	0	41.313080	-107.714300
P170947.0W	10/14/2005	INC	Double Eagle Petroleum Company	CBM	16	92	35	SESE	58	0	41.309460	-107.709500
P170948.0W	10/14/2005	INC	Double Eagle Petroleum Company	CBM	16	92	35	NWSW	58	0	41.313080	-107.723900

Table F-12. Groundwater rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company/Individual	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Total Depth	Lat	Long
P170949.0W	10/14/2005	INC	Double Eagle Petroleum Company	CBM	16	92	35	SESW	58	0	41.309460	-107.719100
P171025.0W	10/21/2005	Complete	Wyo State Board of Land Commissioners / YATES PETROLEUM CORP.	MIS	22	95	16	NENW	200	910	41.884530	-108.156200
P173027.0W	1/19/2006	INC	BP America Production Co.	MIS	17	95	18	SWNE	60	1,120	41.451150	-108.148100
P174639.0W	1/19/2006	INC	Statton Sheep Co. / WESTERN MINERALS	STK	21	93	33	SENE	25	0	41.750200	-107.914300
P174640.0W	1/19/2006	INC	Statton Sheep Co. / WESTERN MINERALS	STK	21	93	17	SWNE	25	0	41.793600	-107.938400
P174641.0W	1/19/2006	INC	Statton Sheep Co. / ANADARKO	STK	22	94	9	NWNE	25	0	41.898380	-108.035200
P173073.0W	2/10/2006	INC	Wyo State Board of Land Commissioners / USDI - BLM / BP America Production Co.	MIS	18	93	15	SENW	50	0	41.537790	-107.864800
P173344.0W	2/27/2006	Complete	USDI - BLM / THAYER BRUCE	STK	21	91	18	SENE	25	0	41.793240	-107.720700
P173453.0W	2/28/2006	Complete	USDI - BLM / Wyo State Board of Land Commissioners / ADAMS STEVE	MIS	19	94	16	SESE	100	0	41.617590	-107.990100
P173454.0W	2/28/2006	Complete	Wyo State Board of Land Commissioners / USDI - BLM / ADAMS STEVE	MIS	17	92	15	SESW	25	2,600	41.442500	-107.751100
P173455.0W	2/28/2006	Complete	USDI - BLM / Wyo State Board of Land Commissioners / ADAMS STEVE	MIS; STK	19	95	13	NESE	100	1,160	41.621140	-108.047700
P174021.0W	4/6/2006	INC	BP America Production Co. / USDI - BLM / Wyo State Board of Land Commissioners	MIS	17	93	25	SWSW	100	660	41.414330	-107.830600

Table F-12. Groundwater rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company/Individual	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Total Depth	Lat	Long
P175170.0W	5/12/2006	INC	FIDELITY EXPLORATION & PRODUCTIN COMPANY / USDI - BLM	MIS	18	95	14	SENE	200	0	41.537980	-108.067200
P175171.0W	5/12/2006	INC	Wyo State Board of Land Commissioners / FIDELITY EXPLORATION & PRODUCTIN COMPANY	MIS	18	92	16	NESE	200	0	41.533880	-107.759400
P174820.0W	5/25/2006	Complete	PINNACLE GAS RESOURCES, INC.	CBM	23	97	36	NENE	25	4,460	41.928170	-108.321700
P175201.0W	6/13/2006	INC	FIDELITY EXPLORATION & PRODUCTIN COMPANY / USDI - BLM	MIS	18	95	18	SESE	200	0	41.530470	-108.144000
P178317.0W	9/7/2006	Complete	Wyo State Board of Land Commissioners / USDI - BLM / BP America Production Co.	MIS	20	93	25	SESW	50	640	41.674790	-107.827000
P177392.0W	9/15/2006	Complete	USDI - BLM / BURLINGTON RESOURCES OIL & GAS	MIS	21	92	8	SESW	100	640	41.800780	-107.827500
P177859.0W	9/19/2006	Complete	Wyo State Board of Land Commissioners / USDI - BLM / B & M WATER SERVICE	MIS; STK	20	94	34	NWSE	80	1,020	41.664770	-107.975700
P178342.0W	10/17/2006	Complete	J-W OPERATING COMPANY / USDI - BLM	MIS	24	94	30	NESW	120	540	42.021740	-108.078300
P178351.0W	10/30/2006	Complete	USDI - BLM / YATES PETROLEUM CORP.	MIS	20	96	12	NESW	100	550	41.720830	-108.174400

Table F-12. Groundwater rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company/Individual	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Total Depth	Lat	Long
P178687.0W	11/16/2006	INC	USDI - BLM / FIDELITY EXPLORATION & PRODUCTIN COMPANY	MIS	18	95	22	NWNW	200	0	41.527110	-108.100800
P178994.0W	11/22/2006	Complete	PH LIVESTOCK CO.	MIS	18	96	31	SWSW	80	308	41.487380	-108.273100
P178794.0W	12/11/2006	INC	USDI - BLM / Devon Energy Production Co.	MIS	14	92	23	NESE	40	0	41.168270	-107.709600
P178919.0W	12/11/2006	Complete	KAUMO LEONARD	DOM_GW; IRR_GW; STK	22	96	15	NESE	5	260	41.877110	-108.242800
P179158.0W	1/17/2007	Complete	Sheehan Patrick & Judith	STK	15	93	3	NWNE	25	830	41.306570	-107.848300
P180336.0W	3/7/2007	INC	WYOMING STATE BOARD OF LAND COMMISSIONERS / BP America Production Co.	MIS	18	93	34	SWSW	60	0	41.487270	-107.869500
P180894.0W	3/22/2007	INC	USDI - BLM / Lance Oil & Gas Co.	MIS	22	93	32	SENW	85	0	41.836920	-107.943500
P181365.0W	5/8/2007	INC	GWIN GAROLD	DOM_GW	19	96	1	NWSW	25	0	41.649660	-108.178300
P181641.0W	6/7/2007	Unadjudicated	USDI - BLM / KINDER MORGAN ROCKIES EXPRESS	MIS	20	94	32	SWNW	12	400	41.669440	-108.022800
P183319.0W	7/18/2007	Complete	P.H. LIVESTOCK CO.	STK	20	93	31	SWSW	12	450	41.662600	-107.926600
P183116.0W	8/22/2007	Complete	J-W OPERATING COMPANY	MIS	25	94	31	NWSE	200	535	42.094110	-108.092700
P183450.0W	8/31/2007	INC	ENCANA OIL & GAS (USA) INC. / USDI - BLM	MIS	17	95	2	NWSE	200	0	41.476610	-108.071400
P183655.0W	10/25/2007	Complete	USDI - BLM / WYOMING STATE BOARD OF LAND COMMISSIONERS / BP America Production Co.	MIS	20	92	20	NWNW	75	540	41.699170	-107.792400
P183692.0W	11/5/2007	INC	Yates Petroleum Corp.	MIS	16	94	4	NENE	175	0	41.397370	-107.976700

Table F-12. Groundwater rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company/Individual	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Total Depth	Lat	Long
P184333.0W	12/17/2007	Complete	STATE BOARD OF LAND COMMISIONERS / BLM / BP AMERICA PRODUCTION COMPANY	MIS	20	94	9	NWSE	50	880	41.723330	-107.994500
P184334.0W	12/17/2007	Complete	BLM / BP AMERICA PRODUCTION COMPANY	MIS	17	93	3	NWNE	75	1,000	41.482500	-107.858100
P185940.0W	2/6/2008	Complete	BUREAU OF LAND MANAGEMENT / STATE BOARD OF LAND COMMISSIONERS / BP AMERICA PRODUCTION COMPANY	MIS	18	92	21	NESW	50	805	41.520980	-107.767900
P186105.0W	3/6/2008	Unadjudicated	NABORS DRILLING USA, LP	MIS	16	92	5	NESE	60	880	41.387160	-107.764900
P186057.0W	3/12/2008	Complete	STATE BOARD OF LAND COMMISSIONERS / BUREAU OF LAND MANAGEMENT / BP AMERICA PRODUCTION COMPANY	MIS	18	92	7	SWNE	50	0	41.551950	-107.802500
P186994.0W	4/22/2008	INC	USDI-BLM / GMT EXPLORATION CO., LLC	MIS	24	96	28	NENW	120	0	42.028470	-108.270900
P186747.0W	4/25/2008	Complete	USDI-BLM / DEVON ENERGY	MIS	21	95	34	NWSW	140	0	41.746330	-108.141600
P187981.0W	6/2/2008	INC	USDI-BLM / BP AMERICA PRODUCTION CO.	MIS	19	92	27	SESW	200	0	41.587360	-107.750300
P187982.0W	6/2/2008	INC	USDI-BLM / BP AMERICA PRODUCTION CO.	MIS	17	95	1	SWNW	80	0	41.479710	-108.061900

Table F-12. Groundwater rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company/Individual	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Total Depth	Lat	Long
P187202.0W	6/25/2008	INC	MEYER TRENTON AND JODY	STK	20	96	35	NENW	25	0	41.670740	-108.192900
P187203.0W	6/25/2008	INC	MEYER TRENTON AND JODY	DOM_GW	20	96	35	SESW	25	0	41.659790	-108.193000
P190145.0W	7/14/2008	Complete	BLM / DEVON ENERGY	MIS	16	93	13	NWNW	120	1,630	41.364460	-107.818400
P187966.0W	7/23/2008	Complete	BLM / STATE BOARD OF LAND COMMISSIONERS / BP AMERICA PROD. CO.	MIS	19	92	29	SWNE	50	880	41.595750	-107.784300
P188725.0W	8/22/2008	Complete	SBOLC / BLM / BP AMERICA PRODUCTION COMPANY	MIS	18	92	23	SWNW	50	840	41.522030	-107.735500
P188948.0W	9/18/2008	Complete	BUREAU OF LAND MANAGEMENT / BP AMERICA PRODUCTION COMPANY	MIS	19	95	21	SWSW	85	920	41.604400	-108.117300
P188949.0W	9/19/2008	Complete	STATE BOARD OF LAND COMMISSIONERS / BUREAU OF LAND MANAGEMENT / BP AMERICA PRODUCTION CO.	MIS	19	94	31	SESW	50	860	41.573550	-108.038100
P188950.0W	9/19/2008	Complete	STATE BOARD OF LAND COMMISSIONERS / BUREAU OF LAND MANAGEMENT / BP AMERICA PRODUCTION CO.	MIS	18	92	1	NWSE	50	900	41.563780	-107.705500
P189036.0W	10/7/2008	Complete	BUREAU OF LAND MANAGEMENT / BP AMERICA PRODUCTION CO.	MIS	20	94	20	SENW	50	760	41.695590	-108.019000

Table F-12. Groundwater rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company/Individual	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Total Depth	Lat	Long
P189038.0W	10/7/2008	Fully Adjudicated	BUREAU OF LAND MANAGEMENT / EOG RESOURCES, INC.	MIS	20	97	36	NESW	120	0	41.664610	-108.284600
P189201.0W	10/15/2008	Complete	USDI - BLM / BP AMERICA PRODUCTION CO.	MIS	20	95	7	SWNE	50	700	41.724430	-108.149500
P189204.0W	10/21/2008	INC	BUREAU OF LAND MANAGEMENT / BP AMERICA PRODUCTION CO.	MIS	16	95	1	NENW	200	860	41.394340	-108.045300
P189347.0W	10/31/2008	INC	HARKER MARK	DOM_GW; STK	20	95	8	NWNE	25	0	41.729190	-108.129600
P189501.0W	11/24/2008	INC	USDI-BLM / BP AMERICA PRODUCTION CO.	MIS	21	93	35	NWSW	100	800	41.746000	-107.890200
P189600.0W	11/26/2008	Complete	BLM / STATE BOARD OF LAND COMMISSIONERS / BP AMERICA PRODUCTION CO.	MIS	17	92	5	NWSE	50	850	41.476740	-107.785000
P189473.0W	12/29/2008	INC	WYOMING STATE LANDS AND INVESTMENTS / BLM / BP AMERICA PRODUCTION CO.	MIS	18	93	1	SWSW	150	0	41.559130	-107.830900
P189475.0W	12/29/2008	INC	FITZGERALD MAEVE AND LLIAM	DOM_GW	23	96	33	SWSW	25	0	41.916280	-108.276600
P189613.0W	1/7/2009	Complete	ADAMS STEPHEN AND CAROLYN / BLM / BP AMERICA PRODUCTION CO.	MIS	19	95	11	NESW	50	1,000	41.636640	-108.068800
P190515.0W	3/9/2009	INC	PINNACLE GAS RESOURCES, INC.	CBM	23	97	35	NENE	25	0	41.928490	-108.339600
P190516.0W	3/9/2009	INC	PINNACLE GAS RESOURCES, INC.	CBM	23	97	35	NENW	25	0	41.928500	-108.349300
P190517.0W	3/9/2009	INC	PINNACLE GAS RESOURCES, INC.	CBM	23	97	35	NESE	25	0	41.921370	-108.339600
P190518.0W	3/9/2009	INC	PINNACLE GAS RESOURCES, INC.	CBM	23	97	35	NESW	25	0	41.921210	-108.349300

Table F-12. Groundwater rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company/Individual	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Total Depth	Lat	Long
P190520.0W	3/9/2009	INC	STATE BOARD OF LAND COMMISSIONERS / PINNACLE GAS RESOURCES, INC.	CBM	23	97	16	SWSW	25	0	41.961190	-108.393100
P190537.0W	3/9/2009	INC	PINNACLE GAS RESOURCES, INC.	CBM	23	97	26	SWNW	25	0	41.939380	-108.354200
P190538.0W	3/9/2009	INC	PINNACLE GAS RESOURCES, INC.	CBM	23	97	26	SWSW	25	0	41.932140	-108.354100
P190540.0W	3/9/2009	INC	PINNACLE GAS RESOURCES, INC.	CBM	23	97	26	SWSE	25	0	41.931920	-108.345600
P190541.0W	3/9/2009	INC	PINNACLE GAS RESOURCES, INC.	CBM	23	97	26	SWNE	25	0	41.939400	-108.344500
P190542.0W	3/9/2009	INC	PINNACLE GAS RESOURCES, INC.	CBM	23	97	36	SWSW	25	0	41.917480	-108.336200
P190543.0W	3/9/2009	INC	PINNACLE GAS RESOURCES, INC.	CBM	23	97	36	SWSE	25	0	41.917340	-108.325200
P190544.0W	3/9/2009	INC	PINNACLE GAS RESOURCES, INC.	CBM	23	97	35	SWSW	25	0	41.917470	-108.354100
P189970.0W	3/27/2009	INC	WYOMING GAME AND FISH COMMISSION	STK	23	92	19	NWSW	25	0	41.948360	-107.851200
P189971.0W	3/27/2009	INC	WYOMING GAME AND FISH COMMISSION	STK	24	91	31	NESW	25	0	42.006190	-107.729500
P190924.0W	7/1/2009	INC	BP AMERICA PRODUCTION COMPANY	MIS	18	95	19	SESW	75	0	41.515540	-108.153100
P191570.0W	8/27/2009	Complete	J-W OPERATING COMPANY	MIS	25	94	31	NWSE	0	0	42.093560	-108.093500
P192718.0W	10/2/2009	INC	ANADARKO / TOWN OF WAMSUTTER	MUN_GW	20	94	27	NENE	200	0	41.686040	-107.971000
P191991.0W	10/9/2009	Complete	BP AMERICA PRODUCTION COMPANY	MIS	18	92	19	NESW	50	800	41.519500	-107.807300

Table F-12. Groundwater rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company/Individual	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Total Depth	Lat	Long
P192719.0W	10/21/2009	INC	USDI - BUREAU OF LAND MANAGEMENT / TOWN OF WAMSUTTER	MUN_GW	20	94	22	NESW	400	0	41.693730	-107.980500
P191915.0W	12/1/2009	Complete	ENCANA OIL & GAS (USA) INC	MIS	24	97	36	SWSW	110	740	42.004910	-108.339700
P191918.0W	12/4/2009	INC	ANADARKO PETROLEUM CORP.	MON	20	93	1	SENE	0	0	41.738610	-107.820000
P192145.0W	2/4/2010	Complete	USDI-BLM / BP AMERICA PRODUCTION COMPANY	MIS	20	93	25	SESW	50	640	41.676450	-107.828700
P194968.0W	3/1/2010	INC	SBOLC / BLM / BP AMERICA PRODUCTION COMPANY	MIS	20	94	35	SENW	150	1,000	41.670330	-107.963900
P194969.0W	3/1/2010	INC	SBOLC / BLM / BP AMERICA PRODUCTION CO	MIS	19	94	31	SESW	0	0	41.574090	-108.038100
P192788.0W	4/13/2010	INC	HARDEK ROBERT	DOM_GW; STK	22	91	9	SWSE	25	0	41.886880	-107.686600
P193634.0W	5/28/2010	Complete	PH LIVESTOCK / ANADARKO PETROLEUM CORPORATION	STK	20	93	5	SESW	10	685	41.734530	-107.906200
P193315.0W	6/18/2010	Complete	STATE BOARD OF LAND COMMISSIONERS / BUREAU OF LAND MANAGEMENT / BP AMERICA PRODUCTION COMPANY	MIS	19	94	23	SWSW	50	300	41.602740	-107.966000

Table F-12. Groundwater rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company/Individual	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Total Depth	Lat	Long
P193303.0W	6/23/2010	Complete	STATE BOARD OF LAND COMMISSIONERS / BUREAU OF LAND MANAGEMENT / BP AMERICA PRODUCTION COMPANY	MIS	20	94	17	SENE	50	800	41.713520	-108.011000
P193949.0W	8/4/2010	Complete	QUEALY PROPERTIES LLC	STK	20	95	13	NWSE	9	9,692	41.707580	-108.051700
P193743.0W	9/1/2010	Complete	USDI-BLM / BP AMERICA PRODUCTION COMPANY	MIS	22	94	21	SWSW	50	1,040	41.860350	-108.043500
P193882.0W	9/10/2010	Complete	MARSH JOHN AND MARY	DOM_GW; STK	20	95	17	NWNW	10	190	41.715650	-108.141400
P194162.0W	10/13/2010	Complete	CHEVRON U.S.A., INC.	IND_GW	19	97	19	NWSE	12	6,927	41.607550	-108.377700
P194163.0W	10/13/2010	Complete	CHEVRON U.S.A., INC.	IND_GW	19	97	19	SENE	7	6,876	41.611570	-108.370900
P194165.0W	10/21/2010	Complete	STATE BOARD OF LAND COMMISSIONERS / USDI-BLM / BP AMERICA PRODUCTION COMPANY	MIS	21	94	26	SWNE	50	740	41.763100	-107.995100
P194217.0W	11/15/2010	Complete	STATE BOARD OF LAND COMMISSIONERS / USDI-BLM / BP AMERICA PRODUCTION COMPANY	MIS	17	94	13	NWSW	150	420	41.446470	-107.944300
P194471.0W	11/23/2010	INC	STATE BOARD OF LAND COMMISSIONERS / PINNACLE GAS RESOURCES, INC	CBM	23	97	16	SWNW	25	0	41.968300	-108.395100

Table F-12. Groundwater rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company/Individual	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Total Depth	Lat	Long
P194472.0W	12/2/2010	Complete	USDI-BLM / BP AMERICA PRODUCTION COMPANY	MIS	20	93	21	SESW	50	660	41.691210	-107.886900
P194620.0W	12/20/2010	INC	PH LIVESTOCK CO.	STK	18	96	7	NENW	25	0	41.555690	-108.269100
P194807.0W	12/20/2010	Complete	STATE BOARD OF LAND COMMISSIONERS / BP AMERICA PRODUCTION COMPANY	MIS	19	93	1	NENE	80	600	41.657810	-107.815700
P194809.0W	12/20/2010	Complete	WY SBOLC / BP AMERICA PRODUCTION COMPANY	MIS	21	94	3	NESW	50	762	41.818080	-108.021100
P194745.0W	1/5/2011	Complete	BP AMERICA PRODUCTION COMPANY	MIS	18	93	35	SWSW	50	600	41.489030	-107.848500
P194748.0W	1/13/2011	Complete	ANADARKO PETROLUEM CORPORATION	MIS	18	94	25	SENW	0	920	41.510020	-107.941300
P196283.0W	1/20/2011	INC	BASIC ENERGY SERVICES LP	MIS	20	94	34	SWSE	0	0	41.659710	-107.974900
P195067.0W	3/4/2011	Complete	ANADARKO LAND CORPORATION / RODEWALD DUANE AND DEBORAH	STK	19	92	25	NESW	9	340	41.589610	-107.714600
P196240.0W	7/14/2011	INC	ADAMS STEVE	STK	19	95	11	SENW	25	0	41.638580	-108.076700
P196383.0W	7/14/2011	INC	USDI - BUREAU OF LAND MANAGEMENT / ENCANA OIL & GAS (USA) INC.	MIS; STK	23	97	4	NWNW	140	0	42.002180	-108.394400
P196579.0W	7/27/2011	INC	WYDOT	MIS	19	95	6	SESE	25	0	41.647780	-108.145300
P196580.0W	7/27/2011	INC	WYDOT	MIS	19	95	6	SESE	50	0	41.647500	-108.145600
P196581.0W	7/27/2011	INC	WYDOT	MIS	19	95	6	SWSE	75	0	41.647220	-108.146700

Table F-12. Groundwater rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company/Individual	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Total Depth	Lat	Long
P196662.0W	8/4/2011	INC	STATE BOARD OF LAND COMISSIONERS / SUMMIT GAS RESOURCES, INC.	CBM; STK	23	97	16	NESE	25	0	41.964690	-108.378400
P196420.0W	8/8/2011	INC	NEWMEYER GERALD	DOM_GW; STK	22	91	19	SWSW	25	0	41.857950	-107.735000
P196602.0W	8/24/2011	Complete	BP AMERICA PRODUCTION COMPANY	MIS	19	93	3	NESW	50	325	41.648580	-107.868000
P196603.0W	8/24/2011	Complete	BP AMERICA PRODUCTION COMPANY	MIS	17	93	21	NWSW	50	200	41.431080	-107.887300
P196872.0W	10/6/2011	Complete	USDI - BUREAU OF LAND MANAGEMENT / STATE BOARD OF LAND COMMISSIONERS / ANADARKO/UPRC / BP AMERICA PRODUCTION COMPANY	MIS	18	93	31	SESW	50	780	41.518150	-107.885800
P197013.0W	10/24/2011	Complete	SBOLC / BLM / BP AMERICA PRODUCTION COMPANY	MIS	18	92	11	SWNE	50	900	41.551640	-107.725600
P197080.0W	10/27/2011	Complete	STATE BOARD OF LAND COMMISSIONERS / BUREAU OF LAND MANAGEMENT / BP AMERICA PRODUCTION COMPANY	MIS	18	93	5	SENW	100	580	41.567560	-107.901700
P197508.0W	2/24/2012	INC	RODEWALD DUANE AND DEBORAH	STK	20	91	35	SWSE	20	0	41.658940	-107.612800

Table F-12. Groundwater rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company/Individual	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Total Depth	Lat	Long
P197552.0W	3/1/2012	INC	BUREAU OF LAND MANAGEMENT / KINDER MORGAN ROCKIES EXPRESS	MIS	20	94	32	SWNW	0	0	41.669440	-108.022800
P197636.0W	3/13/2012	INC	PH LIVESTOCK CO. / ANADARKO PETROLEUM CORPORATION	STK	20	93	3	SENE	25	0	41.739510	-107.855300
P197961.0W	4/30/2012	Complete	BP AMERICA PRODUCTION COMPANY	MIS	22	94	13	NWSW	50	1,300	41.875020	-107.986200
P198015.0W	5/3/2012	INC	MEYER TRENTON AND JODY	MIS; STK	19	95	6	SENW	30	110	41.653870	-108.152900
P198428.0W	7/13/2012	INC	SHEEHAN PATRICK	MIS	15	93	3	NWNE	25	0	41.305950	-107.847800
P198745.0W	8/13/2012	INC	ANADARKO PETROLEUM CORP. / ADAMS STEPHEN	STK	18	93	5	NWSW	25	0	41.563230	-107.908500
P198746.0W	8/13/2012	INC	ANADARKO LAND CORP. / ADAMS STEPHEN	STK	19	93	31	SENW	25	0	41.581150	-107.922800
P198747.0W	8/13/2012	INC	ANADARKO LAND CORP. / ADAMS STEPHEN	STK	18	93	9	SWSW	25	0	41.544870	-107.889000
P198748.0W	8/13/2012	INC	ANADARKO LAND CORP. / ADAMS STEPHEN	STK	18	93	17	SWSW	25	0	41.530450	-107.908300
P198749.0W	8/13/2012	INC	ANADARKO LAND CORP. / ADAMS STEPHEN	STK	18	93	27	SESW	25	0	41.501090	-107.864700
P198750.0W	8/13/2012	INC	ANADARKO LAND CORP. / ADAMS STEPHEN	STK	18	93	29	NESW	25	0	41.505060	-107.903300
P198751.0W	8/13/2012	INC	DOMINGO ECHRVERRIA TRUST / ADAMS STEPHEN	STK	19	93	27	SWSW	25	0	41.587890	-107.869900
P198752.0W	8/13/2012	INC	DOMINGO ECHEVERRIA TRUST / ADAMS STEPHEN	STK	18	93	11	SWNE	25	0	41.551970	-107.840700

Table F-12. Groundwater rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company/Individual	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Total Depth	Lat	Long
P198753.0W	8/13/2012	INC	DOMINGO ECHEVERRIA TRUST / ADAMS STEPHEN	STK	18	93	23	NWNW	25	0	41.526490	-107.850300
P198754.0W	8/13/2012	INC	DOMINGO ECHEVERRIA TRUST / ADAMS STEPHEN	STK	18	93	15	NWNW	25	0	41.540880	-107.869700
P199278.0W	11/5/2012	Complete	BP AMERICA PRODUCTION COMPANY	MIS	17	93	21	NWSW	200	0	41.432120	-107.888800
P199279.0W	11/5/2012	Complete	BP AMERICA PRODUCTION COMPANY	MIS	20	93	21	SESW	150	0	41.689190	-107.884800
P199280.0W	11/5/2012	Complete	BP AMERICA PRODUCTION COMPANY	MIS	18	95	19	SESW	150	0	41.515620	-108.153100
P199281.0W	11/5/2012	Complete	BP AMERICA PRODUCTION COMPANY	MIS	20	94	9	NWSE	150	0	41.722250	-107.994800
P199282.0W	11/5/2012	Complete	BP AMERICA PRODUCTION COMPANY	MIS	17	94	13	NWSW	150	0	41.447190	-107.945900
P199283.0W	11/5/2012	Complete	BP AMERICA PRODUCTION COMPANY	MIS	20	94	20	SESW	150	0	41.689260	-108.018900
P199324.0W	11/15/2012	Complete	BP AMERICA PRODUCTION COMPANY	MIS	22	94	21	SWSW	150	0	41.860350	-108.043500
P199325.0W	11/15/2012	Complete	BP AMERICA PRODUCTION COMPANY	MIS	22	94	29	SESW	150	0	41.845510	-108.061400
P199326.0W	11/15/2012	Complete	BP AMERICA PRODUCTION COMPANY	MIS	18	92	23	SWNW	150	0	41.522030	-107.735500
P199327.0W	11/15/2012	Complete	BP AMERICA PRODUCTION COMPANY	MIS	17	93	3	NWNE	150	0	41.482500	-107.858100
P199328.0W	11/15/2012	Complete	BP AMERICA PRODUCTION COMPANY	MIS	19	93	3	NESW	150	0	41.649200	-107.865600

Table F-12. Groundwater rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company/Individual	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Total Depth	Lat	Long
P199351.0W	11/15/2012	Complete	BP AMERICA PRODUCTION COMPANY	MIS	18	92	19	NESW	150	0	41.519010	-107.807200
P199329.0W	11/19/2012	Complete	BP AMERICA PRODUCTION COMPANY	MIS	19	95	21	SWSW	150	0	41.604400	-108.117300
P199330.0W	11/19/2012	Complete	BP AMERICA PRODUCTION COMPANY	MIS	21	94	3	NESW	150	0	41.818080	-108.021100
P199331.0W	11/19/2012	Complete	BP AMERICA PRODUCTION COMPANY	MIS	19	92	29	SWNE	150	0	41.595750	-107.784300
P199332.0W	11/19/2012	Complete	BP AMERICA PRODUCTION COMPANY	MIS	19	94	23	NWSW	250	0	41.605520	-107.964000
P199333.0W	11/19/2012	Complete	BP AMERICA PRODUCTION COMPANY	MIS	20	95	7	SWNE	150	0	41.724430	-108.149500
P199314.0W	11/21/2012	INC	DOM ECHEVERRIA TRUST / ADAMS STEPHEN	STK	19	93	17	SWSW	20	0	41.616960	-107.908800
P199435.0W	12/13/2012	Complete	BP AMERICA PRODUCTION COMPANY	MIS	18	92	21	NESW	100	0	41.520920	-107.767900
P199690.0W	1/14/2013	Complete	BP AMERICA PRODUCTION COMPANY	MIS	19	93	21	SWSW	150	300	41.604510	-107.887100
P146579.0W	8/22/2002	Complete	USDI - BLM / Samson Resources Co.	MIS	22	94	22	NWSW	40	0	41.862190	-108.025520
P106611.0W	6/30/1997	INC	UNION PACIFIC RESOURCES	MIS	21	97	35	NENE	60	0	41.754790	-108.339560
P111931.0W	9/30/1998	INC	USDI - BLM / UNION PACIFIC RESOURCES	MIS	19	97	4	SWSW	60	0	41.647110	-108.347490
P132358.0W	1/29/2001		BP America Production Co.	MIS	19	95	13	NESE	0	0	41.621140	-108.047670
P133248.0W	3/27/2001		BP America Production Co.	MIS	21	94	3	NESW	0	0	41.819050	-108.020740

Table F-12. Groundwater rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company/Individual	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Total Depth	Lat	Long
P138671.0W	8/28/2001		BP America Production Co.	MIS	22	94	29	SESW	50	0	41.844200	-108.059380
P139579.0W	7/3/2001		BP America Production Co.	MIS	20	94	7	SWNE	0	0	41.726050	-108.033180
P139582.0W	7/11/2001		BP America Production Co.	MIS	17	92	5	NWSE	50	0	41.475390	-107.784350
P147784.0W	10/28/2002		BP America Production Co.	MIS	23	94	35	SWSW	50	0	41.916600	-108.006150
P148709.0W	12/26/2002		POURKALDANI EDIK & CYNTHIA	DOM_GW; STK	21	91	9	SENW	25	0	41.807740	-107.691690
P149530.0W	2/27/2003		USDI - BLM / Adams Steve F.	STK	19	92	6	NWNE	10	0	41.656640	-107.803990
P144638.0W	5/31/2002	Complete	USDI - BLM / Samson Resources Co.	MIS	22	94	28	SWSW	65	0	41.844100	-108.044920
P152752.0W	7/30/2003		Statton Sheep Co.	STK	17	95	13	NESW	25	0	41.447710	-108.057090
P152925.0W	8/7/2003		BP America Production Co.	MIS	19	95	21	NESW	85	0	41.606520	-108.114800
P153287.0W	8/21/2003		BP America Production Co.	MIS	23	95	33	SWSW	90	0	41.917030	-108.160300
P153998.0W	9/5/2003		Statton Sheep Co.	STK	22	95	13	NWSE	25	0	41.877210	-108.092570
P155607.0W	12/19/2003		BP America Production Co.	MIS	22	93	25	NWNW	80	0	41.854840	-107.870940
P161084.0W	8/4/2004		BP America Production Co.	MIS	22	92	35	NWNW	200	0	41.840440	-107.773520
P161336.0W	8/12/2004		BP America Production Co.	MIS	22	93	15	NWNW	200	0	41.883780	-107.909600
P165697.0W	3/21/2005		USDI - BLM / Yates Petroleum Corp.	MIS	21	96	4	NESW	200	0	41.819180	-108.271690
P168408.0W	6/7/2005		BP America Production Co.	MIS	18	93	33	SWSW	50	0	41.487370	-107.888750
P169649.0W	7/13/2005		USDI - BLM / BP America Production Co.	MIS	22	95	11	NWSE	50	0	41.891840	-108.111790
P170571.0W	10/4/2005		Bureau of Land Management / BP America Production Co.	MIS	20	93	20	SENE	150	0	41.696890	-107.894520

Table F-12. Groundwater rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company/Individual	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Total Depth	Lat	Long
P171980.0W	11/30/2005		USDI - BLM / BP America Production Co.	MIS	17	93	10	SWNW	150	0	41.465350	-107.869780
P171981.0W	11/30/2005		BP America Production Co. / USDI - BLM	MIS	17	93	3	SWSW	150	0	41.472700	-107.869830
P174817.0W	5/25/2006		Pinnacle Gas Resources, Inc.	CBM	23	97	36	NESW	25	0	41.921720	-108.329970
P177391.0W	9/15/2006		BLM, RAWLINS FIELD OFFICE / BP America Production Co.	MIS	17	93	21	NWSW	200	0	41.432600	-107.888830
P183109.0W	6/4/2007	INC	USDI - BLM / BP America Production Co.	MIS	17	93	21	NWSW	0	0	41.432600	-107.888830
P183656.0W	10/25/2007		USDI - BLM / WARRIOR ENERGY	MIS	22	95	18	SESE	120	0	41.873590	-108.184440
P164658.0W	1/5/2005	Complete	DEVON ENERGY	MIS	21	95	34	NWSW	140	0	41.746919	-108.141581
P175563.0W	6/27/2006	Complete	PINNACLE GAS RESOURCES, INC.	CBM	23	97	36	SWNE	16	0	41.924681	-108.324672
P191486.0W	9/25/2009	INC	STRATTON SHEEP CO.	STK	18	95	35	SWSE	25	0	41.485944	-108.072833
P191487.0W	9/25/2009	INC	STRATTON SHEEP CO.	STK	16	94	9	SWSE	0	0	41.369611	-107.979750
P193950.0W	8/4/2010	Complete	QUEALY PROPERTIES LLC	STK	21	94	29	SWSE	14	0	41.757617	-108.055400
P194808.0W	12/20/2010	Complete	WY SBOLC / BP AMERICA PRODUCTION COMPANY	MIS	22	94	23	SESW	50	0	41.860361	-108.002689
P194810.0W	12/20/2010	Complete	WY SBOLC / BP AMERICA PRODUCTION COMPANY	MIS	22	94	29	SESW	50	0	41.845511	-108.061411
P194811.0W	12/20/2010	Complete	WY SBOLC / BP AMERICA PRODUCTION COMPANY	MIS	22	94	15	NWSW	50	0	41.875219	-108.023911

Table F-12. Groundwater rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company/Individual	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Total Depth	Lat	Long
P186502.0W	4/21/2008	INC	U.S.D.I., BUREAU OF LAND MANAGEMENT / WYOMING WATER DEVELOPMENT COMMISSION	TST	20	94	22	NESW	0	0	41.693278	-107.980500
P187974.0W	8/19/2008	INC	BLM / STATE BOARD OF LAND COMMISSIONERS / BP AMERICA PROD. CO.	MIS	18	92	11	SWNE	50	0	41.552131	-107.725903
P189576.0W	1/26/2009	INC	BLM / STRATTON SHEEP CO.	STK	24	96	24	NWSE	25	0	42.036239	-108.208156
P189601.0W	11/26/2008	Fully Adjudicated	USDI-BLM / STATE BOARD OF LAND COMMISSIONERS / BP AMERICA PRODUCTION CO.	MIS	17	92	3	NWSE	50	0	41.474586	-107.746114
P189644.0W	1/15/2009	INC	USDI-BLM / PH LIVESTOCK CO.	MIS	19	96	20	SESE	0	0	41.602081	-108.240600
P190519.0W	3/9/2009	INC	STATE BOARD OF LAND COMMISSIONERS / PINNACLE GAS RESOURCES, INC.	CBM	23	97	16	SWNE	25	0	41.968353	-108.383317
P191484.0W	9/25/2009	INC	STRATTON SHEEP CO.	STK	17	95	5	SESW	25	0	41.472697	-108.133711
P191485.0W	9/25/2009	INC	BLM / STRATTON SHEEP CO.	STK	16	94	20	NENW	25	0	41.351744	-108.006750
P194161.0W	10/13/2010	INC	CHEVRON U.S.A., INC.	IND_GW	19	97	19	SESE	80	0	41.603278	-108.371592
P74149.0W	2/27/1987	Complete	USDI - BLM / P. H. LIVESTOCK CO.	STK	18	96	20	SESE	25	0	41.515931	-108.240289
P169652.0W	8/2/2005		USDI - BLM / Yates Petroleum Corp.	MIS	23	95	14	NWSE	100	0	41.964060	-108.111670

Table F-12. Groundwater rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company/Individual	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Total Depth	Lat	Long
P182022.0W	5/24/2007		WYOMING STATE BOARD OF LAND COMMISSIONERS / USDI - BLM / BP America Production Co.	MIS	18	93	25	NWSE	100	0	41.505250	-107.821730
P194986.0W	2/14/2011	Complete	BP AMERICA PRODUCTION COMPANY	MIS	19	93	27	SWSW	50	0	41.589908	-107.867781
P120119.0W	10/29/1999		BP America Production Co.	MIS	18	93	27	SWSW	150	0	41.501570	-107.869340
P105038.0W	2/24/1997	INC	USDI - BLM / SNYDER OIL CORPORATION	MIS	18	92	30	SWSE	70	0	41.501220	-107.802430
P150263.0W	4/2/2003		DOWLIN DOUG AND LORI	MIS	20	94	34	NENE	100	0	41.672000	-107.970860
P157786.0W	4/9/2004		BP America Production Co.	MIS	18	93	1	SWSW	150	0	41.559620	-107.830890
P152043.0W	6/9/2003	Complete	TOM BROWN, INC.	MIS	24	97	26	NESW	50	0	42.023120	-108.352610
P154978.0W	10/31/2003		BP America Production Co.	MIS	17	94	13	NWSW	50	0	41.447720	-107.945920
P174815.0W	5/25/2006		Pinnacle Gas Resources, Inc.	CBM	23	97	36	NENW	25	0	41.930570	-108.329970
P199808.0W	3/4/2013	Fully Adjudicated	STK		18	91	7	NE1/4N W1/4	25	0	41.556240	-107.692550
P199925.0W	3/14/2013	Complete		MIS	21	93	35	NW1/4S W1/4	50	0	41.746019	-107.890169
P200835.0W	8/6/2013	INC		MIS	20	93	26	NW1/4N E1/4	100	0	41.685631	-107.841264
P199926.0W	3/14/2013	Complete		MIS	22	94	13	NW1/4S W1/4	100	0	41.876181	-107.986794
P200454.0W	6/6/2013	Complete		MIS	21	94	23	SE1/4N W1/4	60	705	41.779153	-108.001281
P200455.0W	6/6/2013	Complete		MIS	21	94	21	NW1/4S W1/4	60	655	41.775619	-108.044819
P200632.0W	7/5/2013	INC		STK	22	94	29	SE1/4S W1/4	25	0	41.843814	-108.059489
P200633.0W	7/5/2013	INC		STK	22	94	13	NW1/4S W1/4	25	0	41.876119	-107.986794

Table F-12. Groundwater rights within 1 mile of the CD-C project area, *continued*

WR Number	Priority Date	Status	Company/Individual	Uses	Twn	Rng	Sec	QtrQtr	Total Flow	Total Depth	Lat	Long
P200634.0W	7/5/2013	INC		STK	21	94	23	SE1/4N W1/4	10	0	41.778661	-108.001294
P200255.0W	5/13/2013	INC	STEVE ADAMS	STK	19	95	1	SW1/4N W1/4	25	0	41.653583	-108.061847
P200845.0W	7/5/2013	INC		STK	22	95	18	SE1/4SE 1/4	25	0	41.873083	-108.184444

A double dash (--) indicates no information available.

Record suffixes are denoted as follows:

Notes for non-mining-related groundwater rights within 1 mile of the CD-C project area (search conducted February 18, 2011):

Water rights were searched to the nearest quarter-quarter of each section listed above. Any part of a quarter-quarter that lies within one miles of the CD-C project area is included

"P" Stock and domestic use wells completed prior to May 24, 1969 and registered with the State Engineer's Office prior to December 31,1972.

"'W" Permits are for wells with a priority date for the date of filing with the State Engineer

Use Codes

CBM	Coal Bed Methane	MON	Monitoring
DOM	Domestic	MUN	Municipal
IND	Industrial	STK	Stock
IRR	Irrigation	TST	Test Well
MIS	Miscellaneous		

Separate water rights with a status code of ABA, A&C, AME, CAN, ELI, EXP, REJ, or TRA were eliminated from the search area listing provided above (including those belonging to the mining companies), as none of these use codes represent a valid current right.

Status Codes

Fully Adjudicated:	Well has been drilled and inspected, and a certificate of appropriation issued
Complete:	A notice of completion off the well has been received
Unadjudicated:	Well has not yet been inspected but may have been drilled
Incomplete:	Notice of completion of the well has not been received
Expired:	The permit to appropriate groundwater has expired, generally because a notice that the well has been completed has not been received within the time period specified

Table F-13. Groundwater quality parameters for selected aquifers associated with the CD-C project area

	From Mason and Miller (2005)					From Bartos *et al.* 2006					Produced Water			
	Sweetwater Co. Quaternary Aquifer	Sweetwater Co. Wasatch Aquifer	Sweetwater Co. Mesaverde Aquifer	Sweetwater Co. Nugget Aquifer	Sweetwater Co. Madison Aquifer	Carbon Co. Quaternary Aquifer	Carbon Co. Wasatch Aquifer	Carbon Co. MesaverdeAquifer	Carbon Co. Nugget Aquifer	Carbon Co. Madison Aquifer	Sweetwater Co. Wasatch/Ft. Union Aquifer Produced Water	Sweewater Co. Mesaverde Aquifer Produced Water	Sweetwater Co. Nugget Aquifer Produced Water	Madison Aquifer (USGS 2011b)
No. of Samples	18	80	30	--	17	32	11	130	15	11	--	221	28	2
Parameter														
TDS (Median) (mg/L)	1,200	900	900	--	11,100	500	2,000	5,000	4,500	3,000	13,900	12,500	10,000	30,300
TDS (Min) (mg/L)	500	150	200	3,000	3,820	30	700	250	15,000	150	1,050	2,800	5,000	6,094
TDS (Max) (mg/L)	20,000	7,000	20,000	35,000	76,800	8,000	5,000	40,000	50,000	12,000	153,000	65,000	40,000	54,545
Selenium (Median) (µg/L)	32.9[1]	0.7[2]	nm[7]	<1[3]	nm	3.9[4]	0.6[5]	0.6[6]	nm	1.4[3]	nm	nm	nm	nm
Selenium (Min) (µg/L)	3.8[1]	0.3[2]	nm	<1[3]	nm	<0.5[4]	0.4[5]	<0.3[6]	nm	1.4[3]	nm	nm	nm	nm
Selenium (Max) (µg/L)	133[1]	1.6[2]	nm	<1[3]	nm	4.5[4]	<0.7[5]	0.8[6]	nm	1.4[3]	nm	nm	nm	nm

[1] *Based on 7 Samples*
[2] *Based on 8 Samples*
[3] *Based on 1 Sample*
[4] *Based on 3 Samples*
[5] *Based on 4 Samples*
[6] *Based on 6 Samples*
[7] *Not Measured*

Table F-14. Selected water quality parameters in flowing wells and springs within and adjacent to the CD-C project area

Flowing Well or Spring Water Quality																
Reporting Agency	**USGS**												**BLM**			**WDEQ**
Station ID	411201107413801	411149107534401	411936107455801	412758107424801	412547108030801	412932108062401	413741107513801	413725108170001	414330108125501	415340107425501	415110107554001	415638108125801	MARATHON	SUNEXPL	Micelli Well	WRDS-00053
Location	T14N R92W S12	T14N R093W S08	T16N R092W S29	T17N R92W S12	T17N R95W S24	T18N R95W S33	T19N R093W S15	T19N R97W S13	T20N R96W S10	T22N R91W S08	T22N R93W S28	T23N R96W S25	T18N R93W S10	T19N R93W S34	T21N R94W S14	T20N R94W S34
Sample period	1963	1976	1958	1958	1976	1976	1958	1958	1972	1963	1963	1976	1990	1987	1989	1973
Parameter																
Bicarbonate	719	696	453	213	403	1,080	484	458	855	157	144	1100	302	3,429	1,600	464
Calcium	34	130	120	31	25	59	450	31	0	18	190	3.6	222	294	45	3.1
Carbon Dioxide	7.3	1.8	29	5.4	4.1	43	77	18	14	10	9.2	7	nm	nm	nm	nm
Carbonate	0	0	0	0	0	0	0	0	nm	0	0	nm	0	0	0	27
Chloride	340	94	10	5	19	32	13	25	18	5.8	14	54	5.2	7.1	6,600	23
Fluoride	1.5	1.4	0.5	0.5	2.3	3.1	0.3	nm	1.9	0.4	0.1	5.2	0.38	0.62	1.62	1.4
Hardness	220	820	470	140	100	270	1,800	120	0	53	570	12	1,197	159	0	10
Magnesium	33	120	42	15	9.8	30	170	11	0	1.9	23	0.7	154		7.8	0.5
Nitrate	0.63	nm	0.43	0.18	nm	nm	0.59	2.3	0.11	0.07	0.36	nm	nm	nm	nm	nm
Nitrite + Nitrate	2.8	0.03	1.9	0.8	nm	nm	2.6	10	0.5	0.3	1.6	nm	nm	nm	nm	0.1
Noncarbonate hardness	0	250	98	0	0	0	1,400	0	0	0	450	0	nm	nm	nm	nm
pH, SU	8.2	8.8	7.4	7.8	8.2	7.6	7	7.6	8	7.4	7.4	8.4	7.4	7.2	7.66	8.6
TDS	3,590	7,210	736	497	2,590	3,270	2,430	1,580	777	479	1,780	1,050	1,998	2,201	12,755	532
Silica	5.2	13	11	6.7	13	14	18	6.4	nm	9.2	10	11	nm	nm	nm	12
Sodium + potassium	nm	nm	79	121	nm	nm	64	510	337	nm	nm	nm	nm	nm	nm	nm
Sodium	1,200	2,100	nm	nm	820	1,000	nm	nm	nm	150	320	420	107	73.2	4,550	219
Conductance, umhos/cm	5,200	8,000	1100	776	3,800	4,600	2,680	2,310	nm	769	2,330	1,850	2,200	2400	16,215	843
Sulfate	1,600	4,400	250	210	1,500	1,600	1,500	770	0	220	1,100	4.6	1,089	1,062	6	12

mg/L except as noted

nm = not measured

Source: WRDS 2007; USGS 2007b

Table F-15. Slope Gradient Inputs used in WEPP Modeling

Water Erosion Class	Top of Hill Gradient	Average Hill Slope Gradient	Bottom of Hill Gradient
Slight	0%	10%	5%
Moderate	0%	25%	10%
Severe	0%	30%	20%

Table F-16. Sediment Loading Rates by Alternative

	Rating Class/Limiting Features	Sediment Rate (tons/acre/year)	Alternative						
			Proposed Action (tons/ year)	Alternative A 100-Percent Vertical Drilling (tons/year)	Alternative B Enhanced Resource Protection (tons/year)	Alternative C Cap on Surface Disturbance, High & Low Density (tons/year)	Alternative D Directional Drilling (tons/year)	Alternative E No Action (tons/year)	Alternative F Preferred Action (tons/year)
Water Erosion	Slight	0.0133	456.76	--	440.47	415.68	325.68	207.47	423.87
	Moderate	0.0579	587.57	--	566.61	534.71	418.96	266.86	545.24
	Severe	0.0712	99.54	--	95.98	90.57	70.99	45.21	92.35
	Not Rated/Water	0	0	--	0	0	0	0	0
	Total		**1,143.87**	--	**1,103.06**	**1,040.96**	**815.63**	**519.54**	**1,061.46**

-- Alternative A was not carried forward from the Draft EIS to the Final EIS

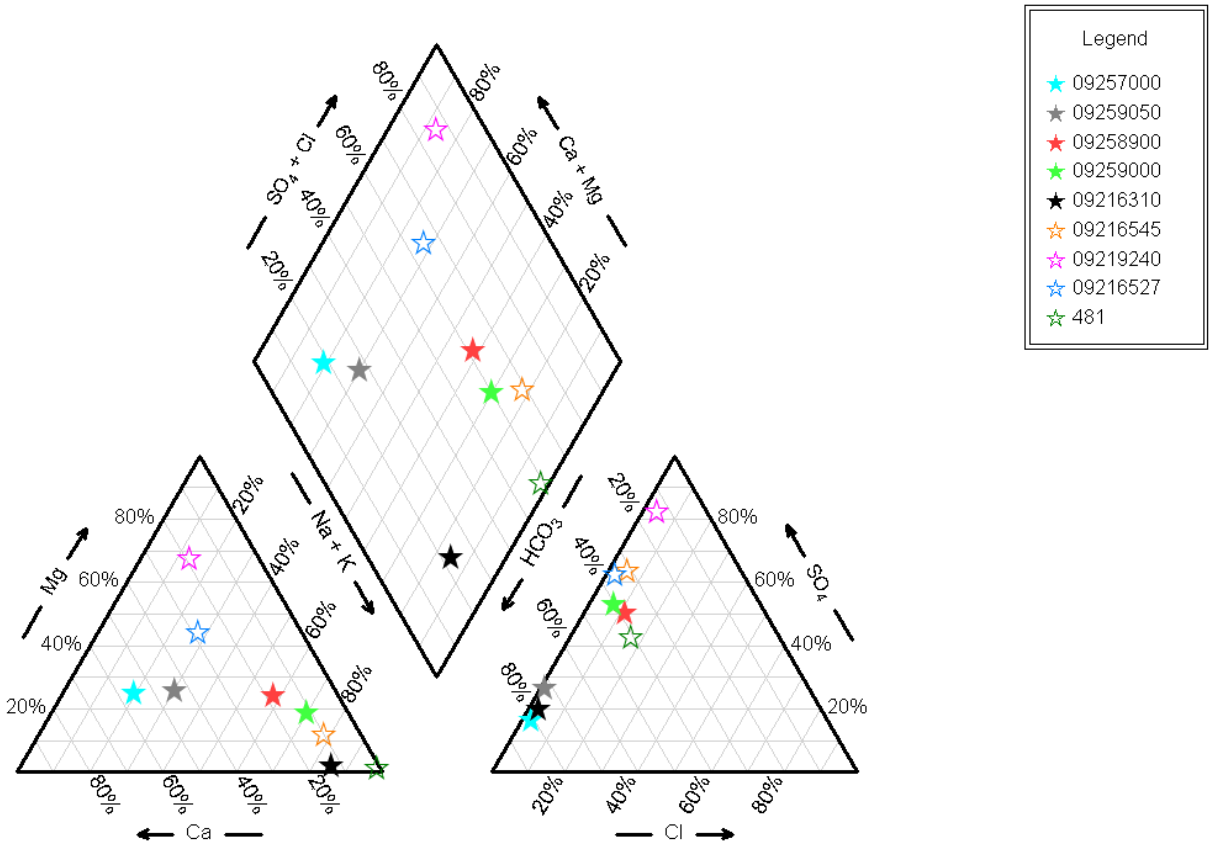
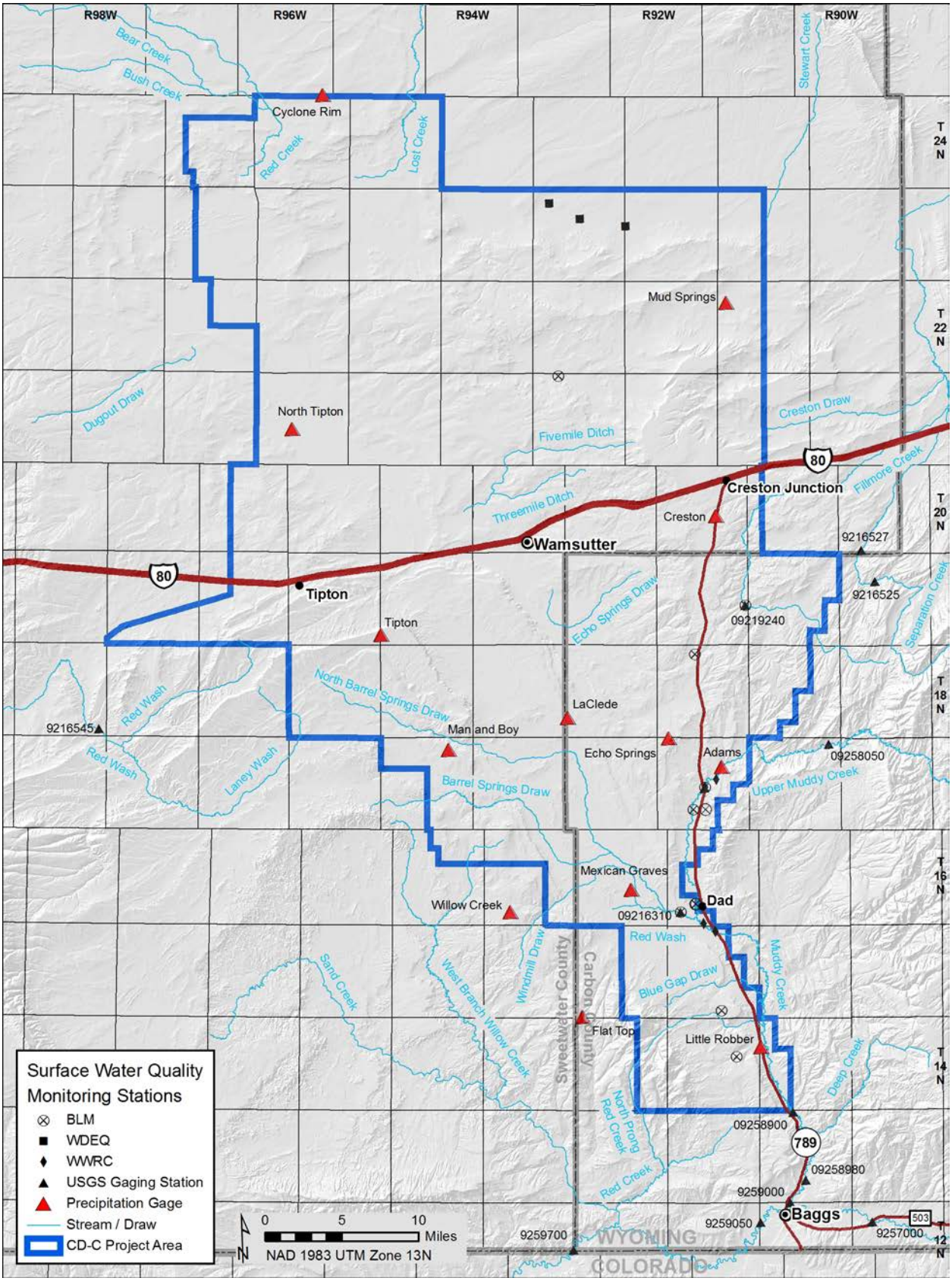


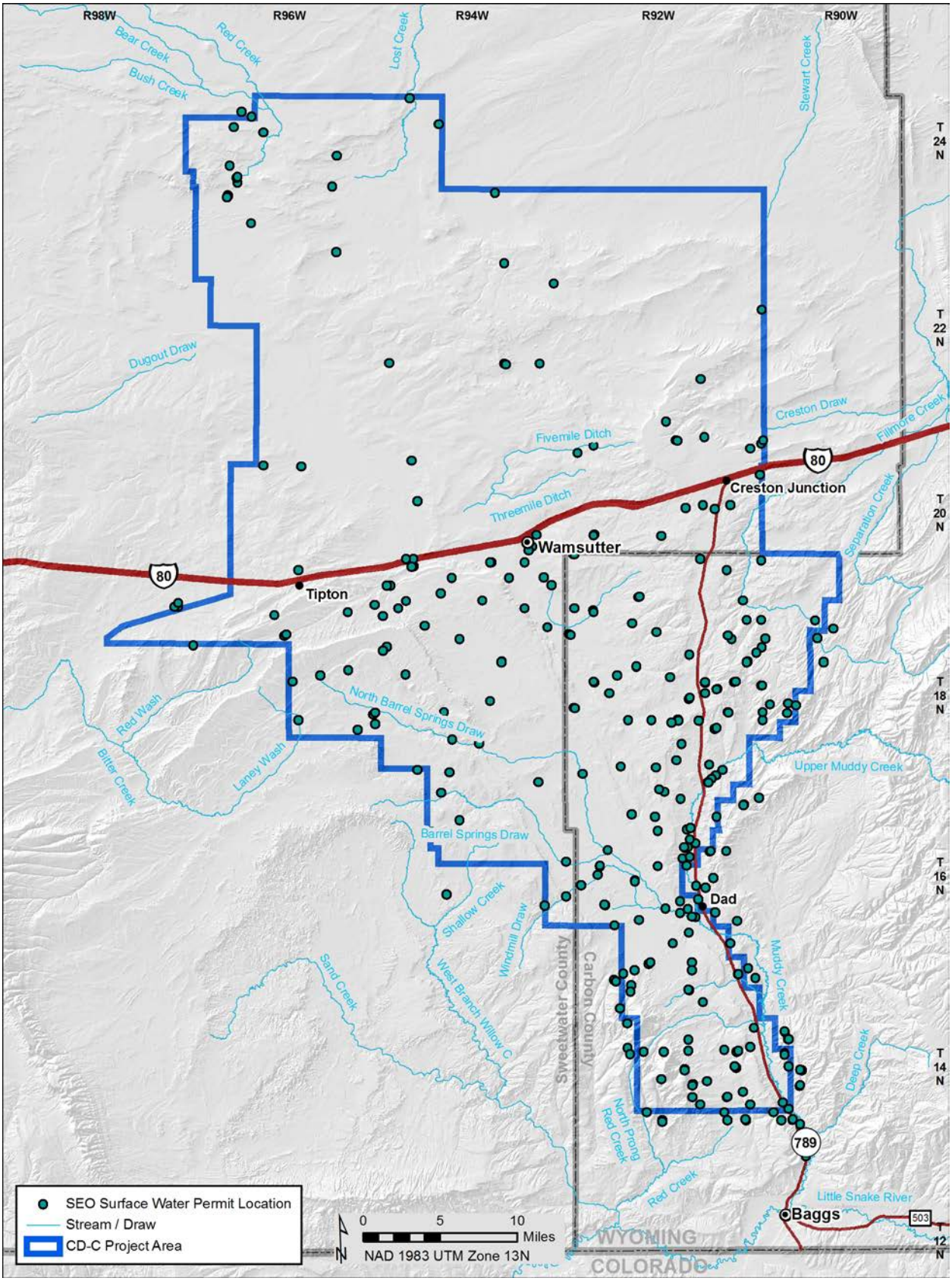
Figure F-1: Piper diagram for selected surface water quality stations within and adjacent to the CD-C project area



Map F-1. Surface water monitoring sites within and adjacent to the CD-C project area

Source: From U.S. Geological Survey, Scientific Investigations Report 2004-5214

No warranty is made by the BLM for use of the data for purposes not intended by the BLM.



Map F-2. Surface water rights within and adjacent to the CD-C project area

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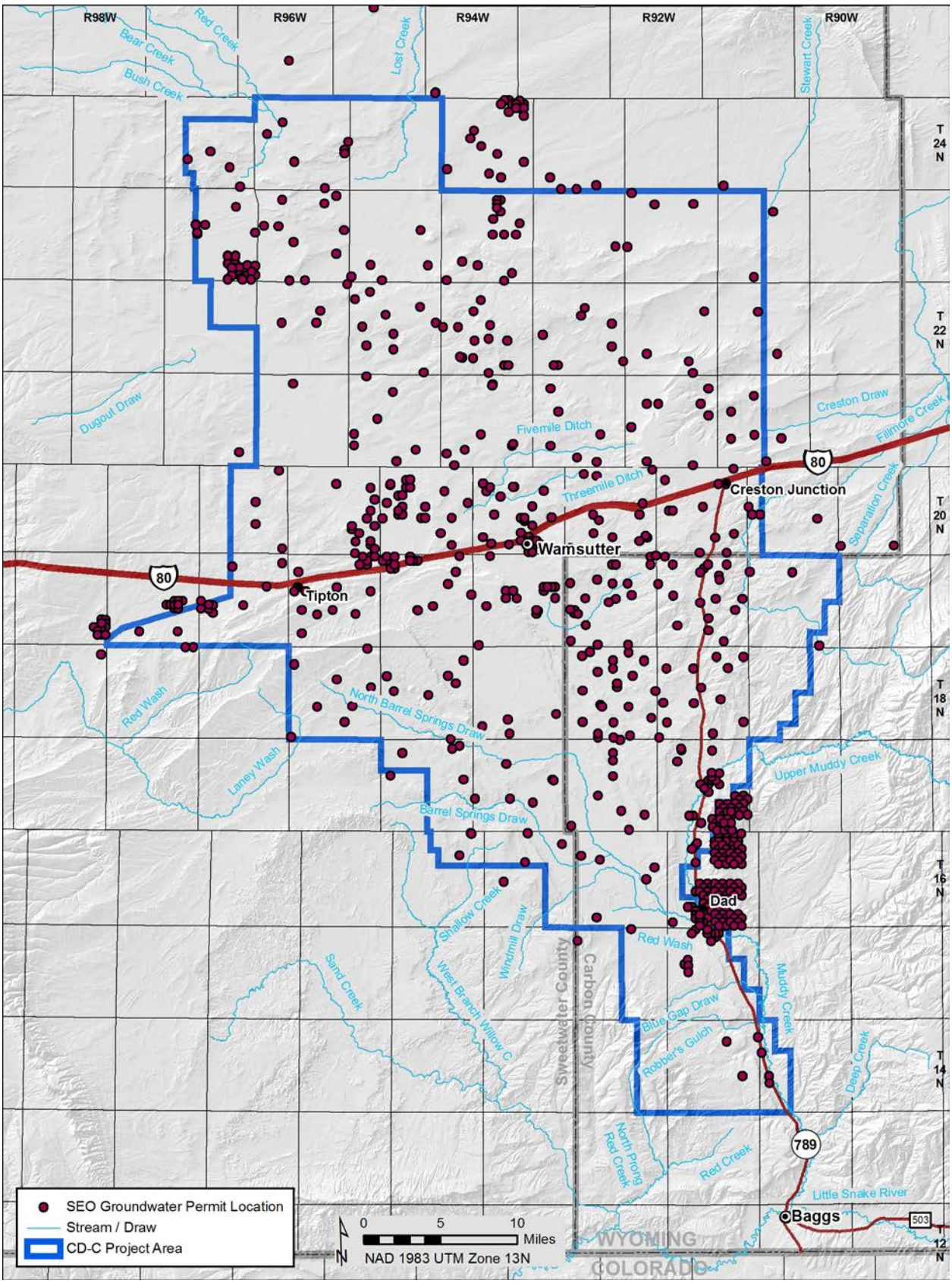

Map F-3. Groundwater rights within and adjacent to the CD-C project area

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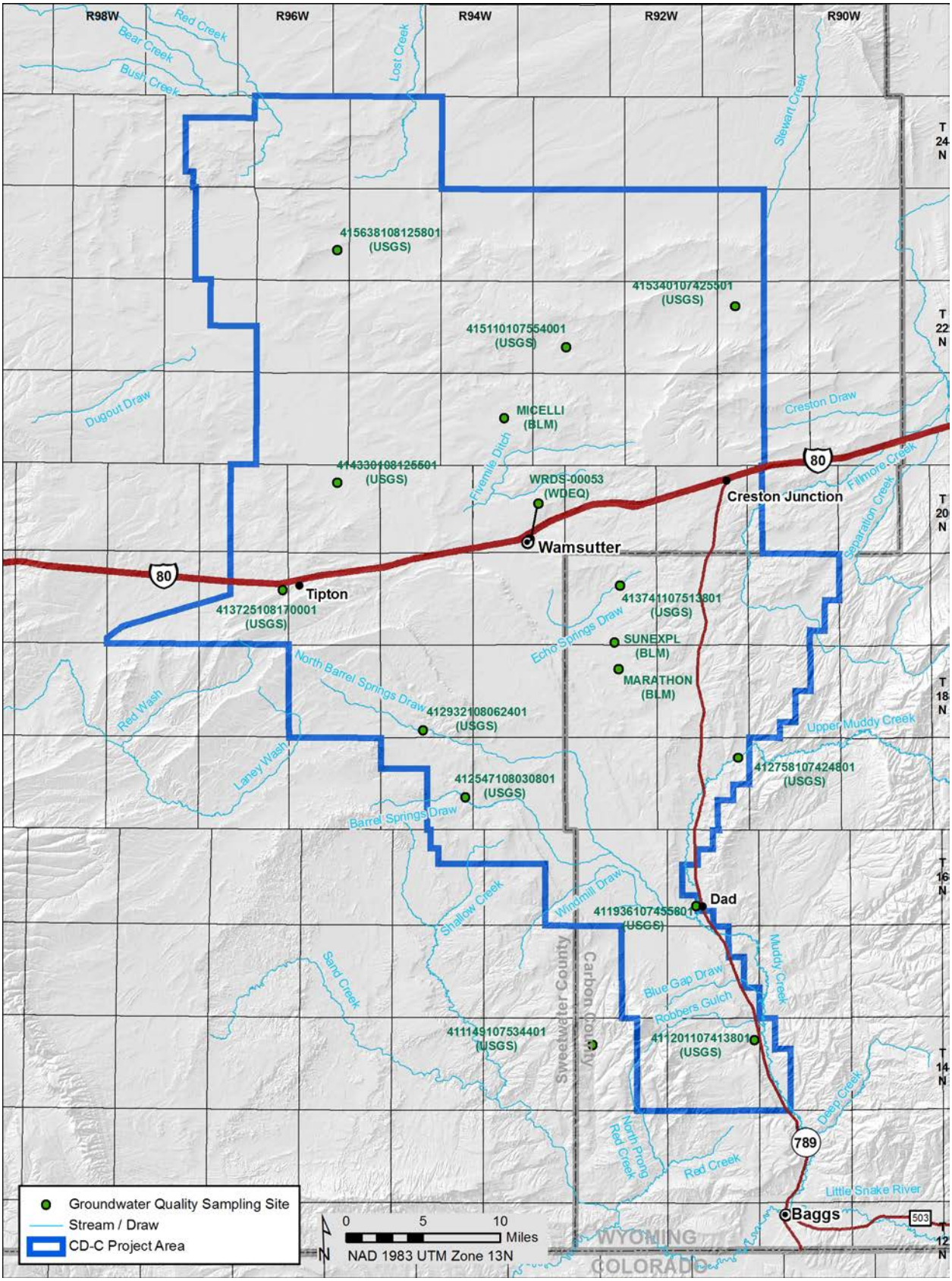
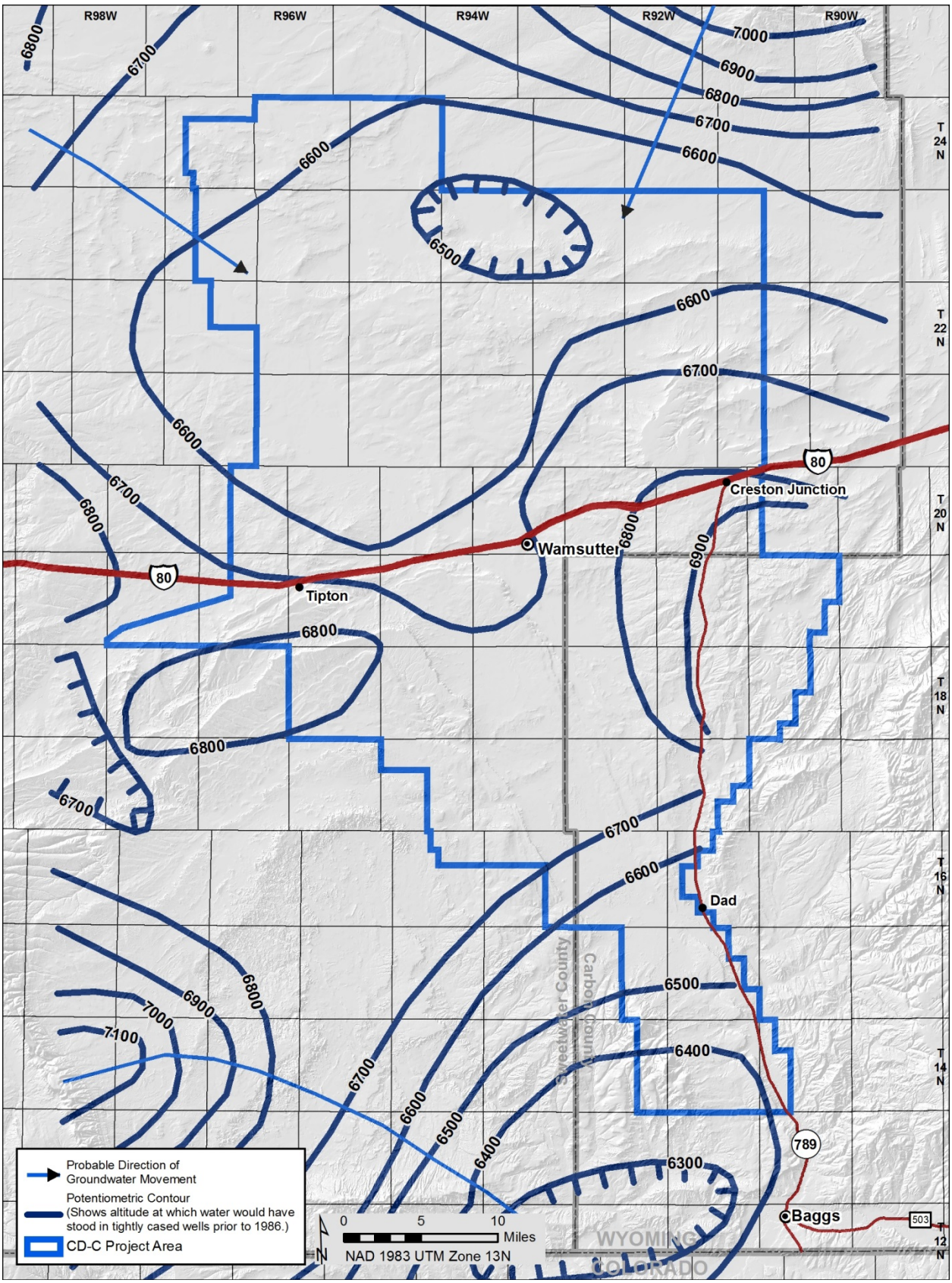


Map F-4. Groundwater monitoring sites within and adjacent to the CD-C project area

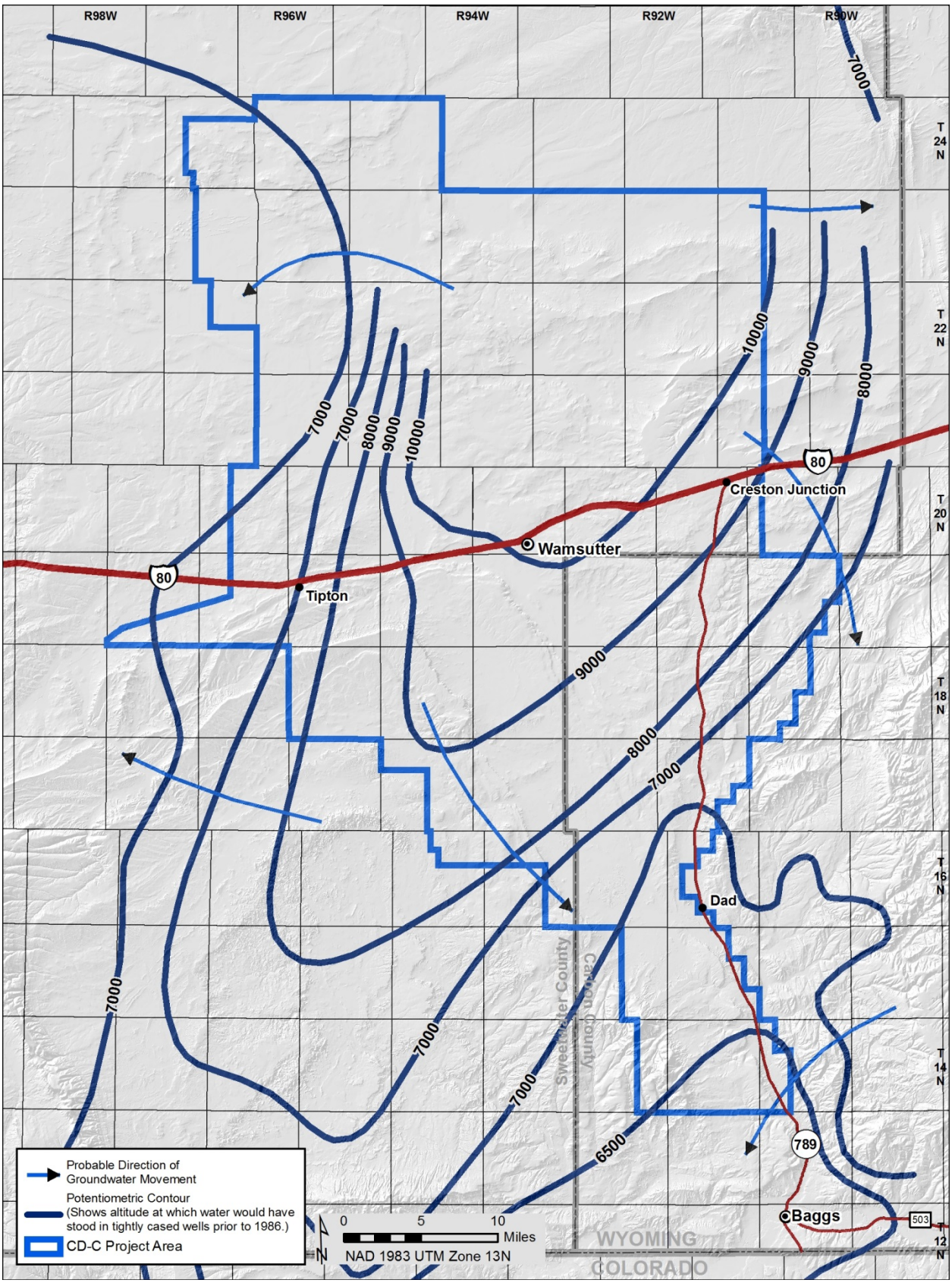
No warranty is made by the BLM for use of the data for purposes not intended by the BLM.



Map F-5. Generalized potentiometric surface and groundwater flow direction, Wasatch Aquifer

Source: U.S. Geological Survey, Scientific Investigations Report 2004-5214

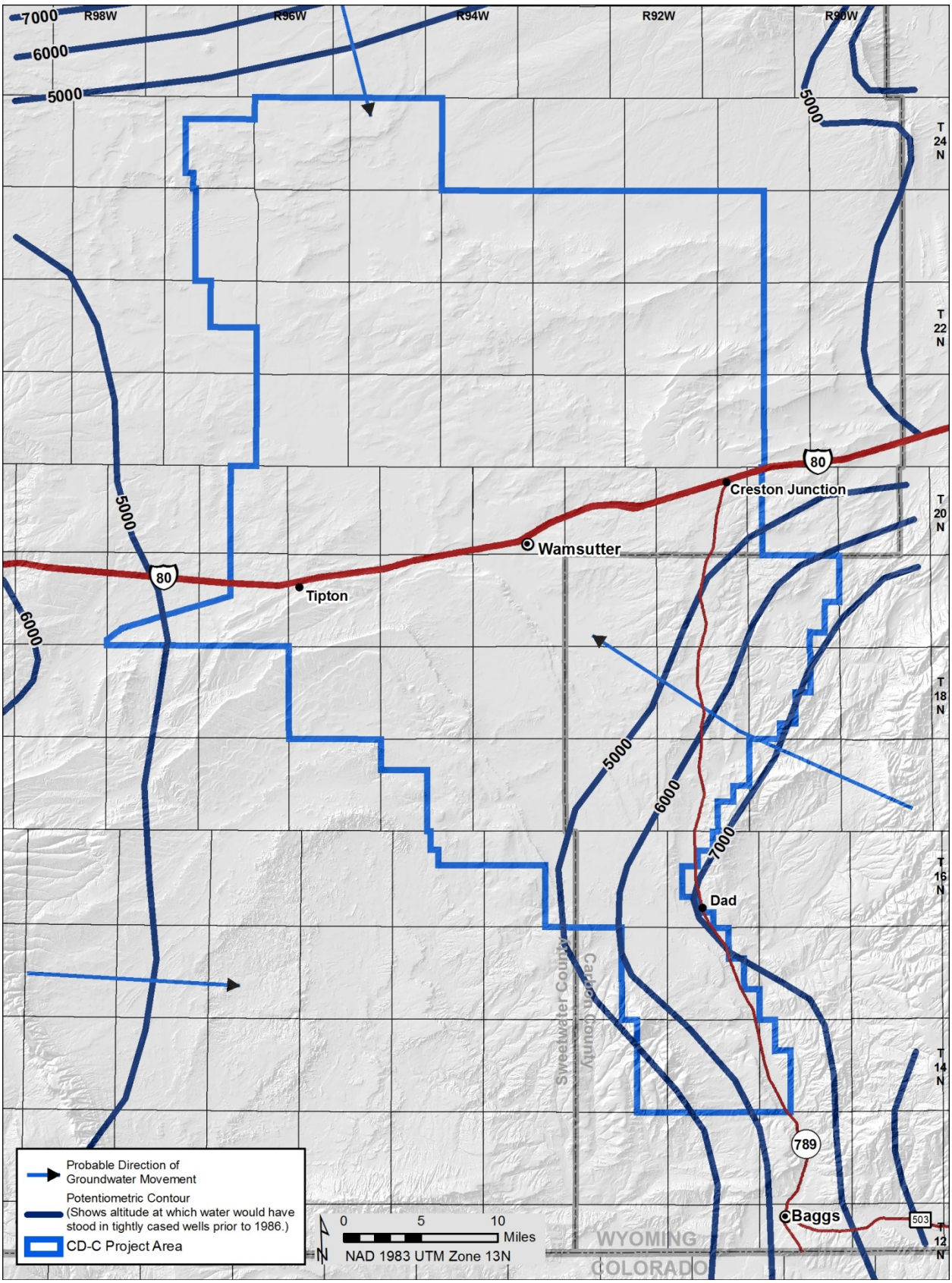
No warranty is made by the BLM for use of the data for purposes not intended by the BLM.



Map F-6. Generalized potentiometric surface and groundwater flow direction, Mesaverde Aquifer

Source: U.S. Geological Survey, Scientific Investigations Report 2004-5214

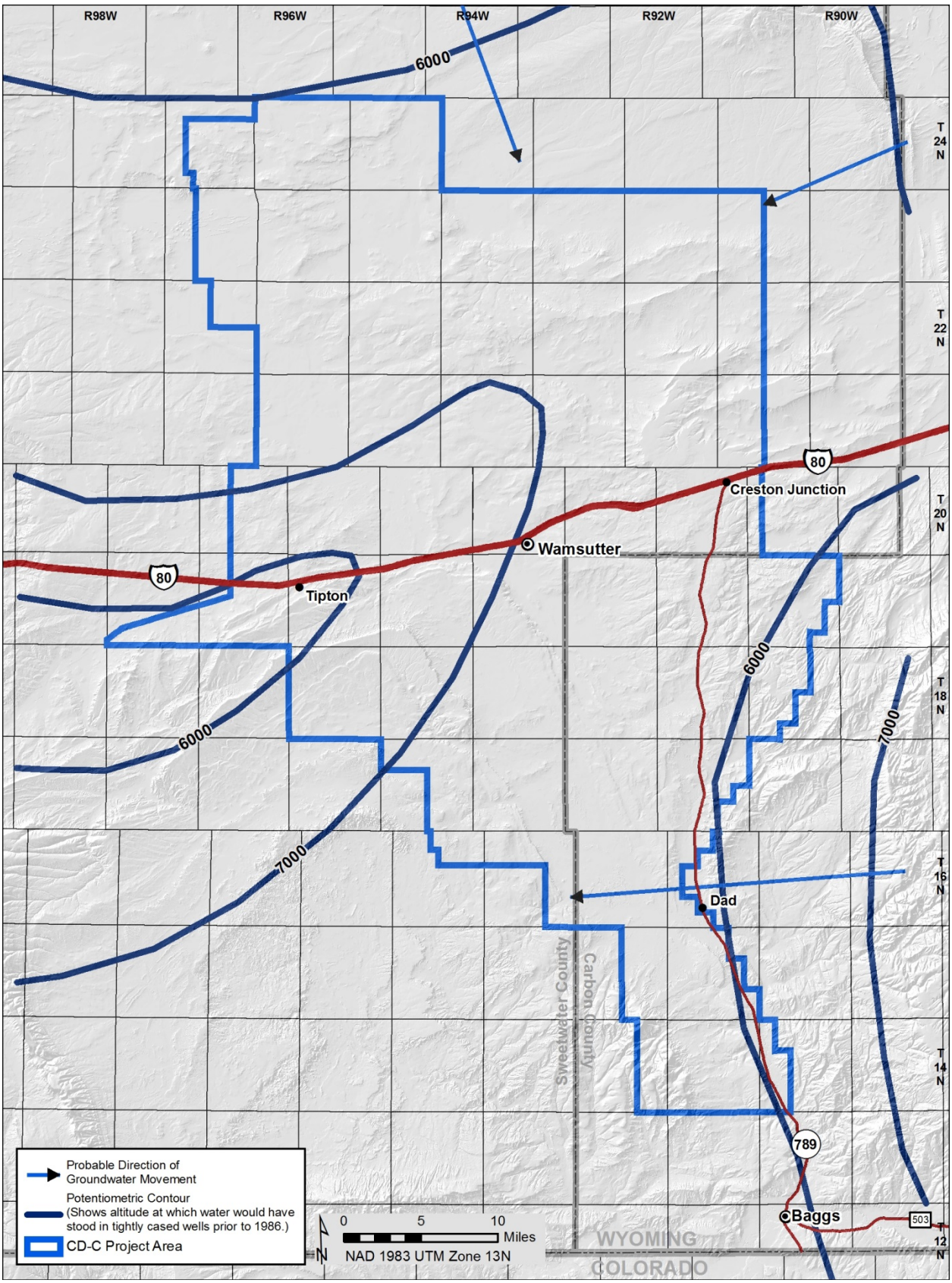
No warranty is made by the BLM for use of the data for purposes not intended by the BLM.



Map F-7. Generalized potentiometric surface and groundwater flow direction, Tensleep Aquifer

Source: U.S. Geological Survey, Scientific Investigations Report 2004-5214

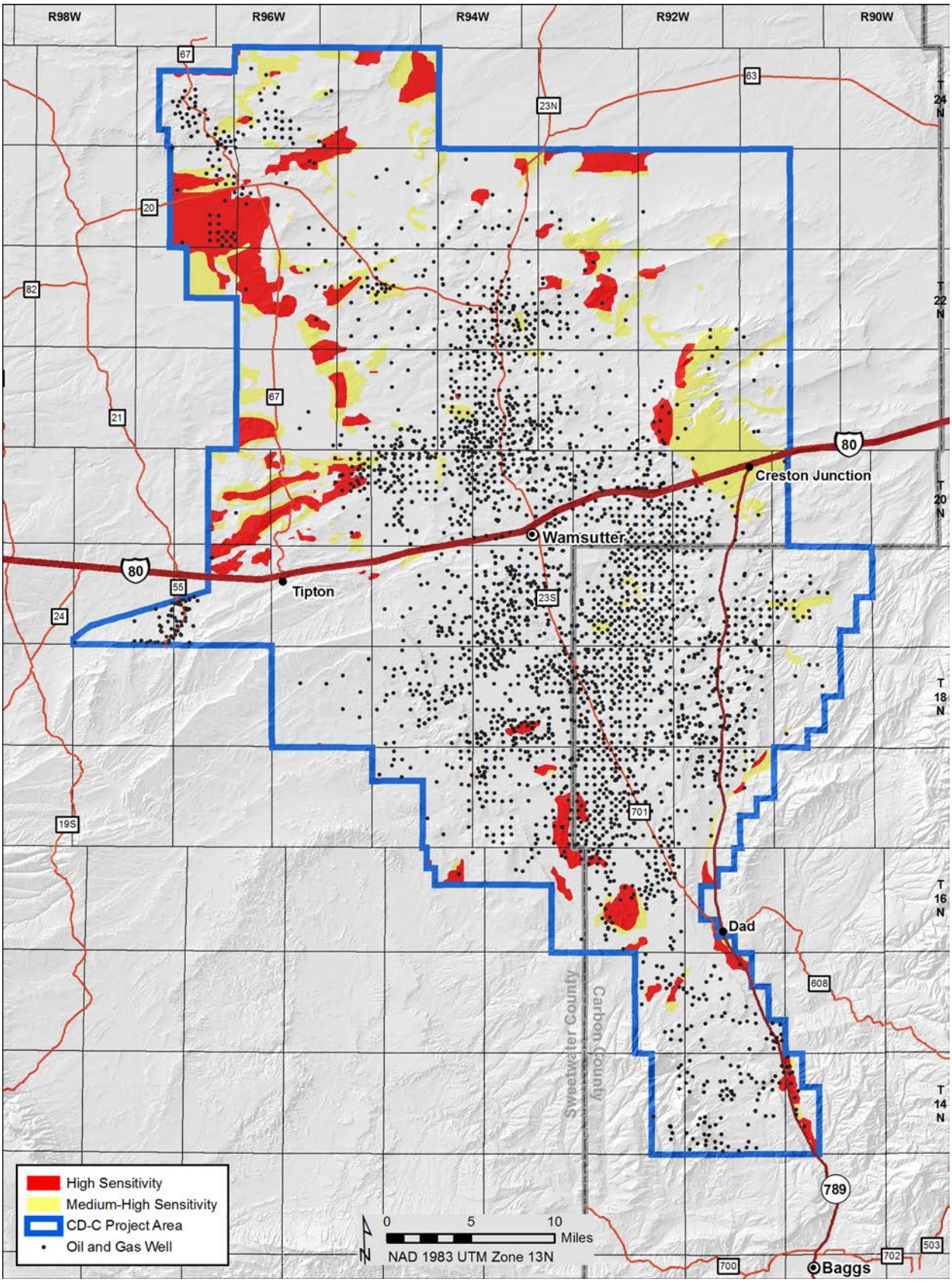
No warranty is made by the BLM for use of the data for purposes not intended by the BLM.



Map F-8. Generalized potentiometric surface and groundwater flow direction, Madison Aquifer

Source: U.S. Geological Survey, Scientific Investigations Report 2004-5214

No warranty is made by the BLM for use of the data for purposes not intended by the BLM.



Map F-9. Aquifer sensitivity in the CD-C project area

Source: Wyoming Ground Water Vulnerability Handbook SDVC Report 98-01

No warranty is made by the BLM for use of the data for purposes not intended by the BLM.

WEPP MODEL

The Water Erosion Prediction Project (WEPP) model was used to predict sediment loading for each alternative in the project area. The WEPP model is a web-based interface designed by the USFS to predict runoff and sediment yield from forests and rangelands with minor soil disturbance. It is not intended for use in predicting runoff and sediment yields from construction sites, and therefore is only being used in reference to the CD-C project area for a comparative analysis. Disturbed WEPP was the interface within the WEPP model used to predict the sediment yield resulting from soil disturbance in the project area. A Disturbed WEPP run was completed for each water erosion class (slight, moderate, and severe), identified on **Map 3.3-1** (Water-erosion Potential for the CD-C project area) and discussed in **Section 3.3.2.1** (Water Erosion). As indicated by the USFS, the sediment loadings predicted by the WEPP model are accurate to only +/- 50 percent and, as such, are primarily for comparison analysis.

The input parameters used in the WEPP model were climate, slope, soil, and vegetation. Each parameter is discussed in detail below.

- Climate parameters used by the WEPP model were developed using the Rawlins, Wyoming FAA Airport climate station in order to represent the CD-C Project Area. This station was selected from the climate model list in the WEPP program as it is near the CD-C project area.
- The WEPP model separates hill slopes into upper and lower slope regions. Each slope region requires an input for the starting and ending gradient within the region. The starting input in the upper slope region represents the top of the hill slope and is generally zero. The ending input represents the average hill side gradient for the model run. The starting input in the lower slope region is again representative of the average hill side gradient and should match the ending input from the upper slope region. The ending input in the lower slope region represents the gradient at the bottom of the hill as it enters a channel. Gradient inputs for each erosion class were determined using the data presented in **Table 3.3-2** (Water erosion classes determined by Erosion Factor (K) and Slope in the CD-C project area).In each water erosion class, the starting input was assumed to be zero, the average hill side gradient was calculated as the average slope from the range listed in Table 3.3-2, and the bottom of the hill gradient input was an estimate of the lowest non-zero slope listed in the range on Table 3.3-2. Following these procedures, the gradient inputs were estimated for each water erosion class and are shown in **Table F-15**.
- The horizontal hill length is also a required input for each of the upper and lower slope regions. Since hill length varies greatly throughout the project area, a standard length of 300 feet was used. This follows the procedures used for Disturbed WEPP modeling conducted for the Bighorn Basin Draft RMP (BLM 2011d).
- The WEPP model is limited to four soil textures: clay loam, silt loam, sandy loam, and loam. The loam soil texture was selected to represent average soil texture throughout the project because all soil types were present within each of the water erosion classes.
- The treatment/vegetation parameter was selected as skid trail as this best represented an area that has been mechanically disturbed and compacted. The percent vegetation cover and percent rock in a disturbed area would likely be zero.

All WEPP erosion analyses were conducted using a 50-year simulation, per USFS recommendation for dry climate. Results of the WEPP modeling for the CD-C project sediment loading comparison are provided in **Table F-16**.

As indicated above, the results of the WEPP model are accurate to only +/- 50 percent, which make them appropriate only for comparison of the estimated sediment loading by alternative. The results confirm that the greater the alternative disturbance, the greater the total sediment loading. The per-acre sediment loading rates for all alternatives are well below the 2 tons per acre per year utilized to estimate the significance of surface water impacts for Criterion 8.

APPENDIX G: ENERGY BY DESIGN – COOPERATIVE MITIGATION PLANNING FOR THE CD-C GAS FIELD

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Introduction and Background

In many cases the environmental mitigation process for development projects is *ad hoc*, opaque, and insufficient, failing to deliver effective outcomes for biodiversity conservation (McKenney and Kiesecker 2009). Mitigation planning too often reflects a reactive, piecemeal approach, focused on site-level impacts of the next proposed project. Here we seek to balance the needs of planned developments with those of biodiversity conservation. The aim is to bring greater efficiencies to development planning and impact mitigation, and more effective conservation outcomes. We seek to improve implementation of the "mitigation hierarchy" at each stage—avoid, minimize/restore, and offset—in a way that is transparent and transferable to industry and regulators, and complementary to the environmental assessment (Kiesecker et al. 2010a). By evaluating threats and impacts at regional and site levels, in a proactive fashion, mitigation planning can steer development projects away from conservation priorities and ensure mitigation provides a higher return for conservation. We generate this up-front planning information by harnessing decades of conservation planning experience, extensive ecological data, and advanced computer-modeling tools, and applying them to assess onsite conservation values as well as to locate compensatory mitigation opportunities.

Mitigation frameworks often ask developers if they have followed the mitigation hierarchy (Council on Environmental Quality 2000) of seeking to avoid, minimize, and restore biodiversity onsite before considering an offset for the residual impacts. However, no quantitative guidelines exist to guide this decision-making process. Landscape-level planning and associated tools provide a framework to address this problem. Identifying wildlife values at a landscape scale and understanding the landscape value of local occurrences can guide decisions regarding when impacts should be avoided or when they can be offset. Placing mitigation design within a landscape-level planning framework can ensure that development actions are consistent with conservation goals. Our landscape-level mitigation framework is intended as a voluntary addition to the EIS, and does not imply that mandatory mitigation will be required through the EIS process.

Here we describe an analysis for the Continental Divide-Creston (CD-C) natural gas field that can be used to inform avoidance of important resources onsite within the field, as well as compensatory mitigation opportunities. BP America Production Company (BP), one of the principal operators on the field, expressed the need for a structured framework to complement the Environmental Impact Statement (EIS) that could be used to avoid potential conflicts between development and onsite wildlife values and identify opportunities to balance onsite impacts with additional conservation options to offset these impacts. BP invited The Nature Conservancy to design such a plan. First, we identified areas within the field that have high value for wildlife or other resources from a regional landscape perspective and should be given special consideration for avoiding impacts from development. Second, we identified opportunities to utilize offsets to mitigate for unavoidable impacts associated with gas development on the field. We sought to design an offset framework where the offsets are ecologically equivalent to the impacts. All methods are adapted from a previous mitigation framework in Wyoming (Kiesecker et al. 2009, Kiesecker et al. 2010b).

Methods

The analysis for the CD-C development included six steps, each of which is described in more detail below: (1) assemble a working group, (2) identify representative biological targets, (3) gather spatial data for biological targets, (4) examine potential onsite development, (5) set impact goals for each biological target associated with the development, and (6) use the Marxan algorithm at increasing spatial extents to identify potential offset sites both on and off the project area.

Study area. Our study area was the 1.1-million acre CD-C natural gas field in Southern Wyoming where BP proposed a project that included drilling up to 8,950 new gas wells, and a larger 3.2 million-acre area surrounding the field for potential offset sites (Map F-3). The CD-C natural gas field is a high-desert xeric

shrubland ecosystem that provides critical habitat for ungulates (pronghorn and mule deer), songbirds, and raptors, in the desert shrublands west of the Sierra Madre mountain range. Greater sage-grouse (*Centrocercus urophasianus)* populations within the field are also a concern, a species recently considered by the U.S. Fish and Wildlife Service (USFWS) for the endangered species list and issued a "warranted, but precluded" listing.

Assemble a working group

A mitigation-design science working group was formed to provide guidance on selection of representative biological targets, designing offsets, and integrating spatial data into the site selection process. These participants (see **Table F-1**) had expertise and involvement with the biological systems that may be impacted by the CD-C development and included representatives from the Wyoming Game and Fish Department (WGFD), Bureau of Land Management (BLM), USFWS, University of Wyoming (UW), biological consulting firms, and the local agricultural production community. The working group helped to provide the most current spatial data for the biological targets, assessed the predictive models being developed, and offered insights into the process being developed. We sought to apply rigorous, objective measures of conservation value whenever possible, recognizing that a quantitative assessment would need to be supplemented by expert opinion. Several meetings were held with members of the working group in 2008 and 2009.

Compile a list of representative biological targets

Biological diversity cannot easily be completely and directly measured. Thus practitioners are forced to select a set of components of biological diversity that can be measured effectively given existing resources, that adequately represent the range of biological phenomena in the project area, and that contribute the most to overall biological diversity of a project area. We addressed the selection of focal targets that would represent wildlife values on the CD-C field with sufficient breadth and depth by starting with the BLM sensitive species list for the Rawlins Field Office (http://swccd.us/images/-M_WyoBLM_Sensitivespecies.pdf). We also consulted the Wyoming Game and Fish Department's Species of Greatest Conservation Concern (http://gf.state.wy.us/wildlife/CompConv-Strategy/SectionI.pdf) and The Nature Conservancy's Wyoming Basins Ecoregional Assessment (Freilich et al. 2001). All biological targets from these lists with data demonstrating occurrence within the bounds of the CD-C field area were selected as a biological targets to be included in the mitigation planning.

This process resulted in 14 species and 10 systems being selected (**Table F-2**). The targets included three rare plant species—Nelson's milkvetch (*Astragalus nelsonianus*), Gibben's beardtongue (*Penstemon gibbensii*) and Persistent sepal yellowcress (*Rorippa calycina*)—all of which have the majority of their known occurrences within the study area (Fertig and Thurston 2003). All ecological systems occurring in the CD-C development area were included as targets and are listed in Table F-2. The eleven selected wildlife species included two amphibians: the northern leopard frog (*Rana pipiens*) and Great Basin spadefoot (*Spea intermontana*). Amphibian breeding habitat is quite rare in the Wyoming basins Ecoregion (Frelitch et al. 2000), meaning that occurrences of these habitats within the development area are particularly important. Crucial winter range and migration corridors were included for mule deer (*Odocoileus hemionus*) and pronghorn antelope (*Antilocarpa americana*). Adversely affecting these critical components of their habitat could lead to population loss—declines have been recently recorded for mule deer populations in the Upper Green River Basin and mule deer have been shown to avoid oil and gas development (Sawyer et al. 2009). The other wildlife species included were the black-footed ferret (*Mustela nigripes*), burrowing owl (*Athene cunicularia*), ferruginous hawk (*Buteo regalis*), mountain plover (*Charadrius montanus*), pygmy rabbit (*Brachylagus idahoensis*), and Wyoming pocket gopher (*Thomomys clusius*).

Wyoming pocket gophers are known only from a small area in south-central Wyoming, and the field may represent a significant portion of their range (Keinath and Beauvais 2006). In general, range-wide it is believed that pygmy rabbit abundance is declining in most known populations (Dobler and Dixon 1990). Information suggests that pygmy rabbit populations can decline rapidly in areas where suitable habitat is altered (Weiss and Vert 1984, Gahr 1993), necessitating additional consideration. Burrowing owls are a neotropical migrant that receives protection under the Migratory Bird Treaty Act and the Convention of International Trade in Endangered Species, and BLM has surface occupancy stipulations for the species (OMBM 1995). While the FWS recognizes the ferruginous hawk as a species of concern (USFWS 1996), it does not give the species any special status under the Endangered Species Act. However, the ferruginous hawk is considered to be declining in several areas, but there is little data available on magnitude of declines (Bechard 1981, Houston and Bechard 1984, Woffinden and Murphy 1989, Ure et al. 1991). Aquatic habitats are of critical importance for wildlife in arid environments and thus all aquatic ecological systems have been identified (playas and riparian wet meadows). Greater sage-grouse (*Centrocercus urophasianus*), previously widespread, have been extirpated from nearly half of their original range in western North America (Schroeder et al. 2004) with a range-wide population decline of 45 – 80 percent and local declines of 17 – 92 percent (Connelly and Braun 1997, Braun 1998, Connelly et al. 2004). Energy development has emerged as a key issue in sage-grouse conservation, as sage-grouse populations appear sensitive to oil and gas development (Holloran 2005, Aldridge and Boyce 2007, Walker et al. 2007).

Spatial data for biological targets

Spatial data were used to identify biological targets occurring within the CD-C field, as well as occurrence of those targets beyond the field boundary where offsets might be applied. The spatial datasets used to represent each target onsite and offsite are detailed in **Table F-2** and include point survey data, vegetation cover estimates, and predictive model estimates.

In cases where survey data were sufficient for estimating occurrence patterns, we relied on these data. For example, for pronghorn, we utilized pronghorn migration routes from the WGFD (2006). In cases where survey data were insufficient to estimate occurrence patterns across the study area, we used predicted habitat models based on species occurrence, observation, and survey data from the Wyoming Natural Diversity Database (WYNDD), Hayden-Wing Associates (HWA), WGFD, and the BLM. We created predictive habitat models for three species (Great Basin spadefoot, northern leopard frog, and sage-grouse winter habitat) for which existing models were not available, using methods from Kiesecker et al. (2009).

Offset goals for biological targets

Our intention with this analysis was not to reinvent the EIS process, as there is an extensive literature on this subject (Canter 1996, Sadar et al. 1995); rather we intended to provide an approach that could complement the ongoing EIS. Thus, for this assessment we used a simple approach to quantify field-level impacts and divided the field into four separate units based on the current well-spacing designations (160-acre spacing, 80-acre spacing, 60-acre spacing and 40-acre spacing) approved by the Wyoming Oil and Gas Commission (http://wogcc.state.wy.us/). Since companies must actively petition to decrease well spacing below 160-acre spacing, we assumed that these areas have a higher probability of development.

We set mitigation goals on and off the project field area differently. We intersected the spatial data for each of the biological targets with the well-spacing category and calculated the acres (for polygons) and number of occurrences (for points) of each target (**Map F-2, Table F-2**) that would need to be mitigated within these areas.

We examined two possible mitigation scenarios:

1. Where development and associated impacts would be concentrated with the areas designated as 40- and 60-acre well spacing, and set goals based on impacts to those areas. Also, we confined the areas that could serve as potential offset sites within the CD-C project area (**Map F-2**).
2. Development and associated impacts in the area designated as 80-acre spacing, and set goals based on impacts to those areas. Also, the analysis for potential offset sites was expanded to outside the CD-C project area (**Maps F-2 and F-3**).

Selecting potential mitigation sites with Marxan

We used the Marxan (version 1.8.2) site-selection algorithm (Ball and Possingham 2000) to select appropriate locations for potential offset sites within the onsite and offsite project areas. We developed criteria to ensure offsets would mitigate onsite impacts, and ran analyses based on the potential impacts associated with the two scenarios (40- to 60-acre spacing and 80-acre spacing).

Marxan is a siting tool for landscape conservation analysis that explicitly incorporates spatial design criteria into the site-selection process. Marxan operates as a stand-alone program and utilizes an algorithm called "simulated annealing with iterative improvement" as a heuristic method for efficiently selecting regionally representative sets of areas for biodiversity conservation (Possingham et al. 2000). Marxan allows inputs of target occurrences represented as points or polygons in a GIS environment and allows for conservation goals to be stated in a variety of ways, such as percent area or numbers of point occurrences. The program also allows for the integration of spatial data sets representing land use pattern and conservation status, and enables rapid evaluation of alternative configurations or scenarios. The ultimate objective is to minimize the cost of the sites selected (i.e. cost = landscape integrity, conservation cost in dollars, size of the reserve) while still meeting objectives.

The working group selected 100-hectare (approximately 250-acre) hexagons as the unit of analysis for running Marxan, because this was of sufficient spatial resolution to represent biological targets and also large enough to permit efficient analyses across broad landscape scales. The effectiveness of a contiguous set of hexagon units for defining natural variability, especially among spatially heterogeneous data sets, is well documented (White et al. 1992). Each hexagon was populated by summing the area of suitable habitat for the targeted community or species. In addition to the biological information used to select potential offset sites, we incorporated a series of additional rules. First we guided site selection to areas of high biological integrity (as per Copeland et al. 2007). This is equivalent to the "cost" function utilized by Marxan (Ball and Possingham 2000).

Results and Discussion

These results complement the planning and analysis work conducted as part of the CD-C EIS, provides an assessment of biological values that are important at a regional scale, and identifies areas where conservation projects targeted at impacted species may provide a way to offset impacts associated with development.

Mapping Sensitive Features

Our maps and data of sensitive features (**Map F-1**) could be used in a variety of ways to both avoid potential conflicts between development and key wildlife resources on the field and minimize impacts associated with development. For example, impacts to known rare plant occurrences (Nelson milkvetch, Gibbens' penstemon and persistent sepal yellowcress) should be avoided given their limited distributions and occurrence patterns. Furthermore, predictive habitat species models could be used to guide surveys prior to development. Impacts to rare and/or sensitive animal species (Wyoming pocket gopher, ferruginous hawk, pygmy rabbit, sage-grouse and burrowing owl) should be avoided whenever possible. For sage-grouse this should include both breeding (= leks) and wintering habitat. Aquatic targets (playas,

wet meadows, and amphibians, including northern leopard frog and Great Basin spadefoot toad) should also be given special consideration and impacts to any riparian or wetland habitats should be avoided.

Onsite and Offsite Mitigation Areas

Mitigation sites could be used in a number of ways to compensate for impacts associated with development. A simple approach may be for BLM to establish a surface disturbance (or activity) threshold on a section-by-section basis (or some other spatial unit) and if development exceeds these disturbance caps it would trigger the need to offset the wildlife values within that section. Alternatively, monitoring plots both within development areas and outside development areas could be established for key wildlife targets. Monitoring that reveals departures (declining trends in populations or habitat quality indices) between development and non-development areas could trigger the need for offsets and could be directed at declining species. For this reason we have included an assessment of offset sites and the species/systems they may benefit.

It is important to note that our site-selection exercise did not account for future oil and gas development potential. Many proposed offset sites are within the Atlantic Rim or Desolation Flats Natural Gas Fields, and therefore may be unsuitable because of future development potential (Map F-3). Prior to establishing sites for actual mitigation offsets, the development potential should be carefully evaluated and incorporated into the decision-making process.

If offsets are used, a number of criteria will need to be addressed to ensure offsets provide the needed benefit. Critical to their usage will be the demonstration of additional conservations benefits (Kiesecker et al. 2009a) that accrue to impacted wildlife species and systems. Areas selected will only be valuable as offsets if opportunities exist to either restore (i.e. improve conditions for target species) habitat or abate future threats (i.e. prevent invasive weed establishment, conservation easements) to habitat in a manner that improves the condition for target species. Reaching no net loss from impacts associated with development will come from onsite actions that minimize impacts or restore habitat, combined with offsite actions that provide additional benefits. As on-the ground projects are considered, a finer currency that incorporates the size of the impact and offset, as well as values associated with ecological function, quality, and integrity will need to be established (Kiesecker et al. 2009a). For the sagebrush ecosystem, several site assessment tools are available for use (i.e., USFWS 1980, habitat evaluation procedures; USNRCS 1997, ecological site descriptions; Parkes et al. 2003, habitat hectares approach).

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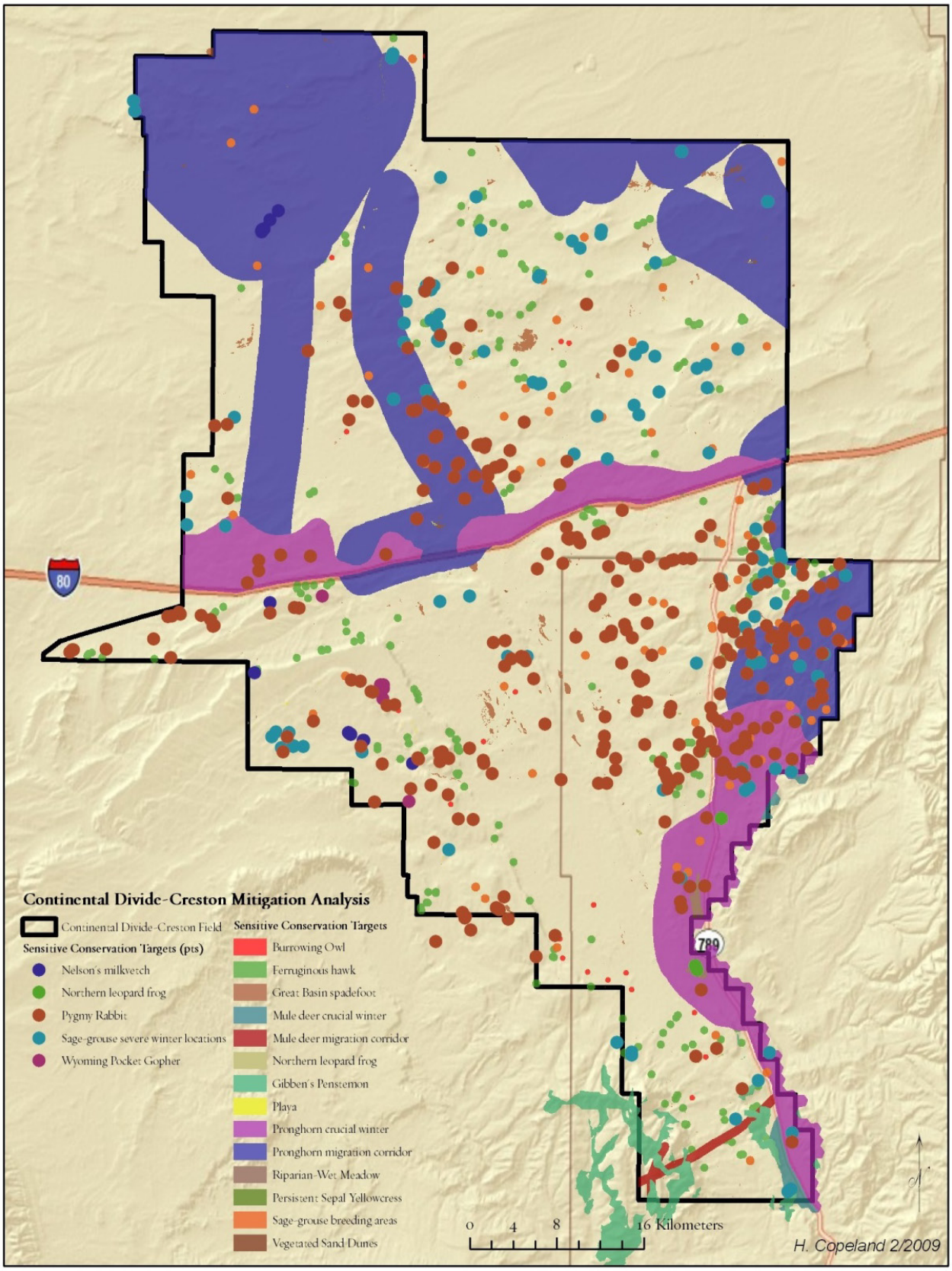
Table G-1. Biological targets selected for mitigation planning exercise and data source used to represent each target

Target Name	Onsite	Offsite
Basin Grassland	HWA vegetation map	WY Basins re-GAP vegetation map
Black-footed ferret habitat	BLM potential habitat from prairie dog town maps	BLM potential habitat from prairie dog town maps
Burrowing owl	BLM nest data (not including historical), with 825 ft buffer	BLM nest data (not including historical), with 825 ft buffer
Ferruginous hawk	BLM natural nests, not including historical, with 1/4 mi (1,200 ft) buffer	BLM natural nests, not including historical, with 1/4 mi (1200 ft) buffer
Gibben's beardtongue	WYNDD model (no known locations onsite)	WYNDD model
Greasewood Fans and Flats	HWA vegetation map	WY Basins re-GAP vegetation map
Great Basin spadefoot	BLM/WYNDD occurrences	BLM/WYNDD occurrences
Great Basin spadefoot habitat	National Wetlands Inventory (modeled habitat)	National Wetlands Inventory (modeled habitat)
Juniper Woodland	HWA vegetation map	WY Basins re-GAP vegetation map
Mixed Desert Shrub	HWA vegetation map	WY Basins re-GAP vegetation map
Mountain Big Sagebrush-Mixed Mountain Shrub	HWA vegetation map	WY Basins re-GAP vegetation map
Mountain Plover Habitat	HWA model	WYNDD domain model
Mule deer crucial winter	Wyoming Game and Fish Department (2004)	Wyoming Game and Fish Department (2004)
Mule deer migration corridor	Wyoming Game and Fish Department (2007)	Wyoming Game and Fish Department (2007)
Nelson’s milkvetch	WYNDD occurrences	WYNDD occurrences
Nelson’s milkvetch habitat	WYNDD habitat model	WYNDD habitat model
Northern leopard frog	BLM/WYNDD occurrences	BLM/WYNDD occurrences
Northern leopard frog habitat	National Wetlands Inventory (modeled habitat)	National Wetlands Inventory (modeled habitat)
Persistent sepal yellowcress	HWA Inventory (Lost Creek polygon)	WYNDD habitat model
Playa	HWA vegetation map	WY Basins re-GAP vegetation map
Pronghorn crucial winter range	Wyoming Game and Fish Department (2004)	Wyoming Game and Fish Department (2004)
Pronghorn migration corridor	Wyoming Game and Fish Department (2007)	Wyoming Game and Fish Department (2007)
Pygmy rabbit	BLM/WYNDD occurrences	BLM/WYNDD occurrences
Pygmy rabbit habitat	WYNDD habitat model (April 2008)	WYNDD habitat model (April 2008)
Riparian-Wet Meadow	HWA vegetation map	WY Basins re-GAP
Sage-grouse breeding areas	BLM/WGFD lek data, with 1/4 mi (1,200 ft) buffer	BLM/WGFD lek data, with 1/4 mi (1,200 ft) buffer
Sage-grouse severe winter range	HWA model (high potential) and known winter locations	TNC habitat model (2009)
Saltbush Fans and Flats	HWA vegetation map	WY Basins re-GAP vegetation map
Vegetated Sand Dunes	HWA vegetation map	WY Basins re-GAP vegetation map
Wyoming Big Sagebrush-Basin Big Sagebrush	HWA vegetation map	WY Basins re-GAP vegetation map
Wyoming pocket gopher	BLM/WYNDD occurrences	BLM/WYNDD occurrences
Wyoming pocket gopher habitat	WYNDD habitat model (Dec 2008)	WYNDD habitat model (Dec 2008)

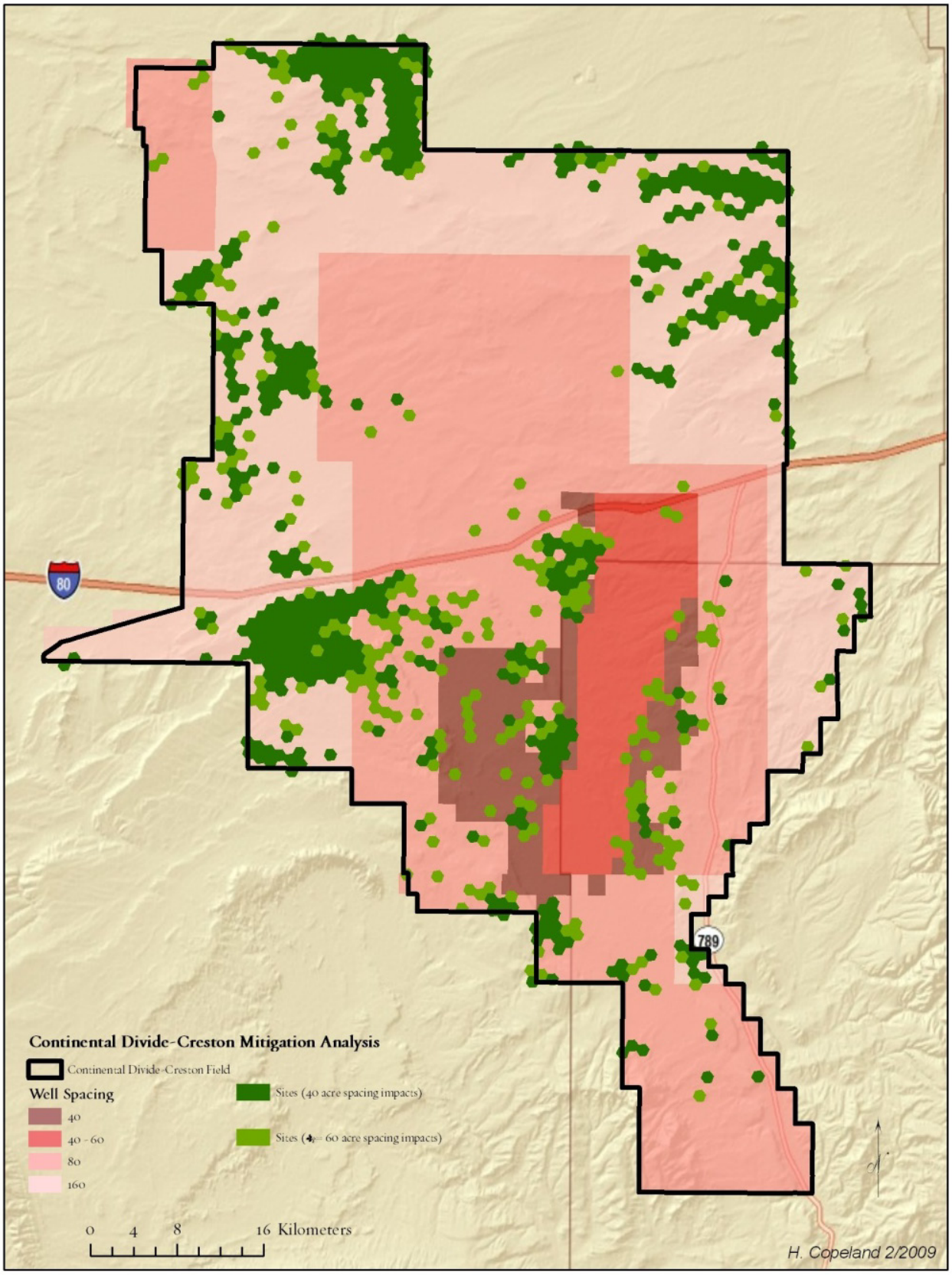
[1] *These acre estimates were used as offset goals for Scenario 1 (40- and 60-acre spacing) and Scenario 2 (80-acre spacing).*

Table G-2. Goals for each of the biological targets by scenario

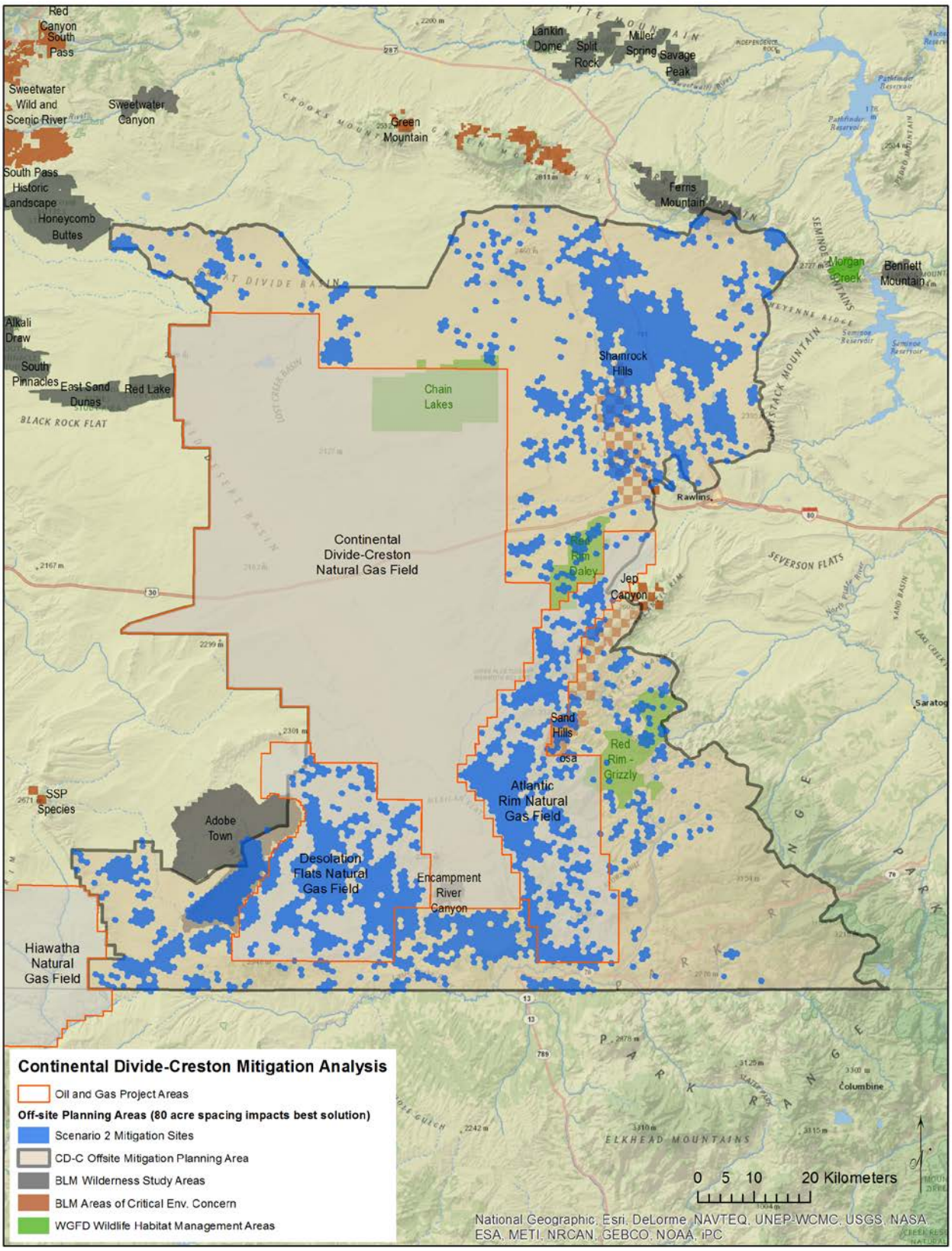
Target Name	Highly Sensitive	Conservation goals within the onsite project area (Scenario 1)	Acres selected onsite by Marxan	Conservation goals within the offsite project area (Scenario 2)	Acres selected offsite by Marxan
Basin Grassland	NO	391	391	1,404	2,141
Black-footed ferret habitat	NO	30,729	23,133	23,955	12,204
Burrowing owl	YES	53	73	328	315
Ferruginous hawk	YES	1,052	1,629	6,964	7,898
Greasewood Fans and Flats	NO	9,725	16,256	42,342	17,953
Great Basin spadefoot habitat	YES	448	741	815	968
Juniper Woodland	NO	0	0	122	794
Mixed Desert Shrub	NO	8,368	9,586	30,970	50,761
Mountain Big Sagebrush-Mixed Mountain Shrub	NO	1,660	4,117	11,456	11,470
Mountain plover habitat	NO	34,911	34,913	77,515	120,812
Mule deer crucial winter	YES	0	189	6,012	35,654
Mule deer migration corridor	YES	0	230	3,550	22,590
Nelson’s milkvetch	YES	0	2	0	0
Nelson’s milkvetch habitat	NO	0	9,490	15,517	2,837
Northern leopard frog	YES	0	1	1	2
Northern leopard frog habitat	YES	30	35	41	984
Gibben's beardtongue	YES	0	1	2,923	7,579
Playa	YES	3	5	25	3,914
Pronghorn crucial winter	YES	1,492	3,086	21,529	15,311
Pronghorn migration corridor	YES	0	22,245	35,494	35,521
Pygmy rabbit	YES	70	70	163	104
Pygmy rabbit habitat	NO	47,102	67,483	177,295	200,261
Riparian-Wet Meadow	YES	7	109	18	3,102
Persistent sepal yellowcress	YES	0	10	0	14,368
Sage-grouse breeding areas	YES	453	463	1,882	2,519
Sage-grouse severe winter locations	YES	2	13	0	0
Sage-grouse winter habitat	NO	10,536	13,176	38,766	34,105
Saltbush Fans and Flats	NO	17,196	17,189	27,015	27,016
Vegetated Sand Dunes	YES	0	71	35	10,923
Wyoming Big Sagebrush-Basin Big Sagebrush	NO	19,562	23,014	79,127	97,228
Wyoming pocket gopher	YES	0	1	5	1
Wyoming pocket gopher habitat	NO	43,654	43,658	100,754	100,952
Riparian-Wet Meadow	YES	7	109	18	3,102
Persistent sepal yellowcress	YES	0	10	0	14,368
Sage-grouse breeding areas	YES	453	463	1,882	2,519
Sage-grouse severe winter locations	YES	2	13	0	0
Sage-grouse winter habitat	NO	10,536	13,176	38,766	34,105
Saltbush Fans and Flats	NO	17,196	17,189	27,015	27,016
Vegetated Sand Dunes	YES	0	71	35	10,923



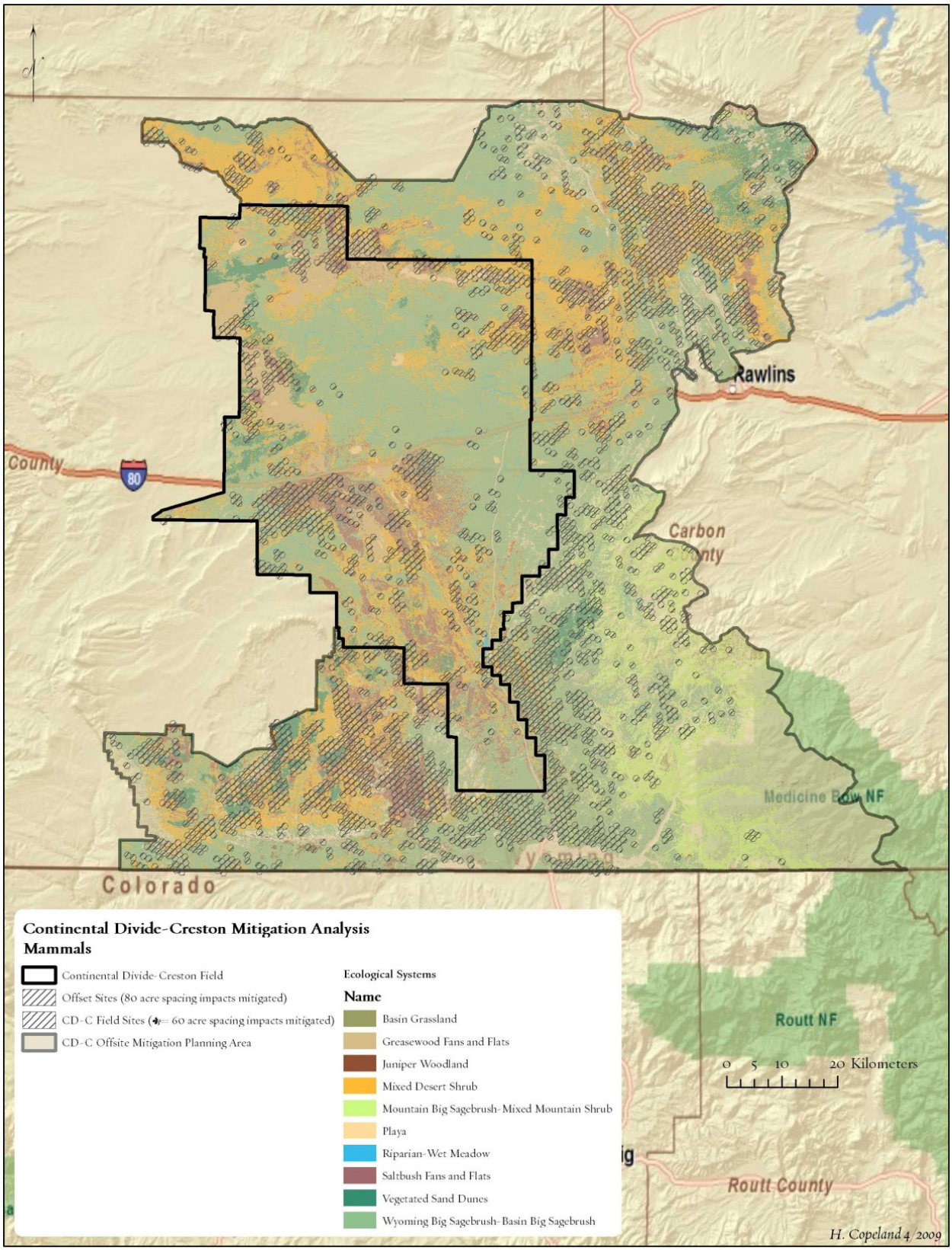
Map G-1. Biological targets with regional importance on the CD-C field.



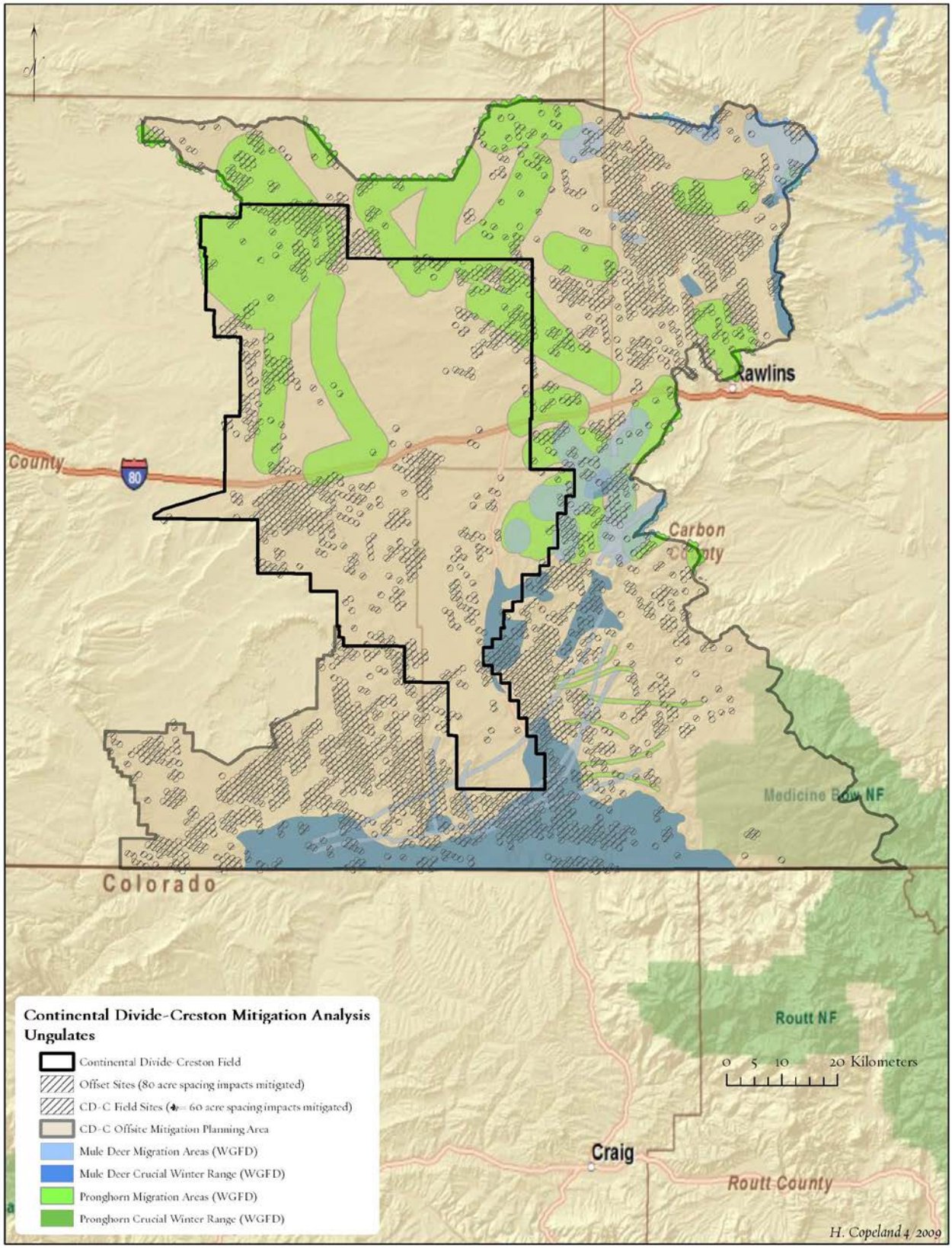
Map G-2. Well spacing designations on the CD-C Field and sites selected to offset impacts associated with development scenario 1 (wells concentrated with areas designated as 40- and 60-acre well spacing).



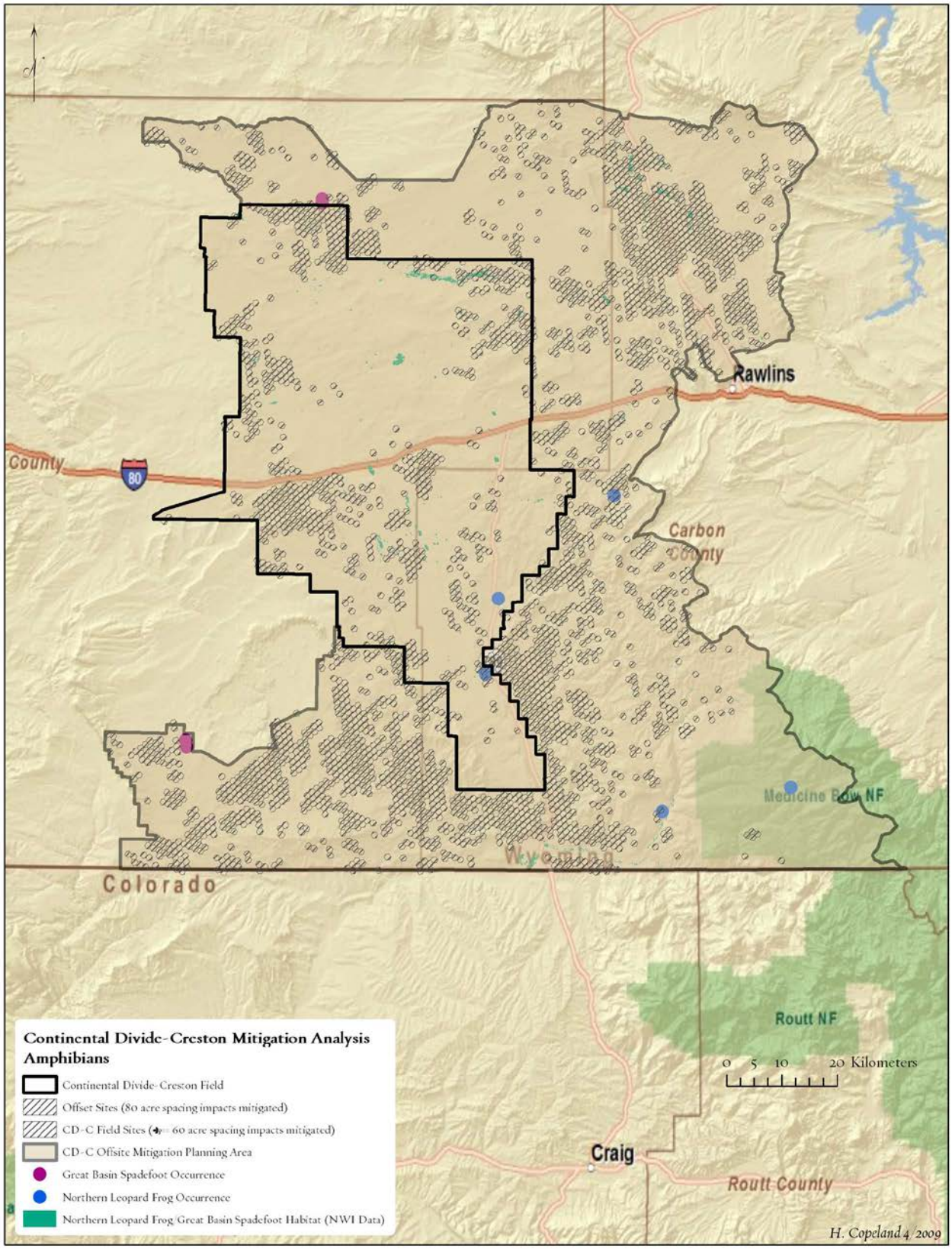
Map G-3. Sites selected outside the project area to offset impacts associated with scenario 2 (wells concentrated with areas designated as 80-acre well spacing).



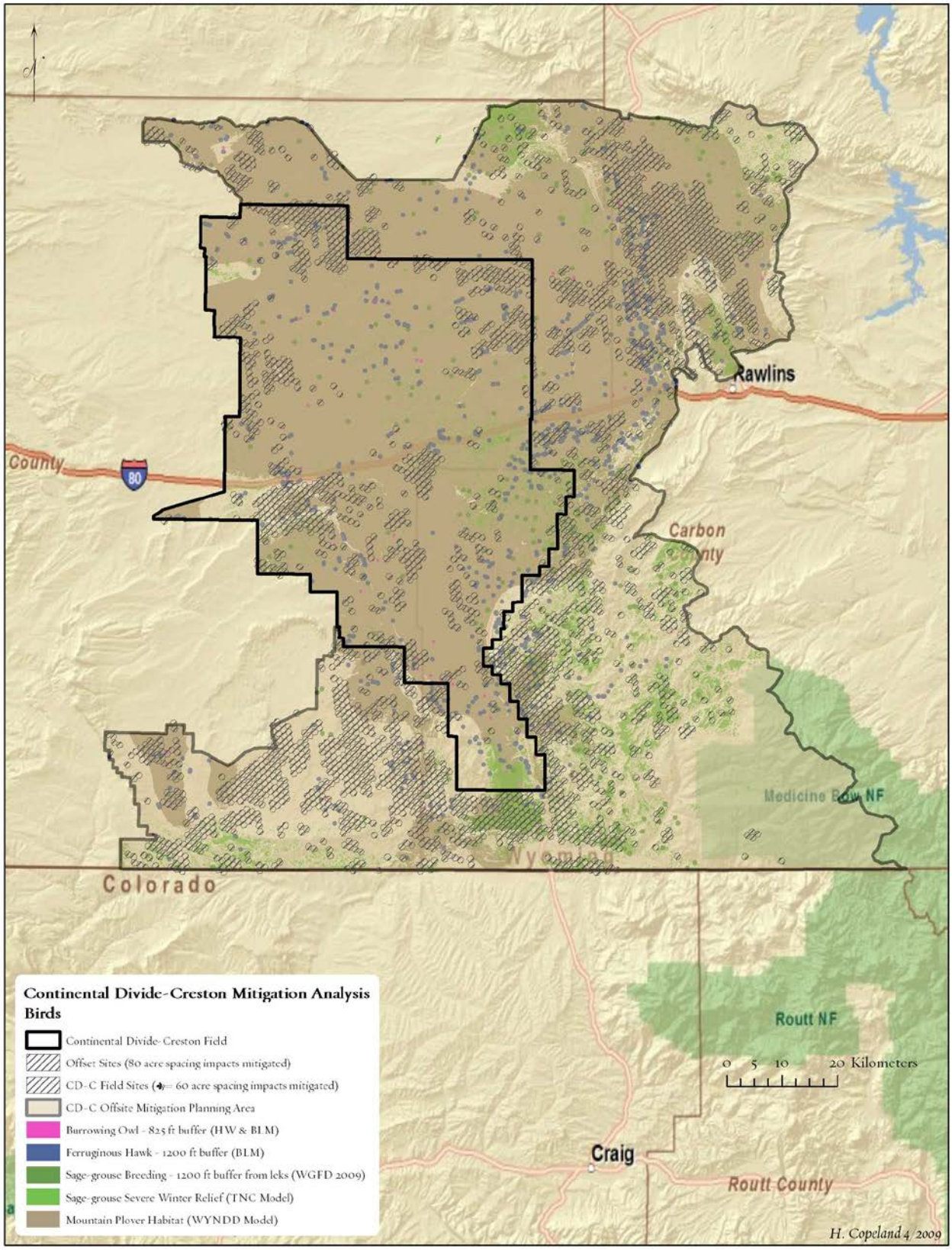
Map G-4. CD-C offset site mitigation analysis, mammals.



Map G-5. CD-C offset site mitigation analysis, ungulates.



Map G-6. CD-C offset site mitigation analysis, amphibians.



Map G-7. CD-C offset site mitigation analysis, birds.

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APPENDIX H: OCCURRENCE POTENTIAL OF WILDLIFE IN THE CD-C PROJECT AREA

Common Name: Birds	Scientific Name	Occurrence Potential[1]
Snow Goose	*Chen caerulescens*	O
Ross's Goose	*Chen rossii*	O
Canada Goose	*Branta canadensis*	B
Trumpeter Swan	*Cygnus buccinator*	O
Tundra Swan	*Cygnus columbianus*	O
Wood Duck	*Aix sponsa*	O
Gadwall	*Anas strepera*	B
American Wigeon	*Anas americana*	B
Mallard	*Anas platyrhynchos*	B
Blue-winged Teal	*Anas discors*	b
Cinnamon Teal	*Anas cyanoptera*	B
Northern Shoveler	*Anas clypeata*	B
Northern Pintail	*Anas acuta*	B
Green-winged Teal	*Anas crecca*	B
Canvasback	*Aythya valisineria*	O
Redhead	*Aythya americana*	B
Ring-necked Duck	*Aythya collaris*	O
Greater Scaup	*Aythya marila*	O
Lesser Scaup	*Aythya affinis*	B
Surf Scoter	*Melanitta perspicillata*	O
White-winged Scoter	*Melanitta fusca*	O
Long-tailed Duck	*Clangula hyemalis*	O
Bufflehead	*Bucephala albeola*	O
Common Goldeneye	*Bucephala clangula*	O
Barrow's Goldeneye	*Bucephala islandica*	O
Hooded Merganser	*Lophodytes cucullatus*	O
Common Merganser	*Mergus merganser*	b
Red-breasted Merganser	*Mergus serrator*	O
Ruddy Duck	*Oxyura jamaicensis*	O
Greater Sage-Grouse	*Centrocercus urophasianus*	B
Dusky Grouse	*Dendragapus obscurus*	B
Columbian Sharp-tailed Grouse	*Tympanuchus phasianellus columbianus*	B
Pacific Loon	*Gavia pacifica*	O
Common Loon	*Gavia immer*	O
Pied-billed Grebe	*Podilymbus podiceps*	b
Horned Grebe	*Podiceps auritus*	O
Red-necked Grebe	*Podiceps grisegena*	O
Eared Grebe	*Podiceps nigricollis*	B
Western Grebe	*Aechmophorus occidentalis*	O
Clark's Grebe	*Aechmophorus clarkii*	O
American White Pelican	*Pelecanus erythrorhynchos*	O
Double-crested Cormorant	*Phalacrocorax auritus*	O
American Bittern	*Botaurus lentiginosus*	O
Great Blue Heron	*Ardea herodias*	B

Common Name: Birds	Scientific Name	Occurrence Potential[1]
Snowy Egret	*Egretta thula*	O
Cattle Egret	*Bubulcus ibis*	O
Green Heron	*Butorides virescens*	O
Black-crowned Night-Heron	*Nycticorax nycticorax*	O
White-faced Ibis	*Plegadis chihi*	O
Turkey Vulture	*Cathartes aura*	O
Osprey	*Pandion haliaetus*	BLM
Bald Eagle	*Haliaeetus leucocephalus*	O
Northern Harrier	*Circus cyaneus*	B
Sharp-shinned Hawk	*Accipiter striatus*	b
Cooper's Hawk	*Accipiter cooperii*	B
Northern Goshawk	*Accipiter gentilis*	O
Broad-winged Hawk	*Buteo platypterus*	O
Swainson's Hawk	*Buteo swainsoni*	B
Red-tailed Hawk	*Buteo jamaicensis*	B
Ferruginous Hawk	*Buteo regalis*	B
Rough-legged Hawk	*Buteo lagopus*	O
Golden Eagle	*Aquila chrysaetos*	B
American Kestrel	*Falco sparverius*	B
Merlin	*Falco columbarius*	O
Peregrine Falcon	*Falco peregrinus*	O
Prairie Falcon	*Falco mexicanus*	B
Gyrfalcon	*Falco rusticolus*	BLM
Virginia Rail	*Rallus limicola*	b
Sora	*Porzana carolina*	b
American Coot	*Fulica americana*	B
Sandhill Crane	*Grus canadensis*	O
Black-bellied Plover	*Pluvialis squatarola*	O
Snowy Plover	*Charadrius alexandrinus*	O
Semipalmated Plover	*Charadrius semipalmatus*	O
Killdeer	*Charadrius vociferus*	B
Mountain Plover	*Charadrius montanus*	B
Black-necked Stilt	*Himantopus mexicanus*	O
American Avocet	*Recurvirostra americana*	B
Spotted Sandpiper	*Actitis macularius*	b
Solitary Sandpiper	*Tringa solitaria*	O
Greater Yellowlegs	*Tringa melanoleuca*	O
Willet	*Tringa semipalmata*	B
Lesser Yellowlegs	*Tringa flavipes*	O
Whimbrel	*Numenius phaeopus*	O
Long-billed Curlew	*Numenius americanus*	O
Marbled Godwit	*Limosa fedoa*	O
Ruddy Turnstone	*Arenaria interpres*	O
Red Knot	*Calidris canutus*	O
Sanderling	*Calidris alba*	O
Semipalmated Sandpiper	*Calidris pusilla*	O
Western Sandpiper	*Calidris mauri*	O

Common Name: Birds	Scientific Name	Occurrence Potential[1]
Least Sandpiper	*Calidris minutilla*	O
Baird's Sandpiper	*Calidris bairdii*	O
Pectoral Sandpiper	*Calidris melanotos*	O
Dunlin	*Calidris alpina*	O
Stilt Sandpiper	*Calidris himantopus*	O
Buff-breasted Sandpiper	*Tryngites subruficollis*	O
Short-billed Dowitcher	*Limnodromus griseus*	O
Long-billed Dowitcher	*Limnodromus scolopaceus*	O
Wilson's Snipe	*Gallinago delicata*	b
Wilson's Phalarope	*Phalaropus tricolor*	B
Red-necked Phalarope	*Phalaropus lobatus*	O
Red Phalarope	*Phalaropus fulicarius*	O
Franklin's Gull	*Larus pipixcan*	O
Bonaparte's Gull	*Larus philadelphia*	O
Ring-billed Gull	*Larus delawarensis*	O
California Gull	*Larus californicus*	O
Herring Gull	*Larus argentatus*	O
Sabine's Gull	*Xema sabini*	O
Caspian Tern	*Hydroprogne caspia*	O
Common Tern	*Sterna hirundo*	O
Forster's Tern	*Sterna forsteri*	O
Black Tern	*Chlidonias niger*	O
Rock Pigeon	*Columba livia*	B
White-winged Dove	*Zenaida asiatica*	O
Mourning Dove	*Zenaida macroura*	B
Yellow-billed Cuckoo	*Coccyzus americanus*	BLM
Black-billed Cuckoo	*Coccyzus erythropthalmus*	O
Barn Owl	*Tyto alba*	O
Great Horned Owl	*Bubo virginianus*	B
Snowy Owl	*Bubo scandiacus*	O
Burrowing Owl	*Athene cunicularia*	B
Long-eared Owl	*Asio otus*	B
Short-eared Owl	*Asio flammeus*	b
Northern Pygmy Owl	*Glaucidium gnoma*	BLM
Northern Saw-whet Owl	*Aegolius acadicus*	O
Common Nighthawk	*Chordeiles minor*	B
Common Poorwill	*Phalaenoptilus nuttallii*	B
White-throated Swift	*Aeronautes saxatalis*	b
Calliope Hummingbird	*Stellula calliope*	B
Broad-tailed Hummingbird	*Selasphorus platycercus*	O
Rufous Hummingbird	*Selasphorus rufus*	O
Belted Kingfisher	*Ceryle alcyon*	B
Lewis's Woodpecker	*Melanerpes lewis*	O
Red-headed Woodpecker	*Melanerpes erythrocephalus*	O
Acorn Woodpecker	*Melanerpes formicivorus*	O
Williamson's Sapsucker	*Sphyrapicus thyroideus*	O
Red-naped Sapsucker	*Sphyrapicus nuchalis*	O

Common Name: Birds	Scientific Name	Occurrence Potential[1]
Downy Woodpecker	*Picoides pubescens*	O
Hairy Woodpecker	*Picoides villosus*	B
American Three-toed Woodpecker	*Picoides dorsalis*	O
Northern Flicker	*Colaptes auratus*	B
Olive-sided Flycatcher	*Contopus cooperi*	b
Western Wood-Pewee	*Contopus sordidulus*	O
Willow Flycatcher	*Empidonax traillii*	O
Least Flycatcher	*Empidonax minimus*	b
Hammond's Flycatcher	*Empidonax hammondii*	B
Gray Flycatcher	*Empidonax wrightii*	b
Dusky Flycatcher	*Empidonax oberholseri*	b
Cordilleran Flycatcher	*Empidonax occidentalis*	B
Say's Phoebe	*Sayornis saya*	B
Ash-throated Flycatcher	*Myiarchus cinerascens*	b
Western Kingbird	*Tyrannus verticalis*	O
Eastern Kingbird	*Tyrannus tyrannus*	O
Loggerhead Shrike	*Lanius ludovicianus*	b
Northern Shrike	*Lanius excubitor*	O
Plumbeous Vireo	*Vireo plumbeus*	O
Warbling Vireo	*Vireo gilvus*	b
Philadelphia Vireo	*Vireo philadelphicus*	b
Red-eyed Vireo	*Vireo olivaceus*	b
Gray Jay	*Perisoreus canadensis*	O
Steller’s Jay	*Cyanocitta stelleri*	O
Blue Jay	*Cyanocitta cristata*	O
Western Scrub-Jay	*Aphelocoma californica*	b
Pinyon Jay	*Gymnorhinus cyanocephalus*	b
Clark’s Nutcracker	*Nucifraga columbiana*	b
Black-billed Magpie	*Pica hudsonia*	B
American Crow	*Corvus brachyrhynchos*	O
Common Raven	*Corvus corax*	O
Horned Lark	*Eremophila alpestris*	B
Tree Swallow	*Tachycineta bicolor*	B
Violet-green Swallow	*Tachycineta thalassina*	B
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*	b
Bank Swallow	*Riparia riparia*	b
Cliff Swallow	*Petrochelidon pyrrhonota*	B
Barn Swallow	*Hirundo rustica*	B
Black-capped Chickadee	*Poecile atricapillus*	B
Mountain Chickadee	*Poecile gambeli*	b
Juniper Titmouse	*Baeolophus ridgwayi*	B
Bushtit	*Psaltriparus minimus*	b
Red-breasted Nuthatch	*Sitta canadensis*	B
White-breasted Nuthatch	*Sitta carolinensis*	O
Brown Creeper	*Certhia americana*	B
Rock Wren	*Salpinctes obsoletus*	B
Canyon Wren	*Catherpes mexicanus*	b

Common Name: Birds	Scientific Name	Occurrence Potential[1]
Bewick's Wren	*Thryomanes bewickii*	B
House Wren	*Troglodytes aedon*	B
Marsh Wren	*Cistothorus palustris*	b
American Dipper	*Cinclus mexicanus*	b
Golden-crowned Kinglet	*Regulus satrapa*	O
Ruby-crowned Kinglet	*Regulus calendula*	B
Blue-gray Gnatcatcher	*Polioptila caerulea*	b
Western Bluebird	*Sialia mexicana*	O
Mountain Bluebird	*Sialia currucoides*	B
Townsend's Solitaire	*Myadestes townsendi*	b
Veery	*Catharus fuscescens*	O
Swainson's Thrush	*Catharus ustulatus*	O
Hermit Thrush	*Catharus guttatus*	B
American Robin	*Turdus migratorius*	B
Gray Catbird	*Dumetella carolinensis*	b
Northern Mockingbird	*Mimus polyglottos*	O
Sage Thrasher	*Oreoscoptes montanus*	B
Brown Thrasher	*Toxostoma rufum*	O
European Starling	*Sturnus vulgaris*	b
American Pipit	*Anthus rubescens*	O
Bohemian Waxwing	*Bombycilla garrulus*	O
Cedar Waxwing	*Bombycilla cedrorum*	O
Tennessee Warbler	*Vermivora peregrina*	O
Orange-crowned Warbler	*Vermivora celata*	B
Nashville Warbler	*Vermivora ruficapilla*	O
Virginia's Warbler	*Vermivora virginiae*	O
Yellow Warbler	*Dendroica petechia*	b
Yellow-rumped Warbler	*Dendroica coronata*	B
Black-throated Gray Warbler	*Dendroica nigrescens*	b
Townsend's Warbler	*Dendroica townsendi*	O
Black-and-white Warbler	*Mniotilta varia*	O
American Redstart	*Setophaga ruticilla*	O
Ovenbird	*Seiurus aurocapilla*	O
Northern Waterthrush	*Seiurus noveboracensis*	O
MacGillivray's Warbler	*Oporornis tolmiei*	B
Common Yellowthroat	*Geothlypis trichas*	b
Wilson's Warbler	*Wilsonia pusilla*	O
Yellow-breasted Chat	*Icteria virens*	b
Western Tanager	*Piranga ludoviciana*	b
Green-tailed Towhee	*Pipilo chlorurus*	B
Spotted Towhee	*Pipilo maculatus*	b
American Tree Sparrow	*Spizella arborea*	O
Chipping Sparrow	*Spizella passerina*	B
Clay-colored Sparrow	*Spizella pallida*	O
Brewer's Sparrow	*Spizella breweri*	B
Vesper Sparrow	*Pooecetes gramineus*	B
Lark Sparrow	*Chondestes grammacus*	b

Common Name: Birds	Scientific Name	Occurrence Potential[1]
Black-throated Sparrow	*Amphispiza bilineata*	O
Sage Sparrow	*Amphispiza belli*	B
Lark Bunting	*Calamospiza melanocorys*	B
Savannah Sparrow	*Passerculus sandwichensis*	b
Baird's Sparrow	*Ammodramus bairdii*	BLM
Fox Sparrow	*Passerella iliaca*	O
Song Sparrow	*Melospiza melodia*	b
Lincoln's Sparrow	*Melospiza lincolnii*	O
Swamp Sparrow	*Melospiza georgiana*	O
White-crowned Sparrow	*Zonotrichia leucophrys*	b
Dark-eyed Junco	*Junco hyemalis*	B
McCown's Longspur	*Calcarius mccownii*	O
Chestnut-collared Longspur	*Calcarius ornatus*	O
Snow Bunting	*Plectrophenax nivalis*	O
Rose-breasted Grosbeak	*Pheucticus ludovicianus*	O
Black-headed Grosbeak	*Pheucticus melanocephalus*	B
Blue Grosbeak	*Passerina caerulea*	O
Lazuli Bunting	*Passerina amoena*	O
Indigo Bunting	*Passerina cyanea*	O
Bobolink	*Dolichonyx oryzivorus*	O
Red-winged Blackbird	*Agelaius phoeniceus*	B
Western Meadowlark	*Sturnella neglecta*	B
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*	B
Brewer's Blackbird	*Euphagus cyanocephalus*	B
Common Grackle	*Quiscalus quiscula*	O
Brown-headed Cowbird	*Molothrus ater*	B
Bullock's Oriole	*Icterus bullockii*	O
Scott's Oriole	*Icterus parisorum*	b
Gray-crowned Rosy-Finch	*Leucosticte tephrocotis*	O
Black Rosy-Finch	*Leucosticte atrata*	O
Brown-capped Rosy-Finch	*Leucosticte australis*	O
Pine Grosbeak	*Pinicola enucleator*	O
Cassin's Finch	*Carpodacus cassinii*	B
House Finch	*Carpodacus mexicanus*	B
Red Crossbill	*Loxia curvirostra*	O
White-winged Crossbill	*Loxia leucoptera*	O
Common Redpoll	*Carduelis flammea*	O
Pine Siskin	*Carduelis pinus*	b
American Goldfinch	*Carduelis tristis*	O
Evening Grosbeak	*Coccothraustes vespertinus*	O
House Sparrow	*Passer domesticus*	B

Common Name: Mammals	Scientific Name	Occurrence Potential
Masked Shrew	*Sorex cinereus*	B
Merriam's Shrew	*Sorex merriami*	B
Dusky Shrew	*Sorex monticolus*	b
Dwarf Shrew	*Sorex nanus*	B
Water Shrew	*Sorex palustris*	b
Vagrant Shrew	*Sorex vagrans*	O
Western Small-footed Myotis	*Myotis ciliolabrum*	O
Long-eared Myotis	*Myotis evotis*	O
Little Brown Myotis	*Myotis lucifugus*	O
Fringed Myotis	*Myotis thysanodes*	O
Long-legged Myotis	*Myotis volans*	O
Eastern Red Bat	*Lasiurus borealis*	O
Hoary Bat	*Lasiurus cinereus*	O
Silver-haired Bat	*Lasionycteris noctivagans*	O
Big Brown Bat	*Eptesicus fuscus*	O
Spotted Bat	*Euderma maculatum*	BLM
Townsend's Big-eared Bat	*Corynorhinus townsendii*	BLM
Pika	*Ochotona princeps*	B
Pygmy Rabbit	*Brachylagus idahoensis*	b
Desert Cottontail	*Sylvilagus audubonii*	B
Mountain Cottontail	*Sylvilagus nutallii*	O
Snowshoe Hare	*Lepus americanus*	B
White-tailed Jackrabbit	*Lepus townsendii*	B
Yellow-pine Chipmunk	*Tamias amoenus*	B
Cliff Chipmunk	*Tamias dorsalis*	b
Least Chipmunk	*Tamias minimus*	B
Uinta Chipmunk	*Tamias umbrinus*	B
Yellow-bellied Marmot	*Marmota flaviventris*	B
Uinta Ground Squirrel	*Spermophilus armatus*	B
Wyoming Ground Squirrel	*Spermophilus elegans*	B
Golden-mantled Ground Squirrel	*Spermophilus lateralis*	B
Spotted Ground Squirrel	*Spermophilus spilosoma*	B
Thirteen-lined Ground Squirrel	*Spermophilus tridecemlineatus*	B
White-tailed Prairie Dog	*Cynomys leucurus*	B
Black-tailed Prairie Dog	*Cynomys ludovicianus*	BLM
Eastern Fox Squirrel	*Sciurus niger*	B
Red Squirrel	*Sciurus hudsonicus*	B
Wyoming Pocket Gopher	*Thomomys clusius*	B
Northern Pocket Gopher	*Thomomys talpoides*	b
Olive-backed Pocket Mouse	*Perognathus fasciatus*	B
Silky Pocket Mouse	*Perognathus flavus*	b
Great Basin Pocket Mouse	*Perognathus parvus*	B
Ord's Kangaroo Rat	*Dipodomys ordii*	B
Beaver	*Castor canadensis*	B
Deer Mouse	*Peromyscus maniculatus*	B
Pinyon Mouse	*Peromyscus truei*	B
Northern Grasshopper Mouse	*Onychomys leucogaster*	B

Common Name: Mammals	Scientific Name	Occurrence Potential
Bushy-tailed Woodrat	*Neotoma cinerea*	B
Southern Red-backed Vole	*Clethrionomys gapperi*	B
Western Heather Vole	*Phenacomys intermedius*	h
Long-tailed Vole	*Microtus longicaudus*	h
Montane Vole	*Microtus montanus*	B
Meadow Vole	*Microtus pennsylvanicus*	B
Sagebrush Vole	*Lemmiscus curtatus*	B
Muskrat	*Ondatra zibethicus*	B
Preble's Meadow Jumping Mouse	*Zapus hudsonius preblei*	BLM
Western Jumping Mouse	*Zapus princeps*	B
Porcupine	*Erethizon dorsatum*	B
Coyote	*Canis latrans*	B
Swift Fox	*Vulpes velox*	h
Red Fox	*Vulpes vulpes*	b
Raccoon	*Procyon lotor*	B
Marten	*Martes americana*	b
Short-tailed Weasel	*Mustela erminea*	b
Long-tailed Weasel	*Mustela frenata*	b
Black-footed Ferret	*Mustela nigripes*	h
Mink	*Mustela vison*	b
Badger	*Taxidea taxus*	B
Striped Skunk	*Mephitis mephitis*	b
Mountain Lion	*Puma concolor*	b
Canada Lynx	*Lynx canadensis*	BLM
Bobcat	*Lynx rufus*	B
Elk	*Cervus elaphus*	B
Mule Deer	*Odocoileus hemionus*	B
White-tailed Deer	*Odocoileus virginianus*	O
Pronghorn	*Antilocapra americana*	B
Feral Horse	*Equus caballus*	B
Common Name: Amphibians	**Scientific Name**	**Occurrence Potential**
Tiger Salamander	*Ambystoma tigrinum*	O
Great Basin Spadefoot	*Spea intermontana*	O
Boreal Toad	*Bufo boreas boreas*	O
Wyoming Toad	*Bufo baxteri*	BLM
Northern Leopard Frog	*Rana pipiens*	O
Boreal Chorus Frog	*Pseudacris maculata*	O

Common Name: Reptiles	Scientific Name	Occurrence Potential
Ornate Box Turtle	*Terrapene ornata ornata*	O
Many-lined Skink	*Eumeces multivirgatus*	H
Northern Sagebrush Lizard	*Sceloporus graciosus graciosus*	O
Northern Plateau Lizard	*Sceloporus undulatus elongatus*	O
Greater Short-horned Lizard	*Phrynosoma hernandesi*	O
Pale Milksnake	*Lampropeltis triangulum multistriata*	H
Great Basin Gophersnake	*Pituophis catenifer deserticola*	O
Intermountain Wandering Gartersnake	*Thamnophis elegans vagrans*	O
Plains Gartersnake	*Thamnophis radix*	H
Prairie Rattlesnake	*Crotalus viridis viridis*	O

[1] *Occurrence potential of wildlife species includes direct evidence of breeding (B), indirect evidence of breeding (b), record of observation (O), historical record of observation (h), and historical breeding record (H) in the 1-degree grid blocks covering 41 N latitude and 107 W and 108 W longitude (Cerovski et al. 2004). Some species included in the table were not recorded in Cerovski et al. (2004), but were added on the request of the BLM-RFO.*

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APPENDIX I: WILDLIFE INVENTORY, MONITORING, AND PROTECTION PLAN

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1. INTRODUCTION

This wildlife inventory, monitoring, and protection plan was prepared in conjunction with the Continental Divide-Creston Environmental Impact Statement (CD-C EIS) for the CD-C project area. The BLM is responsible for managing the biological integrity and habitat function of both terrestrial and aquatic ecosystems within the CD-C project area to sustain and optimize the distribution and abundance of all native, desirable non-native, and Special Status Species (Approved Rawlins Resource Management Plan and Record of Decision [Rawlins RMP] 2008a). The goal of the plan is to avoid and/or minimize adverse impacts to wildlife present on project-affected areas by:

- monitoring wildlife population trends within and adjacent to the CD-C project area during the course of project development and operations,
- developing appropriate mitigation actions, and
- analyzing the effectiveness of the mitigation measures.

Implementation of the plan will provide opportunities for land managers and project personnel to achieve and maintain desired levels of wildlife productivity and populations within and adjacent to the CD-C project area (e.g., at pre-project levels) by minimizing and/or avoiding potential adverse impacts to wildlife species. In addition, the implementation of this plan will facilitate the maintenance of a diverse assemblage of wildlife populations within and adjacent to the CD-C project area simultaneously with development of natural gas reserves.

Proposed inventory, monitoring, protection measures, cause and effect, and adaptive management mitigation will be implemented under the preferred alternative selected for the EIS. Implementation of the plan will begin upon the signing of the Record of Decision (ROD), and is estimated to continue for the life of the project. The plan will receive a review for effectiveness by the BLM annually.

2. IMPLEMENTATION PROTOCOL

This Wildlife and Plant Inventory/Monitoring, Protection/Adaptive Management, and Analysis Implementation Plan (Plan) contains four (4) basic steps that are required to determine if impacts are occurring to a species, how these impacts are occurring, what mitigation practices are required to reduce and/or remove these impacts, and an analysis to determine if the mitigation practices are effective in removing or reducing these impacts. The basis of the plan follows these four steps:

1. Inventory/monitor species and their associated habitats;
2. Monitor these species to determine changes in population numbers (cause and effect);
3. Identify and implement protection measures if the population shows negative changes; and
4. Analyze the effectiveness of the protection measures, making adjustments if required.

This section provides preliminary information pertaining to the protocols for each of the four steps. The wildlife species/categories for which specific inventory, monitoring, protection, and analysis procedures will be applied were developed based on management agency (Bureau of Land Management [BLM], U.S. Fish and Wildlife Service [USFWS], Wyoming Game and Fish Department [WGFD]) and individual concerns identified during the preparation of the EIS and through discussion at the Monitoring without Borders meetings. During annual meetings, yearly monitoring programs will be developed that would identify the species to be monitored during that particular year. The Monitoring Without Borders program, originally established through the Continental Divide/Wamsutter II EIS, would facilitate annual meetings and decisions. Monitoring programs would be developed cooperatively between the BLM, Operators, and other cooperators during the Monitoring Without Borders annual meetings and will be based on need, funding, and personnel availability for each upcoming field season and/or year. Not all species identified in this monitoring plan would be monitored on an annual basis.

Considerable efforts will be required by agency and Operator personnel for Plan implementation each year. Many of the proposed annual agency data collection activities are consistent with current agency requirements. Additionally, during annual planning (**Section 2.1.2** below) and throughout project implementation, all efforts will be made to accommodate agency personnel schedules and responsibilities. In addition, further agency cost-sharing methodologies will be considered such that public demands and statutory directives are achieved.

2.1 Annual Reports and Meetings

2.1.1 Reports

Monitoring conducted by the Operators and/or the BLM will be provided to the Monitoring Without Borders group by November 15 of each calendar year, and will contain the following information, in report format and following the requirements identified in **Table I-1**:

1. During project development, Operators will provide an updated inventory/monitoring report and description of all existing project developments (i.e., well pad location, size, roads, and associated level of human activity at each feature), as well as those tentatively proposed for development during the next 12 months in a format that is Geographic Information System (GIS) compatible; and
2. Annual reports will:
   a. summarize annual wildlife inventory/monitoring,
   b. summarize monitoring results,
   c. protection measures implemented, and effectiveness of protection measures,
   d. note any trends across years
   e. identify and assess protection measures implemented during past years,
   f. specify monitoring and protection measures proposed for the upcoming year,
   g. recommend modifications to the existing wildlife monitoring/protection plan based on the successes and/or failures of past years, and
   h. identify additional species/categories to be monitored.

Where possible, the data presented in reports will be used to identify potential correlations between development and wildlife productivity and/or abundance, as well as sources of potential disturbance to wildlife. GIS will be used for information storage, retrieval, and planning, and annual GIS data updates will be conducted. Raw data collected each year will also be provided to other management agencies, at the request of the agencies.

The BLM will submit a final annual report to all potentially affected individuals and groups by early February of each year. Additional reports may be prepared in any year, as necessary, to comply with other relevant wildlife laws, rules, and regulations.

2.1.2 Meetings

A one-day meeting will be organized by the BLM and held in December (or as determined by the BLM) of each year to discuss and modify, as necessary, proposed wildlife inventory, monitoring, protection protocol, and analysis of protection measures for the subsequent year. Decisions regarding annual Operator-specific financing and personnel requirements will be made at these meetings. A protocol for accommodating previously unidentified development sites will also be determined during the annual meeting. Final decisions will be made by the BLM based on the input of all affected parties. Additional meetings may be required as necessary.

Additional meetings may be held in any given year as necessary to inform and update cooperators on the findings of additional reports.

2.2 Annual Inventory and Monitoring

Inventory/monitoring is the process of gathering field data on wildlife distribution, numbers, and/or composition. This includes traditional wildlife range determination and habitat association inventories. It also encompasses population monitoring which is the process of detecting a demographic (e.g., growth rate, recruitment and mortality rates) or distributional change in a population over the course of repeated inventories and relating these changes to either natural processes (e.g., winter severity, predation) or human-related activities (e.g., animal harvesting, mining, forestry, urban development, etc.). Population monitoring may include the development and use of population models that integrate existing demographic information (including harvest) on a species. Inventory/monitoring also includes the process of compiling general (overview) information on the historical and current abundance and distribution of a species, its habitat requirements, rate of population change, and limiting factors (species statistics). Species statistics enable prioritization of animal inventories and population monitoring. All of these activities are included under the term inventory/monitoring (Ministry of Environment, Lands and Parks, November 1998).

Monitoring studies are more site- and problem-specific than inventories. Longer-term monitoring studies better estimate fluctuations in wildlife uses of habitat. Conducting longer-term monitoring of wildlife species is more efficient and accurate for determining how certain land use practices affect wildlife and habitats. Inventories and monitoring procedures are grouped together here because usually the monitoring studies will result from the implementation of the CD-C project and will be based on a combination of these inventory and monitoring results. Monitoring studies involve collecting wildlife and habitat information over time to determine: (1) wildlife use of habitat components; (2) effects of certain land uses (e.g. well pads, roads, human activity in the field) on certain wildlife and habitats; (3) species or habitat changes caused by project implementation, as well as certain natural environmental conditions (e.g., drought); (4) accuracy of predictive models; (5) improvement in the accuracy of predictive models; (6) additional mitigation to protect wildlife and habitat in an area (i.e., from new data, new stipulations may be recommended or required to protect a species and its habitat); and (7) additional habitat improvement to benefit a species or habitat of concern. These actions can determine if the management objectives in the CD-C EIS are being met, can improve a biologist's predictive models (Cooperrider et. al., 1986), and are basically the fundamentals of adaptive management.

The most critical stage of implementing and completing an inventory/monitoring study is not data collection, presentation, or interpretation, but rather design. Years of data can be useless if a study is poorly designed. The use of this Plan, along with the BLM RFO Monitoring without Borders Program, can allow the BLM wildlife biologists to establish a flexible, systematic, and logical approach toward solving wildlife habitat management problems (Cooperrider et. al., 1986) within and adjacent to the CD-C project area. The inventory and monitoring protocols will be as identified below for each wildlife species/category. These protocols will be unchanged, except as authorized by the BLM or specified in this Plan. Additional wildlife species/categories and associated inventories and monitoring protocols may be added or may be omitted in future years, pending species status changes, as well as results presented in the coordinated review of annual reports. Opportunistic wildlife observations may be made throughout the year by agency and Operator personnel present in the project area.

The frequency of inventory and monitoring requirements will be dependent upon the level of development in the project area. In general, frequency will increase with increased levels of development. Monitoring results may lead to further, currently unidentified, scientific studies specifically designed to determine cause and effect. The BLM will identify the level of effort required by this Plan subject to these categories:

- Threatened, Endangered, Candidate, and Proposed Species (Special Status Species) (Plants/Animals) and associated habitats
- BLM Sensitive Species (Plants/Animals) and associated habitats

- Big Game and associated habitats
- Raptors and associated habitats
- Song birds, waterfowl, and shorebirds and associated habitats
- Amphibians, reptiles, and fish and associated habitats

Although site- and species-specific surveys will be conducted in association with Application for Permit to drill (APD) and right-of-way application field reviews, additional large-scale field work may be required based on need.

2.2.1 Special Status Species and Associated Habitat: Inventory and Monitoring Protocols

The BLM is required to conduct Section 7(a) consultation (or conferencing for proposed species) under the Endangered Species Act of 1973 (ESA) with the USFWS if there is the potential for a proposed project to impact any listed species (directly or indirectly) within the CD-C project area. Listed species or proposed species discovered incidentally may require further investigation and consultation (BLM 2011).

The level of inventory and monitoring required for Special Status Species will be commensurate with established protocols for the potentially affected species. Inventory and monitoring surveys for Special Status Species will be conducted by the BLM or a BLM-approved Operator-financed biologist in areas of potential habitat within the CD-C project area and all surveys will be conducted in coordination with the BLM. Methodologies and results of these surveys will be included in annual reports as required in **Table I-1**. A preliminary list of Special Status Species proposed for management and that are known to occur, or have the potential to occur, in the vicinity of the project area is shown in **Table 3.9-3, Chapter 3** of the EIS. As Special Status Species are added to or withdrawn from the USFWS, BLM, and/or WGFD lists, appropriate modifications reflecting these changes will be incorporated into this Plan and specified in annual reports.

Surveys for species or associated habitats will be implemented for the APD and/or right-of-way application processes. If any Special Status Species or habitats are observed, the observations will be noted on appropriate data forms (**Table I-2a**) and efforts will be made to determine species activities (e.g., breeding, nesting, foraging, hunting, etc.). If any management agency identifies a potential for concern regarding any of these species, additional inventory and monitoring and mitigation may be implemented as specified in annual reports.

Special Status Species data collected during surveys and described below will be provided only as necessary to those requiring the data for specific management and/or project development needs. Site- and species-specific Special Status Species surveys will be conducted as necessary in association with all APD and right-of-way application field reviews. It should be noted that the following species or their associated habitats are not known to occur in the CD-C project area; therefore, inventories for these species will not be required at this time: Preble's meadow jumping mouse, yellow-billed cuckoo, Wyoming toad, blowout penstemon plant, and the Colorado butterfly plant. The project is located outside of the North Platte River watershed; therefore there will be no downstream impacts from activities associated with the proposed CD-C project within the North Platte River watershed.

Black-footed Ferret (Endangered). The USFWS, in coordination with the WGFD, has developed a list of habitat blocks that are not likely to be inhabited by black-footed ferrets (block cleared). In these areas, take of individual ferrets and effects to a wild population are not an issue and surveys for ferrets are no longer recommended. Although ferret surveys are not required in these areas, the area may still maintain value for the survival and recovery of the species in the future. The CD-C project area is located within three Black-footed Ferret Non-Block Cleared Areas (Complexes) which include: (1) the Continental Divide Complex, (2) the Desolation Flats Complex, and (3) the Dad Complex. Individual projects that are located within potential black-footed ferret habitat will require consultation with the BLM and WGFD

and may require ferret surveys in areas that would likely result in a "take" of a black-footed ferret during project implementation.

BLM biologists will determine the presence/absence of prairie dog colonies at each proposed development site during the APD and right-of-way application field reviews and determine if these colonies meet the requirements for potential black-footed ferret habitat. In the event that a proposed project cannot be relocated, surveys will be conducted as deemed necessary, during consultation with the BLM, WGFD and USFWS. The prairie dog colonies in the project area will be mapped and burrow densities determined, if required, by a BLM-approved Operator-financed biologist in association with the proposed development plan. Colonies that meet USFWS criteria as potential black-footed ferret habitat (USFWS 1989), in non-block cleared areas, will be surveyed for black-footed ferrets by a USFWS-certified Operator-financed surveyor prior to BLM authorizing disturbance of these colonies. Black-footed ferret surveys will be conducted in accordance with USFWS guidelines and approved by BLM and USFWS (**Table I-2a**).

Ute Ladies'-Tresses Plant (Threatened). The Ute ladies'-tresses plant is located in riparian and wetland habitats between 4,300-7,000 feet in elevation. This species is not known to occur within the project area and the likelihood of occurrence is low; however, there is the potential of occurrence according to the USFWS. Locations of potential Ute ladies'-tresses plants within the CD-C project area will be mapped using the latest available aerial imagery, land use/land cover data (GAP and Landsat), and ground-truthing. This habitat information will be digitized into a GIS format and may be used to guide surveys for this threatened plant at the appropriate time of year (**Table I-2a**).

Colorado River Species (Endangered). The BLM is required to conduct Section 7(a) consultation with the USFWS for water depletions from the Colorado River Basin. It has been determined that upstream water depletions from this system may have a detrimental impact on four listed fish species and their Critical Habitat downstream. Depletions represent an annual reduction in the volume of stream flow that would have reached the Critical Habitat of the four endangered fish species residing in the Colorado River Basin. References for the water depletion determination form are located in **Table I-2a**.

2.2.2 BLM Wyoming State Sensitive Species (Plants/Animals) and Associated Habitats, Inventory and Monitoring Protocols

BLM Sensitive Species are species designated internally in accordance with BLM Manual 6840 (BLM 2008b). The document states: "*Actions authorized by the BLM shall further the conservation/recovery of federally listed species and conservation of Bureau sensitive species. Bureau sensitive species will be managed consistent with species and habitat management objectives in land use plans…to promote their conservation and to minimize the likelihood and need for listing under the ESA*."

Surveys to inventory and monitor BLM Wyoming State Sensitive Species (BLM Sensitive Species) will be conducted by the BLM or a BLM-approved Operator-financed biologist in areas of potential habitat within the CD-C project area. Information on the habitats and use of the project area is required and sources of this information include the BLM, Wyoming Natural Diversity Database (WYNDD), the WGFD, and the USFWS. In addition, surveys for site-specific species or associated habitats will be implemented at the APD and/or right-of-way application processes. If any BLM Sensitive Species or habitats are observed, the observations will be noted on appropriate data forms (**Table I-2a**) and efforts will be made to determine their activities (e.g., breeding, nesting, foraging, hunting, etc.). If any management agency identifies a potential for concern regarding any of these species, additional inventory, monitoring, and mitigation may be implemented as specified in annual reports.

2.2.2.1 BLM Sensitive Small Mammals and Associated Habitats

The long-eared myotis, fringed myotis, spotted bat, Townsend's big-eared bat, pygmy rabbit, Wyoming pocket gopher, and white-tailed prairie dog have been identified as BLM Sensitive Species in the RFO

and have the potential to occur within the CD-C project area. The swift fox and black-tailed prairie dog are also identified as BLM Sensitive Species in the RFO; however, they are not expected to occur within the CD-C project area.

Bat Species (long-eared myotis, fringed myotis, spotted bat, Townsend's big-eared bat). Long-eared myotis, fringed myotis, spotted bats and Townsend's big-eared bats inhabit conifer and deciduous forests, caves and mines, rock crevices, man-made structures and shrublands and have been observed within the CD-C project area. These bats could be both resident and migratory within the project area and utilize the project area for feeding; however, hibernation is unlikely because suitable habitat is limited. Inventory and monitoring specifically for bat species within the CD-C project area has not occurred; therefore, impacts to these species as a result of implementing the Proposed Action within the CD-C project area are not known. Acoustic bat surveys, bat carcass surveys, radar surveys and mist netting surveys are four (4) potential inventory and monitoring techniques that could be used to identify where bat species are present within the project area and potential impacts to these species. There is limited information pertaining to impacts to bat species as a result of natural gas drilling (**Table I-2a**).

Pygmy Rabbit. Pygmy rabbits are a sagebrush obligate and occur in basin prairie and riparian shrub and tall sagebrush in dense patches with sandy and loose soils. These rabbits are known to occur within the CD-C project area. The inventory and monitoring protocol for this species is identified in **Table I-2a**.

Wyoming Pocket Gopher. The Wyoming pocket gopher occurs in side-hills and ridge-tops, in cushion-plant communities within otherwise sagebrush-grasslands habitat. The species has the potential to occur within the CD-C project area. The inventory and monitoring protocol for this species is identified in **Table I-2a**. During 2009 interagency/industry survey efforts in the RFO followed WYNDD's protocol of trapping for three consecutive nights or until a pocket gopher was captured. Trapping procedures are referenced in Table 1-2a.

White-Tailed Prairie Dog. The white-tailed prairie dog inhabits sagebrush-grasslands and is located within the project area.

2.2.2.2 BLM Sensitive Upland Game Birds, Migratory Raptors, Songbirds, Shorebirds, Waterfowl and Habitats

The loggerhead shrike, sage thrasher, Brewer's sparrow, sage sparrow, white-faced ibis, trumpeter swan, long-billed curlew, bald eagle, ferruginous hawk, mountain plover, and burrowing owl species have been identified as BLM Sensitive Species in the RFO and have the potential to occur within the CD-C project area. These species have the potential to occur in the following habitats:

- Loggerhead shrike, sage thrasher, Brewer's sparrow, and sage sparrow occur within basin/prairie shrub and mountain foothills shrub habitats, sagebrush and are sagebrush obligate species.
- White-faced ibis inhabits marshes and wet meadows.
- Trumpeter swan inhabits lakes, ponds, and rivers.
- Long-billed curlew inhabits grasslands, plains, foothills and wet meadows.
- Bald eagle inhabits large rivers, streams and lakes, but have been observed in the project area primarily from November through April, forages on winter carrion and the nearest potential nesting habitat is along the Little Snake River nine miles south of the project area.
- Ferruginous hawk inhabits sagebrush-grasslands and has been found in the project area.
- Mountain plover inhabits grasslands and has been found within the project area.
- Burrowing owl has been observed in sagebrush-grasslands in the project area and has a close association with burrowing mammals such as prairie dogs, ground squirrels, and badgers.

The following species are also identified as BLM Sensitive Species in the RFO; however, they are not expected to occur within the CD-C project area: Baird's sparrow, Columbian sharp-tailed grouse, northern goshawk, and peregrine falcon.

The BLM has responsibilities under the Migratory Bird Treaty Act (MBTA) to analyze and protect all migratory birds. Most of North America's birds are migratory and migrate during the night, usually at higher altitudes when weather conditions are favorable. Songbirds are vulnerable to colliding with man-made structures such as buildings, communication towers, power-poles or even wind turbines during poor weather conditions that force them to lower altitudes (BLM 2011).

Bird surveys are required to estimate the temporal and spatial use of the CD-C project area and vicinity by birds. Fixed-point count surveys can be used as a tool to inventory for songbird, raptor and other groups of birds. Radar surveys using marine radar surveillance can also be used to determine avian species flight patterns in the project area (i.e. foraging movements and migration). Multiple sampling locations should be identified within the selected study areas and surveyed in consultation with the BLM and WGFD (**Table I-2a**).

Songbirds (loggerhead shrike, sage thrasher, Brewer's sparrow, sage sparrow). Bird surveys are required to estimate the temporal and spatial use of the CD-C project area and vicinity by these four BLM Sensitive bird species. Fixed-point count surveys can be used as a tool to inventory for these birds. Radar surveys using marine radar surveillance can also be used to determine their flight patterns in the project area (i.e. foraging movements and migration). Multiple sampling locations should be identified within the selected study areas and surveyed in consultation with the BLM and WGFD (**Table I-2**a).

Shorebirds (white-faced ibis, long-billed curlew). Ground surveys can be used during the breeding season, mitigation season (migratory) and the non-breeding season (winter) to determine species numbers. Aerial surveys and four-wheelers can be used for inaccessible areas (**Table I-2a**).

Waterfowl (trumpeter swan). In the event that surveys are required, aerial surveys in the fall and mid-winter will be conducted. Ground surveys can be used for areas that are inaccessible. Ground surveys are used to verify species composition of some swan flocks. The primary purpose of these surveys is to document the size of the U.S. trumpeter swan flocks and to enumerate the annual production of cygnets to fledgling age. The survey also provides some information on territorial occupancy and the distribution of failed breeders and non-breeders from year to year (USFWS 2011).

Bald Eagle. When bald eagles are located within a proposed project area, then surveys are required that include nest and production surveys, winter use surveys, and eagle flight patterns and use of the project area throughout all phases of the project. In addition, analysis or mitigation measures necessary to comply with the Bald and Golden Eagle Protection Act are required by the BLM in coordination with the USFWS (BLM 2011). The CD-C project area does not have any known nesting habitat for bald eagles; however, bald eagles may fly over the area and feed in the area during certain times of the year, especially winter.

Marine surveillance radar may be required to determine eagle flight patterns in the CD-C project area (i.e. foraging movements and migration). Multiple sampling locations should be identified within the area and surveyed in consultation with the BLM. In addition, telemetry studies (radio or satellite) may be required to determine eagle flight patterns in the CD-C project area (BLM 2011)

Ferruginous Hawk. Ferruginous hawks are found in mixed-grass prairie and sagebrush steppe habitats during the spring, summer, and fall and generally build nests on rock outcrops, the ground, and cliff ledges.

Ferruginous hawk surveys are required to: (1) identify nest densities occurring within the CD-C project area and (2) record nest locations to identify areas with a potential increased risk of disturbance or collisions for adults or young associated with nest sites (BLM 2011). Ferruginous hawk inventories will be conducted by the BLM at least every five years (as identified in annual reports), to determine the

location of new nests, based on funding availability. These surveys may be implemented aerially, via helicopter, or from the ground. Operators may provide financial assistance for aircraft rental, based on funding availability.

Breeding and nesting monitoring will be conducted annually between April and July at known nest locations by the BLM or a BLM-approved Operator-financed biologist, in order to ascertain nest activity status. Monitoring generally will be conducted from the ground, and attempts will be made to determine the cause of any documented nest failure. Operators may provide financial assistance for aircraft rental, as necessary. Site- and species-specific ferruginous hawk nest inventories will be conducted as necessary in association with all APD and right-of-way application field reviews.

All nest/productivity surveys will be conducted using procedures that minimize potential adverse effects to nesting ferruginous hawks. Specific survey measures for reducing detrimental effects are listed in Grier and Fyfe (1987) and Call (1978) and include the following:

a. Nest visits will be delayed for as long as possible in the nesting season;
b. Nests will be approached cautiously, and their status (e.g., nestlings/fledglings) will be determined from a distance with binoculars/scope;
c. Nests will be approached tangentially and in an obvious manner to avoid startling adults;
d. Nests will not be visited during adverse weather conditions (e.g., precipitation events, windy periods, and the hottest part of the day);
e. Visits will be kept as brief as possible;
f. All inventories will be coordinated by the BLM;
g. The number of nest visits in any year will be kept to a minimum; and
h. All raptor nest location data will be considered confidential.

Greater Sage-Grouse (Candidate). Greater Sage-Grouse depend on extensive areas of sagebrush for food and cover and their breeding grounds (leks) are located in open patches with sagebrush habitat. Grouse exhibit site fidelity to leks, winter and summer areas. Greater Sage-Grouse lek inventories will be conducted by the BLM and WGFD within and adjacent to the project area to determine lek locations. These surveys will use the WGFD protocol (**Table I-2a**). Surveys may be conducted aerially, based on funding availability, or on the ground, in order to determine lek locations and will follow the protocols identified in Table I-2a.

Selected leks, identified by the BLM, will be monitored annually to determine lek attendance by the BLM or a BLM-approved Operator-financed biologist, in coordination with the WGFD and using the WGFD protocol (**Table I-2a**). Monitoring will occur between April 1 and May 15, such that all leks within the CD-C project area are monitored at least once every 3 years. Population trend analysis may also be required and will be completed with a suitable nearby reference area. The BLM will direct lek monitoring efforts such that efforts are made to have the same individuals monitor the same leks within and across years. Data collected during these surveys will be provided on a standardized form (Table I-2a).

Helicopter surveys for wintering areas will occur when weather conditions provide the best opportunity for these types of surveys and will be scheduled between December 15 and February 30. These winter surveys should be flown at about 25 – 50 meters above ground at ¼-mile intervals. These surveys are designed to visually identify sage-grouse and/or their tracks (BLM 2011).

On September 22, 2015 the BLM published the Record of Decision and Approved Resource Management Plan Amendment for Greater Sage-Grouse (ARMPA (BLM 2015b). The ARMPA calls for the BLM, in coordination with the State of Wyoming and other stakeholders, to establish a monitoring framework for Sage-Grouse populations and habitat within Priority Habitat Management Areas (PHMAs). The monitoring framework will be incorporated into individual project approvals, as appropriate and

necessary(MD SSS 1).

The ARMPA also directs that the Sage-Grouse Habitat Assessment Framework (HAF) or best available assessment tool be used when assessing Sage-Grouse habitats at multiple scales (MD GMD 15). The HAF is described in ARMPA Appendix D, The Greater Sage-Grouse Habitat Management Strategy.

Mountain Plover. Mountain plover breeding habitat includes short-grass prairie and shrub-steppe landscapes, dry land, cultivated farms, and are frequently associated with prairie dog towns. Plovers usually nest on sites where vegetation is sparse or absent; conditions that can be created by herbivores, including domestic livestock and prairie dogs. Vegetation in shortgrass prairie sites is typically less than 4 inches tall. Nest sites within the shrub-steppe landscape are also confined to areas with little to no vegetation, although surrounded by areas visually dominated by shrubs. Commonly, nest sites within shrub-steppe areas are on active prairie dog towns. Nests are commonly located near a manure pile or rock. In addition to areas disturbed by prairie dogs or livestock, nests have also been found on bare ground created by oil and gas development activities and on dryland, cultivated agriculture in the southern part of their breeding range. Mountain plovers are rarely found near water. Positive indicators for mountain plovers therefore include level terrain, prairie dogs, bare ground, cactus pads, cattle, widely spaced plants, and horned larks. It would be unusual to find mountain plovers on sites characterized by irregular or rolling terrain, dense, matted vegetation, grass taller than 4 inches, wet soils, or the presence of killdeer.

Mountain plover habitat within the CD-C EIS has been mapped within the project area; however, standard site-specific habitat surveys will be conducted as necessary in association with all APD and right-of-way application field reviews. Surveys, if required, will be conducted by the BLM or a BLM-approved Operator-financed biologist to detect the presence of plovers. Surveys will generally be conducted during the period of April 24 through May 10 to determine presence/absence of mountain plovers and June 25 through July 10 to determine density of nesting mountain plovers (**Table I-2a**). These dates may change after consultation with the USFWS and WGFD.

Burrowing Owl. Burrowing owls are commonly found in prairie dog towns, are migratory, breed throughout the plains and prairies of the western United States and winter in the southern United States and throughout Mexico. Federal and state laws prohibit the harming and killing of burrowing owls and the destruction of active nests.

Prairie dog colonies and other suitable burrowing owl nesting areas on and within 0.75 miles of existing and proposed disturbance areas will be searched for western burrowing owls by the BLM from April 15 through September 15 to determine the presence or absence of nesting owls within the CD-C project area (BLM 2011). If burrowing owls are found, attempts will be made to determine reproductive success. In addition, standard site-specific surveys will be conducted in association with all APD and right-of-way application field reviews.

2.2.2.3 BLM Sensitive Amphibians, Reptiles, and Fish Species and Associated Habitats

The northern leopard frog, Great Basin spadefoot toad, Colorado River cutthroat trout, roundtail chub, flannelmouth sucker, and bluehead sucker have been identified as BLM Sensitive Species in the RFO and have the potential to occur within the CD-C project area. The Western boreal toad and hornyhead chub are also identified as BLM Sensitive Species in the RFO; however, they are not expected to occur within the CD-C project area.

There are no sensitive reptile species identified in the CD-C project area at this time. If species are identified in the future, then presence/absence surveys and hibernacula/maternity den site searches will be required in sensitive reptile habitat (BLM 2011) at the CD-C project area and site-specific APD and/or right-of-way level.

Northern Leopard Frog and Great Basin Spadefoot Toad. Habitat mapping, Acoustic Breeding Surveys, and Visual Encounter Surveys (**Table I-2a**) can be used to determine if the northern leopard frog and Great Basin Spadefoot species are present within the CD-C project area and at the APD and/or right-of-way application process.

Colorado River Cutthroat Trout, Roundtail Chub, Flannelmouth Sucker, and Bluehead Sucker. At this time, the fish species inventory in the CD-C project area has been completed. BLM sensitive fish species population monitoring will continue to be conducted by the WGFD and the BLM. Monitoring for the associated habitats for sensitive fish species will be required and may include channel morphology, water quality, and in-stream habitat.

2.2.2.4 BLM Sensitive Plant Species and Associated Habitats

The meadow milkvetch, Cedar Rim thistle, Gibbens' beardtongue, and persistent sepal yellowcress plants have been identified as BLM Sensitive Species in the RFO and have the potential to occur within the CD-C project area. The many-stemmed spider flower, Laramie columbine, dune wild rye, Laramie false sagebrush, and limber pine are also identified as BLM Sensitive Plant Species in the RFO; however, they are not expected to occur within the CD-C project area.

Locations for BLM Sensitive Plant Species within the CD-C project area will be mapped using the best available data from WYNDD modeling and ground-truthing. This habitat information will be digitized into a GIS format and may be used to guide these plant surveys at the appropriate time of the year (BLM 2011).

Meadow Milkvetch, Cedar Rim Thistle, Gibbens' Beardtongue, and Persistent Sepal Yellowcress Plants. Sensitive plant surveys will be required within the CD-C project area. In addition, surveys for site-specific species or associated habitats will be implemented at the APD and/or right-of-way application processes to determine the potential to affect these plant species (**Table I-2a**).

2.2.3 Big Game and Associated Habitats

Data on big game use of crucial winter ranges and migration corridors within and adjacent to the project area will be requested by the BLM from the WGFD, as deemed necessary by the BLM. Surveys are required to fully understand the big game use in the project area and the associated impacts that may occur (BLM 2011). This information will be used to assess the effectiveness of protection measures implemented for the project. In the event that BLM, in consultation with the WGFD and other interested parties, determines that additional data should be collected for big game, these issues will be discussed at the annual meeting.

Big Game Crucial Winter Range. A radio or satellite telemetry study will be developed in cooperation between the BLM and WGFD to monitor the use of big game crucial winter range within the CD-C project area. In addition, Pellet Count Surveys can be used to evaluate the seasonal spatial distribution of big game species based on the presence of pellet groups.

Shrub age can be an important aspect, within mule deer habitat, often indicating that older-aged plants are more typical with most inventory and monitoring studies. Older plants typically produce leaders with greater lignin, greater secondary compounds which limit digestibility and less vigor. Current research in various locations (e.g., Colorado, Idaho, Nevada, Utah) have identified nutrition as an aspect currently limiting mule deer's ability to increase in numbers. This occurs in both winter ranges as well as transitional ranges for mule deer (BLM JIO-PAPO, 2012).

Big Game Migration Corridors. A radio or satellite telemetry study will be developed in cooperation between the BLM and WGFD to determine movement of big game and potential migration corridors within the CD-C project area.

2.2.4 Raptors and Associated Habitats

Raptor surveys are required to: (1) identify the species and nest densities occurring within the CD-C project area and (2) record raptor nest locations to identify areas with a potential increased risk of disturbance or collisions for adults or young associated with nest sites (BLM 2011). Raptor inventories will be conducted by the BLM at least every five years (as identified in annual reports), to determine the location of new raptor nests, based on funding availability. These surveys may be implemented aerially, via helicopter, or from the ground. Operators may provide financial assistance for aircraft rental, based on funding availability.

Breeding and nesting monitoring will be conducted by the BLM or a BLM-approved Operator-financed biologist, annually, at known nest locations, between February and August, in order to ascertain nest activity status. Monitoring generally will be conducted from the ground, and attempts will be made to determine the cause of any documented nest failure. Operators may provide financial assistance for aircraft rental, as necessary. Site- and species-specific raptor nest inventories will be conducted as necessary in association with all APD and right-of-way application field reviews.

All raptor nest/productivity surveys will be conducted using procedures that minimize potential adverse effects to nesting raptors. Specific survey measures for reducing detrimental effects are listed in Grier and Fyfe (1987) and Call (1978) and are located in **Section 2.2.2.2, Inventory/Monitoring Protocol for Ferruginous Hawks**.

Winter use raptor surveys are required to (1) identify the species and winter densities occurring within the CD-C project area and (2) record raptor hunting use areas with a potential increased risk of disturbance or collisions for raptors to predict potential impacts. Suitable raptor perch sites such as cliffs, rock outcrops, man-made structures, tree tops, and areas of relatively high prey densities should be searched for hunting raptors. Helicopters can be used for these surveys; however, care should be taken to minimize disturbance to raptors during surveys (BLM 2011).

2.2.5 Songbirds, Waterfowl, and Shorebirds and Associated Habitats

The BLM has responsibilities under the MBTA to analyze and protect all migratory birds. Bird surveys are required to estimate the temporal and spatial use of the CD-C project area and vicinity by birds (see **Section 2.2.2.2**). Marine surveillance radar surveys and ground surveys such as point counts, line transect surveys, and spot mapping could be used to determine presence of these species.

Point count surveys can be used as a tool to determine songbird and other groups of birds. Radar surveys using marine radar surveillance can also be used to determine avian species flight patterns in the project area (i.e. foraging movements and migration). Multiple sampling locations should be identified within the selected study areas and surveyed in consultation with the BLM and WGFD (**Table I-2a**).

2.2.6 Amphibians, Reptiles, and Fish and Associated Habitats

Amphibian surveys would be required since there are riparian habitats or playas within the CD-C project area. In addition, surveys for site-specific species or associated habitats will be implemented at the APD and/or right-of-way application processes to determine the potential to affect amphibians, reptile and fish species.

Amphibian Species and Associated Habitats. Habitat mapping, Acoustic Breeding Surveys, and Visual Encounter Surveys (**Table I-2a**) can be used to determine amphibian species presence within the CD-C project area and at the APD and/or right-of-way application process.

Reptile Species and Associated Habitats. Presence/absence surveys and hibernacula/maternity den site searches will be required in potential reptile habitat (BLM 2011) at the CD-C project area and site-specific APD and/or right-of-way level.

Fish Species and Associated Habitats. The use of hydroacoustics, gill netting, seining, and electrofishing by boat, canoe, or backpack can be used to measure fish abundance and distribution (AZGFD 2009, Taylor and Maxwell 2007).

2.2.7 General Wildlife Species

BLM staff will be responsible for maintaining records of selected wildlife species observed during the course of their activities on the project area. Operator personnel may also provide data on wildlife observations. The information provided will include observations of wildlife species, their numbers, location, activity, and other pertinent data as applicable and identified on the General Wildlife Observation Data Sheet (**Table I-2a**). Where Operators are uncertain of the United States Geological Survey (USGS) coordinates for an observation, a general description of the location may be provided and in instances where species or sex information is questionable, Operators will identify the observation as such.

Additional inventory and monitoring measures may be applied for other species as specified in annual reports (**Table I-1**). Surveys will be conducted in adherence with protocol to be established by the BLM, other agencies and Operators, and Operators may provide financial assistance for these inventory and monitoring investigations (**Table I-2a**).

2.3 Determine and Implement Protection Measures, Effects Analysis, and Apply Adaptive Management

Long-term studies and monitoring programs identified above, along with implementing protection measures, should be established to evaluate and compare the effectiveness of various mitigation techniques. Efforts should be made to continually integrate monitoring data into adaptive management strategies, including making individual and compiled results available to industry and agencies to improve energy-development and mitigation techniques. Opportunities to enable agencies, conservation organizations, and energy companies to collaboratively interact and contribute data should be identified (WGFD 2010). Evaluations of the biological response of focal species are integral to assessing success in delivering conservation programs (Naugle 2011).

During project development, the BLM is responsible to manage or restore habitat to conserve, recover, and maintain species populations consistent with the CD-C EIS and Rawlins RMP (BLM 2008a) plans. The Rawlins RMP states that a full range of mitigation options will be considered when developing mitigation for project-level activities, including those located within the CD-C project area. The wildlife protection measures proposed herein have been developed from past measures identified for oil and gas developments in Wyoming and are basically tools to implement while exercising adaptive management. Additional measures may be included and/or existing measures may be modified in any given year as allowable and as deemed appropriate by BLM in consultation with other agencies, Operators, and interested parties. These measures will be specified in annual reports (**Table I-1**). Protection measures will be implemented by Operators with assistance from and/or in consultation with the BLM. In addition, these measures may be modified on a site-specific basis as deemed appropriate by the BLM after completion of the APD and right-of-way application field reviews.

The principal protection measure for most wildlife will be species- and project-specific measures as well as general wildlife and associated habitat protection measures. The implementation of these measures may also benefit other wildlife species found on and adjacent to the project area. Sensitive and crucial habitats should be avoided where possible. Protection measures (e.g., BMPs identified in the Rawlins RMP and CD-C EIS, **Appendix C**) will be applied based on the analysis of information gathered through inventory and monitoring. These BMPs are included in the Rawlins RMP and CD-C EIS and include, but are not limited to, measures such as timing restrictions to protect species and habitat from disruptive activities during critical periods, modifications of BLM fences to allow big game species greater freedom

of movement to avoid disruptive activities, and vegetation treatments, such as herbicide treatments, seeding, prescribed burning, cutting/chopping for regeneration, planting shrubs or trees, or fertilization. The process of adaptive management will be used to determine the effectiveness of BMPs and necessary changes in conservation management will be made if identified. This process allows ineffective management actions to be modified, or new actions implemented, to reduce impacts to wildlife from development.

The Nature Conservancy's (TNC) *Energy by Design – Cooperative Mitigation Planning for the CD-C Gas Field* (**Appendix G**) is a science-based approach designed to reduce conflicts and steer development away from conservation priorities, increase the cost-effectiveness of mitigation, and direct funding to higher-value conservation. The project blends landscape-level conservation with the mitigation hierarchy including: (1) avoid; (2) minimize/restore; and (3) offset to improve mitigation efforts. This is accomplished in a four step process which includes the following;

a. Develop a landscape conservation plan (or use an existing landscape plan);
b. Blend landscape conservation planning with mitigation hierarchy to evaluate conservation and development conflicts;
c. Determine the residual impacts associated with development and select an optimal offset portfolio; and then
d. Estimate the offset contribution to conservation goals.

TNC's final report for the CD-C project area was completed on August 1, 2009. Protection measures and adaptive management for the CD-C project area could be identified from this plan.

The *Wyoming Landscape Conservation Initiative* (WLCI) was created in 2007 as a multi-agency and stakeholders' initiative designed to maintain and enhance wildlife habitat and other resource values within energy development and other changes. Partners are conducting science-based research and monitoring, completing habitat enhancements and restoration, encouraging effective reclamation and mitigation practices, identifying and prioritizing landscape-scale conservation work, and promoting grazing practices which benefit wildlife, ranchers, and open-space conservation. Initial funding for this program has come through federal appropriations and projects to date have included fence modifications and exclosure fencing, prescribed burns, riparian enhancements, invasive species treatments, river restoration, and conservation easements (WGFD 2010). Protection measures and adaptive management for the CD-C project area could be identified from this plan.

2.3.1 Special Status Species and Associated Habitats: Protection Measures (Adaptive Management)

The level of protection required for Special Status Species is obligatory under the ESA. If crucial features for any Special Status Species are found during on-site surveys of the proposed project, avoidance of these features will be required first. In the event this is not feasible, the BLM will conference and/or consult and coordinate with the USFWS to determine and implement the most effective protection measures required to protect Special Status Species and their habitats. Habitat and species conservation measures for Special Status Species are identified in the Rawlins RMP (BLM 2008a) biological assessment and the biological opinion. Both documents will be adhered to for compliance with the ESA and conservation measures will be applied to all surface-disturbing and disruptive activities, as appropriate. In the event that a Special Status Species is observed, especially during construction activities, work at the project site will be curtailed until there is concurrence between BLM and the USFWS on what activities can be authorized. Activities will, in most cases, be delayed until such time that no adverse effects will occur.

The Rawlins RMP requires the BLM maintain, restore, or enhance Special Status Species, as well as Sensitive Species habitat to prevent listing under the ESA, in coordination with other local, state and

federal agencies. It is assumed that the protocol specified for general wildlife will likely benefit Special Status Species as well. If any management agency identifies a potential for impacts to any Special Status Species, additional measures may be implemented as specified in annual reports.

Black-footed Ferret. Habitat and species conservation measures for the black-footed ferret are identified in the Rawlins RMP (BLM 2008a) biological assessment and the biological opinion. Both documents will be adhered to for compliance with the ESA and conservation measures will be applied to all surface-disturbing and disruptive activities, as appropriate. These protection measures are identified to reduce impacts to the black-footed ferret within the CD-C project area (Rawlins RMP, page 2-54). If black-footed ferrets are found on the project area, the USFWS will be notified immediately and formal consultations will be initiated to develop strategies that ensure no adverse effects to the species. Before ground-disturbing activities are initiated in black-footed ferret habitat, authorizations to proceed must be received from the BLM, in consultation with the USFWS.

Ute Ladies'-Tresses Plant. Habitat and species conservation measures for the Ute ladies'-tresses plant are identified in the Rawlins RMP (BLM 2008a) biological assessment and the biological opinion. Both documents will be adhered to for compliance with the ESA and conservation measures will be applied to all surface-disturbing and disruptive activities, as appropriate. These protection measures are identified to reduce impacts to the Ute ladies'- tresses plant within the CD-C project area (Rawlins RMP, page 2-54).

Colorado River Fish Species. Habitat and species conservation measures for Colorado River fish species are identified in the Rawlins RMP (BLM 2008a) biological assessment and the biological opinion. Both documents will be adhered to for compliance with the ESA and conservation measures will be applied to all surface-disturbing and disruptive activities, as appropriate. These protection measures are identified in the Rawlins RMP, page 2-54.

2.3.2 BLM Wyoming State Sensitive Species (Plants/Animals) and Associated Habitats: Protection Measures (Adaptive Management)

Surface-disturbing and disruptive activities that would potentially affect the habitat of Special Status Species will be intensively managed on a case-by-case basis. In addition, surface-disturbing and disruptive activities will be intensively managed to minimize impacts on identified crucial habitat for sensitive species for the purpose of protecting these species and their associated habitats. Coordination with the WGFD will allow the *Recommendations for Development of Oil and Gas Resources Within Important Wildlife Habitats* management actions to be implemented to reduce impacts to BLM sensitive species (**Table I-2b**).

2.3.2.1 BLM Sensitive Small Mammals and Associated Habitats

Bat Species (long-eared myotis, fringed myotis, spotted bat, Townsend's big-eared bat). Habitat and species protection measures for BLM sensitive bat species are identified in the Rawlins RMP (BLM 2008a). These protection measures are identified to reduce impacts to bat species within the CD-C project area (Rawlins RMP, page 2-54). In addition, all open vent stack equipment shall be designed and constructed to prevent bat use and potential mortalities.

Pygmy Rabbit. Habitat and species protection measures for the pygmy rabbit are identified in the Rawlins RMP (BLM 2008a). These protection measures are identified to reduce impacts to the pygmy rabbits within the CD-C project area (Rawlins RMP, page 2-54). The BLM has identified additional protection measures to reduce impacts to this species.

Wyoming Pocket Gopher. Habitat and species protection measures for the Wyoming pocket gopher are identified in the Rawlins RMP (BLM 2008a). These protection measures are identified to reduce impacts to the Wyoming pocket gopher within the CD-C project area (Rawlins RMP, page 2-54). To protect the identified Wyoming pocket gopher and associated habitat, the BLM has identified additional protection

measures to reduce impacts to this species. The survey protocol is available from the BLM Rawlins Field Office upon request.

White-tailed Prairie Dog. Habitat and species protection measures for the white-tailed prairie dog are identified in the Rawlins RMP (BLM 2008a). These protection measures are identified to reduce impacts to the white-tailed prairie dog within the CD-C project area (Rawlins RMP, page 2-54 to 2-55).

2.3.2.2 BLM Sensitive Upland Game Birds, Migratory Raptors, Songbirds, Shorebirds, Waterfowl and Habitats

Habitat and species protection measures for the BLM Sensitive raptors, songbirds, shorebirds and waterfowl are identified in the Rawlins RMP (BLM 2008a). These protection measures are identified to reduce impacts to upland game birds, migratory raptors, songbirds, shorebirds, and waterfowl within the CD-C project area (Rawlins RMP, page 2-52 to 2-55). These are required to comply with both the Rawlins RMP and the MBTA.

Songbirds (loggerhead shrike, sage thrasher, Brewer's sparrow, sage sparrow). All open vent stack equipment shall be designed and constructed to prevent avian mortalities due to bird use and perching. In addition, nesting habitats could be treated with nitrogen fertilizers (BLM 2008c).

Shorebirds (white-faced ibis, long-billed curlew). Protection measures that could reduce impacts to nesting shorebirds would be implemented on surface-disturbing and disruptive activities located near water habitats such as mudflats, salt ponds, marshes, rocky shores and agricultural fields (USFWS 2011).

Waterfowl (trumpeter swan). Protection measures that could reduce impacts to waterfowl would be implemented on surface-disturbing and disruptive activities located near water habitats such as wetland, and marshes (Wetlands Regional Monitoring Program Plan 2002). In addition, not permitting the use of open pits (Naugle 2011) in the natural gas field would reduce impacts to waterfowl species.

Bald Eagle and Ferruginous Hawk. Habitat and species protection measures for the bald eagle and ferruginous hawk are identified in the Rawlins RMP (BLM 2008a), pages 2-53 to 2-55. These protection measures are identified to reduce impacts to the bald eagle and ferruginous hawk within the CD-C project area. Protection protocol will be as described for raptors (See **Section 2.3.1**). Additional measures will be applied on a species- or site-specific basis, as deemed appropriate by the BLM and/or USFWS, and specified in annual reports.

Greater Sage-Grouse. Habitat and species protection management actions for greater sage-grouse are identified in ARMPA. The ARMPA provides consistent habitat management across the range of the Greater Sage-Grouse using management tools that would assure a net conservation gain to the Sage-Grouse within PHMAs (Core areas) and within General Habitat Management Areas (GHMAs). Those tools will be applied to oil and gas development in the CD-C project area under the Proposed Action and all alternatives, including the No Action Alternative. **Section 2.2.7.9** of the Final EIS**, Management of Greater Sage Grouse,** provides a summary of the principal management tools from the ARMPA that will be at work in the CD-C project area. A complete description of the tools can be found in the ARMPA, available at: https://eplanning.blm.gov/epl-front-office/projects/lup/9153/63189/68431/002_Wyoming_ARMPA_Main-Body.pdf

Mountain Plover. Habitat and species protection measures for the mountain plover are identified in the Rawlins RMP (BLM 2008a). These protection measures are identified to reduce impacts to the mountain plover within the CD-C project area (Rawlins RMP, page 2-52 to 2-55). Mountain plover habitat will be avoided where practical due to the presence of alternative well and road development sites. Where these habitats will be disturbed, reclamation will utilize procedures designed to reestablish suitable plover habitat. The primary protection measure for mountain plover on the project area will be avoidance plover habitat during the breeding season.

Burrowing Owl. Habitat and species protection measures for the burrowing owl are identified in the Rawlins RMP (BLM 2008a). These protection measures are identified to reduce impacts to the burrowing owl within the CD-C project area (Rawlins RMP, page 2-53 to 2-55).

2.3.2.3 BLM Sensitive Amphibians, Reptiles, and Fish Species and Associated Habitats

Habitat and species protection measures for the BLM sensitive amphibian, reptile and fish species are identified in the Rawlins RMP (BLM 2008a), page 2-54. In addition, a portion of the Upper Muddy Creek/Grizzly Wildlife Habitat Management Area occurs within the CD–C project area (Rawlins RMP, page 2-41) which affords additional protection measures for Colorado River fish species unique to the Muddy Creek watershed.

2.3.2.4 BLM Sensitive Plant Species and Associated Habitats

Habitat and species protection measures for the BLM sensitive plant species are identified in the Rawlins RMP (BLM 2008a). These protection measures are identified to reduce impacts to sensitive plant species within the CD-C project area (Rawlins RMP, page 2-54 to 2-55).

Operators will finance site-specific surveys for BLM Sensitive Plant Species prior to any surface disturbance in areas determined by the BLM to contain potential habitat for such species (BLM 2008b). These surveys will be completed by a qualified botanist as authorized by the BLM and this botanist will be subject to the BLM's 6840 policy requirements. Data from these surveys will be provided to the BLM, and if any sensitive plants or habitats are found, BLM recommendations for avoidance of the proposed project location will be implemented (BLM 2008c).

Meadow Milkvetch, Cedar Rim Thistle, Gibbens' Beardtongue and Persistent Sepal Yellowcress Plants. In extreme cases when the proposed project cannot be relocated, then seed-banking of these plants from the disturbance location would be recommended to attempt off-site propagation, since most of the common techniques such as off-site compensation or habitat restoration have proven largely unsuccessful (BLM 1997).

2.3.3 Big Game Species and Associated Habitats: Protection Measures (Adaptive Management)

Big Game Crucial Winter Range. The Rawlins RMP (BLM 2008a) requires the BLM to maintain, restore, or enhance habitat function in crucial winter range, including those areas located within the CD-C project area. Habitat and species protection measures for the big game species and their habitats are identified in the Rawlins RMP. These protection measures are identified to reduce impacts to big game species within the CD-C project area (Rawlins RMP, page 2-53 to 2-54). In addition, a portion of the Upper Muddy Creek/Grizzly Wildlife Habitat Management Area occurs within the CD–C project area (Rawlins RMP, page 2-41) which affords additional protection measures for elk and mule deer crucial winter range. Coordination with the WGFD will allow the *Recommendations for Development of Oil and Gas Resources Within Important Wildlife Habitats* management actions to be implemented to reduce impacts to big game species (**Table I-2b**).

Snow fences, if used, will be limited to segments of ¼ mile or less. Project personnel will also be advised to minimize stopping and exiting their vehicles in big game winter habitat during crucial winter periods. In addition, escape openings will be provided along roads in big game crucial winter ranges, as designated by the BLM, to facilitate exit of big game animals from snowplowed roads. The use of gates on roads within development areas would also preclude or limit motorized public access in sensitive wildlife areas. Additional habitat protection and/or improvement measures may also be applied in any given year as directed by the BLM, in consultation with Operators and other agencies, and specified in annual reports.

There are several projects that can be implemented to improve habitat and use for big game species which include, but are not limited to: (1) fertilization projects which help offset direct and indirect habitat losses by increasing sagebrush production, enhancing available winter forage and potentially increasing

palatability and nutrient quality for wintering big game (specifically mule deer) (BLM 2012, BLM 2008c); (2) closing roads from January 1-April 30 each year to protect big game from disruptive human activity which, during difficult winter months, can increase the mortality rate for these animals and patrolling the areas is required to allow the BLM to educate the public, distribute maps, answer questions, deter violators, encourage the public to report violations, and issue citations when needed; (3) implement chemical thinning treatments (tebuthiuron, or Spike™) to increase forage variety, quantity and quality and improve the big sagebrush and mountain shrub age-class structure; (4) establish conservation easements; (5) implement fence modification projects; (6) implement prescribed fire treatments for big game species (e.g., spring and fall ranges should focus on herbaceous component to help does with fawning and winter ranges should focus more on shrubs and shrub productivity); (7) seeding after fires; (8) mechanical treatments such as crushing with an aerator and including seeding in the treatment; (9) chaining, disking and imprinting pipe harrowing and aerating; (10) mowing; (11) other vegetation treatments such as planting of shrubs and aspen; and (12) control of invasive weeds (BLM 2012).

Big Game Migration Corridors. Big game migration corridor habitat protection measures are identified in the Rawlins RMP (BLM 2008a). These protection measures are identified to reduce impacts to big game species within the CD-C project area (Rawlins RMP, page 2-54). Surface-disturbing and disruptive activities will be managed, on a case-by-case basis, in identified big game migration and transitional ranges to maintain their integrity and function for big game species in these areas. Although fences are not a direct result of natural gas development, fences that are identified to be a problem to big game migration, as a result of development, will be modified to meet BLM fence standards. New fences are allowed in big game migration corridors, provided they meet BLM fence standards.

2.3.4 Raptors and Associated Habitats Protection Measures (Adaptive Management)

The primary protection measure for raptor species on the project area will be avoidance of nest locations during the breeding season. Habitat and species protection measures for raptor species are identified in the Rawlins RMP (BLM 2008a). These protection measures are identified to reduce impacts to raptor species within the CD-C project area (Rawlins RMP, page 2-53). Coordination with the WGFD will allow the *Recommendations for Development of Oil and Gas Resources Within Important Wildlife Habitats* management actions to be implemented to reduce impacts to raptor species (**Table I-2b**)

The goshawk, osprey, and screech owl raptor species are located within the RFO area; however, they require different habitat types than those located within the CD-C project area and are highly unlikely to nest within the project area. In the rare event that one of these species is found, their breeding and nesting habitat will be protected by the protection measures found in the Rawlins RMP.

2.3.5 Songbirds, Waterfowl, and Shorebirds and Associated Habitats Protection Measures (Adaptive Management)

Habitat and species protection measures for songbirds, waterfowl, and shorebirds species are identified in the Rawlins RMP (BLM 2008a). These protection measures are identified to reduce impacts to songbirds, waterfowl, and shorebirds within the CD-C project area (Rawlins RMP, page 2-52 to 2-54). All open vent stack equipment shall be designed and constructed to prevent use birds and to discourage perching. Surface-disturbing and disruptive activities will be intensively managed. BMPs will be applied to surface-disturbing and disruptive activities to maintain or enhance habitat for these species ((BLM 2008a). Coordination with the WGFD will allow the *Recommendations for Development of Oil and Gas Resources Within Important Wildlife Habitats* management actions to be implemented to reduce impacts to songbirds, waterfowl, and shorebird species (**Table I-2b**).

2.3.6 Amphibians, Reptiles, and Fish and Associated Habitats Protection Measures (Adaptive Management)

Habitat and species protection measures for amphibian, reptile and fish species are identified in the Rawlins RMP (BLM 2008a). These protection measures are identified to reduce impacts to the amphibians, reptiles, and fish within the CD-C project area (Rawlins RMP, page 2-54). Coordination with the WGFD will allow the *Recommendations for Development of Oil and Gas Resources Within Important Wildlife Habitats* management actions to be implemented to reduce impacts to amphibian, reptile, and fish species (**Table I-2b**)

2.3.7 General Wildlife Species Protection Measures (Adaptive Management)

The Rawlins RMP (BLM 2008a) requires the BLM manage projects through facility placement and minimization of construction disturbance to maintain connectivity between large contiguous blocks of undisturbed habitat. Reclamation activities associated with proposed projects within the CD-C project area must include wildlife habitat objectives in the plans.

Unless otherwise indicated, the following protection measures will be applied for all wildlife species. Additional measures primarily designed to minimize impacts to other resources (e.g., vegetation and surface water resources, including wetlands, steep slopes, etc.) are identified in the EIS in **Chapter 4**, and these measures may provide additional protection for wildlife. Additional actions may be applied in any given year to further minimize potential impacts to wildlife. These actions will be specified in annual reports.

All roads on and adjacent to the project area that are required for the proposed project will be appropriately constructed, improved, maintained, and signed to minimize potential wildlife and vehicle collisions and facilitate wildlife (most notably big game) movement through the project area. Appropriate speed limits will be adhered to on all project roads, and Operators will advise employees and contractors regarding these speed limits. Some existing roads on the project area and surrounding transportation planning area may be reclaimed if they become redundant, and/or closed (gated and locked, year-round or seasonally) to deny unnecessary access.

To protect important habitat in portions of the project area (i.e., ephemeral draws dominated by basin big sagebrush), areas with sagebrush greater than three feet tall will be avoided where possible.

Additional non-species-specific wildlife mitigations that may reduce and/or eliminate potential impacts to species and associated habitats include the following:

a. Reserve, work-over, and flare pits and other locations potentially hazardous to wildlife will be adequately protected by netting and/or fencing as directed by the BLM to prohibit wildlife access.
b. If dead or injured raptors, big game, migratory birds, or unusual wildlife are observed on the project area, Operator personnel will contact the appropriate BLM and WGFD offices. Under no circumstances will dead or injured wildlife be approached or handled by Operator personnel.
c. Employee and contractor education will be conducted regarding wildlife laws. If violations are discovered on the project area, Operators will immediately notify the appropriate agency. If the violation is committed by an employee or contractor, said employee or contractor will be disciplined and may be dismissed by the Operator and/or prosecuted by the WGFD and/or USFWS.
d. Operators will implement policies designed to control off-site activities of operation personnel and littering, and will notify all employees (contract and company) that conviction of a violation can result in disciplinary action, including dismissal.
e. Use of smaller rigs, directional drilling, oak mats, and purpose-built rigs.
f. When studies become available that indicate the need for changes, modifications of timing or other stipulations would be implemented or deleted based on the findings.

Additional project- and site-specific mitigation measures may be added in future years, as specified in annual reports.

Table I-1: Summary of general wildlife meeting and reporting requirements

Action	Dates	Responsible Entity
Annual tentative plan of development	By November 15, annually	Operator using format identified in Table I-2a
Annual inventory, monitoring, protection measures, and effects analysis data will be completed	By November 15, annually	Operator using format identified by the BLM for the annual report
Annual reports	Annually: Final–early February	BLM will review and determine if requirements are being met
Annual meeting	December and as necessary	BLM with participation by other agencies and Operators

Table I-2a: Summary of references for wildlife inventory and monitoring requirements

Special Status Species; BLM Sensitive Species; Big Game Crucial Winter Range and Migration Corridors; Raptors; Songbirds, Waterfowl, and Shorebirds; Amphibians, Reptiles, and Fish; and General Wildlife Species and Associated Habitats located within and adjacent to the CD-C project area (Operators will be required to use the inventory and monitoring protocols identified below for each species in this table. Changes to the protocols will be based on decisions made by the BLM and will be discussed at the Monitoring without Borders Meetings held each year and at other meetings as deemed appropriate)	
Species / Associated Habitat	**Inventory and Monitoring Requirements**
Threatened, Endangered, Candidate, and Proposed Species (Special Status Species)	
Black-footed Ferret (E) (*Mustela nigripes*)	(CD/WII EIS [BLM 2000] and BLM 2008a – Wildlife and Fisheries p. 2-51 to 2-55; Appendices 8, 10, 14, 15, 17, 26, and 36)
	Habitat, Species: WGFD: WY Wyoming State Wildlife Action Plan- 2010 (WY SWAP 2010) Species Accounts p. IV-2-20 to 2-11; Habitat Section-Sagebrush Shrublands p. III-9-12 to 9-15, Desert Shrublands p. III-3-8 to 3-10
	USFWS 1989. Black-footed Ferret Survey Guidelines for Compliance with the Endangered Species Act. Denver, Colorado, and Albuquerque, New Mexico: U.S. Fish and Wildlife Service. April 1989. 10 pp. + appendices.
Ute Ladies'-Tresses Plant (T) (*Spiranthes diluvialis*)	BLM 2008a – Wildlife and Fisheries p. 2-51 to 2-55; Appendices 8, 10, 14, 15, 17, 26, and 36; Vegetation p. 2-46 to 2-48.
	Habitat, Species: WGFD: WY SWAP 2010 Aquatic Basins p. III-13-17 to 13-19, Habitat Section-Riparian p. III-8-14 to 8-18, Wetlands p. III-10-11 to 10-13
	Rare Plant Mapping: *Bureau of Land Management High Desert District Wildlife and Plant Survey Protocols for Wind Energy Development*. Page13.
	BLM Buffalo Field Office Wildlife Surveys; <http://www.blm.gov/wy/st/en/field_offices/Buffalo/wildlife.html>
Colorado River Fish Species: bonytail (*Gila elegans*), Colorado pikeminnow (*Ptychocheilus lucius*), humpback chub (*Gila cypha*), razorback sucker (*Xyrauchen texanus*)	BLM 2008a – Wildlife and Fisheries p. 2-51 to 2-55; Appendices 8, 10, 14, 15, 17, 26, and 36
	Habitat, Species: WGFD: WY SWAP 2010 Aquatic Basins p. III-13-17 to 13-19, Habitat Section-Riparian p. III-8-14 to 8-18, Wetlands p. III-10-11 to 10-13
	Protection Measures: *Bureau of Land Management High Desert District Wildlife and Plant Survey Protocols for Wind Energy Development*. Appendix H.
BLM Sensitive Species	
Bat species: long-eared myotis (*Myotis evotis*), fringed myotis (*Myotis thysanodes*), spotted bat (*Euderma maculatum*), Townsend's big-eared bat (*Corynorhinus townsendii*)	BLM 2008a – Wildlife and Fisheries p. 2-51 to 2-55; Appendices 8, 10, 14, 15, 17, 26, and 36
	Habitat, Species: WGFD: WY SWAP Species Accounts p. IV-2-41, p. IV-2-27, p. IV-2-77 and p. IV-2-84; spotted bat- Habitat Section-Sagebrush Shrublands p. III-9-12 to 9-15, Aspen/Deciduous Forest p. III-1-11 to 1-13, Cliffs-Canyons-Caves and Rock Outcrops p. III-2-8 to 2-10, Habitat Section-Riparian p. III-8-14 to 8-18, Wetlands p. III-10-11 to 10-13
	Bat Carcass Survey, Bat Protection Plan: *Bureau of Land Management High Desert District Wildlife and Plant Survey Protocols for Wind Energy Development*. Page 3 and Appendix A.
	Goodbar, J. R. 1999. Oil and Gas Drilling in Cave and Karst Areas: A Process of Mitigating Impacts. Proceedings of the 1997 Karst and Cave Management Symposium, 13th National Cave Management Symposium, Bellingham, Washington and Chilliwack and Vancouver Island, BC, Canada, October 7-10, 1997. pp. 195-197.
	Bat Conservation International. Media and Information Literature Database. Literature Library. www.batcon.org

Table I-2a: Summary of references for wildlife inventory and monitoring requirements, *continued*

Species / Associated Habitat	Inventory and Monitoring Requirements
Pygmy rabbit (*Sylvilagus idahoensis*)	BLM 2008a – Wildlife and Fisheries p. 2-51 to 2-55; Appendices 8, 10, 14, 15, 17, 26, and 36
	Habitat, Species: WGFD: WY SWAP 2010 Species Accounts p. IV-2-70; Habitat Section-Sagebrush Shrublands p. III-9-12 to 9-15, Aspen/Deciduous Forest p. III-1-11 to 1-13
	Survey Protocol: *Bureau of Land Management High Desert District Wildlife and Plant Survey Protocols for Wind Energy Development*. Appendix F.
	BLM JIO-PAPO 2012. Pinedale Anticline Project Office, Bureau of Land Management, Pinedale Field Office. <http://www.wy.blm.gov/jio-papo/papo/index.htm>
Wyoming pocket gopher (*Thomomys clusius*)	BLM 2008a – Wildlife and Fisheries p. 2-51 to 2-55; Appendices 8, 10, 14, 15, 17, 26, and 36
	Habitat, Species: WGFD: WY SWAP 2010 Species Accounts p. IV-2-97, Desert Shrublands p. III-3-8 to 3-10
	Survey Protocol, Sampling Techniques: *Bureau of Land Management High Desert District Wildlife and Plant Survey Protocols for Wind Energy Development*. Appendix I.
White-tailed prairie dog (*Cynomys gunnisoni*)	BLM 2008a – Wildlife and Fisheries p. 2-51 to 2-55; Appendices 8, 10, 14, 15, 17, 26, and 36
	BLM JIO-PAPO 2012. Pinedale Anticline Project Office, Bureau of Land Management, Pinedale Field Office. <http://www.wy.blm.gov/jio-papo/papo/index.htm>
Swift Fox *(Vulpes velox)*	BLM 2008a – Wildlife and Fisheries p. 2-51 to 2-55; Appendices 8, 10, 14, 15, 17, 26, and 36
	Habitat, Species: WGFD: WY SWAP 2010 Species Accounts, p. IV-2-81; Habitat Section- Sagebrush Shrublands p. III-9-12 to 9-15
Songbirds: loggerhead shrike (*Lanius ludovicianus*), sage thrasher (*Oreoscoptes montanus*), Brewer's sparrow (*Spizella breweri*), sage sparrow (*Amphispiza belli*)	BLM 2008a – Wildlife and Fisheries p. 2-51 to 2-55; Appendices 8, 10, 14, 15, 17, 26, and 36
	Habitat, Species: WGFD: WY SWAP 2010 Species Accounts p. IV-1-29, p. IV-1-112 and p. IV-1-114; Habitat Section-Sagebrush Shrublands p. III-9-12 to 9-15, Foothill Shrublands p. III-4-10 to 4-12
	Fixed Point Count Surveys and Marine Surveillance Radar Surveys: *Bureau of Land Management High Desert District Wildlife and Plant Survey Protocols for Wind Energy Development.* pp 3–11.
Shorebirds: white-faced ibis (*Plegadis chihi*), long-billed curlew (*Numenius americanus*)	BLM 2008a – Wildlife and Fisheries p. 2-51 to 2-55; Appendices 8, 10, 14, 15, 17, 26, and 36
	Habitat, Species: WGFD: WY SWAP 2010 Species Accounts p. IV-1-85 and p. IV-1-136, Habitat Section-Riparian p. III-8-14 to 8-18, Wetlands p. III-10-11 to 10-13
	Develop water sources for wildlife in coordination with the WGFD and the BLM water Development Handbook {I-1741-0} (Casper FO RMP)
	Species Survey, Monitoring: U.S. Shorebird Conservation Plan: A Comprehensive Monitoring Program for North American Shorebirds. 2000. Pages 80–81
	Wetlands Regional Monitoring Program Plan 2002, Part 2: Data Collection Protocols Shorebirds, Gary W. Page, Point Reyes Bird Observatory, Stinson Beach CA and Nils Warnock, Point Reyes Bird Observatory, Stinson Beach CA

Table I-2a: Summary of references for wildlife inventory and monitoring requirements, *continued*

Species / Associated Habitat	Inventory and Monitoring Requirements
Waterfowl: trumpeter swan (*Cygnus buccinator*)	BLM 2008a – Wildlife and Fisheries p. 2-51 to 2-55; Appendices 8, 10, 14, 15, 17, 26, and 36
	Habitat, Species: WGFD: WY SWAP 2010 Species Accounts p. IV-1-125, Habitat Section-Riparian p. III-8-14 to 8-18, Wetlands p. III-10-11 to 10-13
	Trumpeter Swan Survey of the Rocky Mountain Population Winter 2011, U.S. Fish and Wildlife Service Migratory Birds and State Programs Mountain-Prairie Region Lakewood, Colorado, April 12, 2011 <http://www.fws.gov/mountain-prairie/species/birds/trumpeterswan/trumpeter_swan_survey_winter_2011.pdf>
	USFWS Red Rock Lakes National Wildlife Refuge. Mountain-Prairie Region. April 1, 2011 <http://www.fws.gov/redrocks/Refuge-Management-Trumpeter-Swan.htm>
Bald eagle (*Haliaeetus leucocephalus*)	BLM 2008a – Wildlife and Fisheries p. 2-51 to 2-55; Appendices 8, 10, 14, 15, 17, 26, and 36
	Habitat, Species: WGFD: WY SWAP 2010 Species Accounts p. IV-1-8, Habitat Section-Riparian p. III-8-14 to 8-18, Wetlands p. III-10-11 to 10-13
	Field Protocol for Spatially-Balanced Sampling of Landbird Populations. Hanni, D.J., C.M. White, R.A. Sparks, J.A. Blakesley, G.J. Levandoski, and J.J. Birek. 2010. Unpublished report. Rocky Mountain Bird Observatory, Brighton, CO. 34pp.
	Survey Protocol, Raptor Nesting/Habitat Surveys: *Bureau of Land Management High Desert District Wildlife and Plant Survey Protocols for Wind Energy Development.* pp3 – 11 and Appendix G
Ferruginous hawk (*Buteo regalis*)	BLM 2008a – Wildlife and Fisheries p. 2-51 to 2-55; Appendices 8, 10, 14, 15, 17, 26, and 36
	Habitat, Species: WGFD: WY SWAP 2010 Species Accounts p. IV-1-55; Habitat Section-Sagebrush Shrublands p. III-9-12 to 9-15
	Field Protocol for Spatially-Balanced Sampling of Landbird Populations. Hanni, D.J., C.M. White, R.A. Sparks, J.A. Blakesley, G.J. Levandoski, and J.J. Birek. 2010. Unpublished report. Rocky Mountain Bird Observatory, Brighton, CO. 34pp.
	Fixed Point Count Surveys and Marine Surveillance Radar Surveys: *Bureau of Land Management High Desert District Wildlife and Plant Survey Protocols for Wind Energy Development.* pp3 – 11
	Raptor Nesting/Habitat Surveys: *Bureau of Land Management High Desert District Wildlife and Plant Survey Protocols for Wind Energy Development*. Appendix G.
Greater Sage-Grouse (C) (*Centrocercus urophasianus*)	Annually from April to mid-May to determine lek activity. BLM or BLM-approved Operator-financed biologist. WGFD standard protocols/form required for grouse lek monitoring (CD/WII EIS [BLM 2000] BLM 2008a – Wildlife and Fisheries p. 2-51 to 2-55; Appendices 8, 10, 14, 15, 17, 26, and 36)
	At least every five years. BLM or BLM-approved Operator-financed biologist with Operator-provided financial assistance for aircraft rental will inventory for new leks. RFO (CD/WII EIS [BLM 2000] and BLM 2008a – Wildlife and Fisheries p. 2-51 to 2-55; Appendices 8, 10, 14, 15, 17, 26, and 36)
	Habitat, Species: WGFD: WY SWAP 2010 Species Accounts p. IV-1-69 to 1-70; Habitat Section-Sagebrush Shrublands p. III-9-12 to 9-15, Desert Shrublands p. III-3-8 to 3-10
	Greater Sage-Grouse Habitat Management Policy on Wyoming Bureau of Land Management (BLM) Administered Public Lands including the Federal Mineral Estate. Instruction Memorandum No. WY-2010-012. December 29, 2009. EMS Transmission: January 4, 2010.
	Wyoming Game and Fish Department Greater Sage-Grouse Lek Monitoring Techniques.

Table I-2a: Summary of references for wildlife inventory and monitoring requirements, *continued*

Species / Associated Habitat	Inventory and Monitoring Requirements
Greater Sage-Grouse (C) *continued*	**Monitoring Techniques, Survey Types:** *Bureau of Land Management High Desert District Wildlife and Plant Survey Protocols for Wind Energy Development*. Pages 11-12 and Appendix C.
	BLM JIO-PAPO 2012. Pinedale Anticline Project Office, Bureau of Land Management, Pinedale Field Office. <http://www.wy.blm.gov/jio-papo/papo/index.htm>
	In order to resolve conflicts with vegetation treatments adjacent to and within the CD-C project area, refer to the nine (9) steps in the *Wyoming Guidelines for Managing Sagebrush Communities with an Emphasis on Fire Management* (Wyoming Interagency Vegetation Committee 2002:12)
	Establish a monitoring framework for Sage-Grouse populations and habitat within PHMAs. The monitoring framework will be incorporated into individual project approvals as appropriate and necessary (ARMPA MD SSS 1) using HAF or the best available assessment tool when assessing Sage-Grouse habitats at multiple scales (ARMPA MD GMD 15).
Mountain plover (*Charadrius montanus*)	BLM 2008a – Wildlife and Fisheries p. 2-51 to 2-55; Appendices 8, 10, 14, 15, 17, 26, and 36
	Habitat, Species: WGFD: WY SWAP 2010 Species Accounts p. IV-1-92, Habitat Section-Desert Shrublands p. III-3-8 to 3-10
	Mountain Plover Survey Guidelines. U.S. Fish and Wildlife Service. April 2002.
	Annually from May to July. BLM or BLM-approved Operator-financed biologist. Standard form required for mountain plover monitoring.
	Survey Protocol, Survey Guidelines: *Bureau of Land Management High Desert District Wildlife and Plant Survey Protocols for Wind Energy Development*. Page 12 and Appendix D.
	Species Survey, Monitoring: *U. S. Shorebird Conservation Plan: A Comprehensive Monitoring Program for North American Shorebirds.* 2000. Pages 60-61
Burrowing owl (*Athene cunicularia*)	BLM 2008a – Wildlife and Fisheries p. 2-51 to 2-55; Appendices 8, 10, 14, 15, 17, 26, and 36
	Habitat, Species: WGFD: WY SWAP 2010 Species Accounts p. IV-1-33; Habitat Section-Sagebrush Shrublands p. III-9-12 to 9-15, Desert Shrublands p. III-3-8 to 3-10
	Survey Protocol: *Bureau of Land Management High Desert District Wildlife and Plant Survey Protocols for Wind Energy Development*. Page 8 and Appendix B.
Amphibians: northern leopard frog (*Rana pipiens*), Great Basin spadefoot toad (*Spea intermontana*)	BLM 2008a – Wildlife and Fisheries p. 2-51 to 2-55; Appendices 8, 10, 14, 15, 17, 26, and 36
	Habitat, Species: WGFD: WY SWAP 2010 Species Accounts p. IV-4-9, Habitat Section-Riparian p. III-8-14 to 8-18, Foothill Shrublands p. III-4-10 to 4-12, Wetlands p. III-10-11 to 10-13
	Habitat, Acoustic and Visual Survey Protocol: *Bureau of Land Management High Desert District Wildlife and Plant Survey Protocols for Wind Energy Development*. Page 7.
Fish: Colorado River cutthroat trout (*Oncorhynchus clarkii pleuriticus*), roundtail chub (*Gila robusta*), flannelmouth sucker (*Catostomus latipinnis*), and bluehead sucker (*Catostomus discobolus*)	BLM 2008a – Wildlife and Fisheries p. 2-51 to 2-55; Appendices 8, 10, 14, 15, 17, 26, and 36
	Habitat, Species: WGFD: WY SWAP 2010 Species Accounts p. IV-3-19, p. IV-3-68, p. IV-3-28 and p. IV-3-3; III-13-17 thru 13-19; Aquatic Basins p. III-13-17 to 13-19, Habitat Section-Riparian p. III-8-14 to 8-18, Wetlands p. III-10-11 to 10-13
	AZ Game and Fish Department Fish Survey Techniques 2009. <http://www.azgfd.gov/w_c/Fish_Survey_Techniques.shtml>
	Hydroacoustics: Lakes and Reservoirs. J. Christopher Taylor, Suzanne L. Maxwell. <http://www.stateofthesalmon.org/fieldprotocols/downloads/SFPH_p5-.pdf>

Table I-2a: Summary of references for wildlife inventory and monitoring requirements, *continued*

Species / Associated Habitat	Inventory and Monitoring Requirements
Meadow milkvetch plant (*Astragalus diversifolius var. diversifolius*)	BLM 2008a – Wildlife and Fisheries p. 2-51 to 2-55; Appendices 8, 10, 14, 15, 17, 26, and 36
	Habitat, Species: WGFD: WY SWAP 2010 Aquatic Basins p. III-13-17 to 13-19, Habitat Section-Riparian p. III-8-14 to 8-18, Wetlands p. III-10-11 to 10-13
Cedar Rim thistle plant (*Cirsium aridum*)	BLM 2008a – Wildlife and Fisheries p. 2-51 to 2-55; Appendices 8, 10, 14, 15, 17, 26, and 36
	Habitat, Species: WGFD: WY SWAP 2010 Habitat Section-Desert Shrublands p. III-3-8 to 3-10, Cliffs-Canyons-Caves and Rock Outcrops p. III-2-8 to 2-10
Gibbens' beardtongue plant (*Penstemon gibbensii*)	BLM 2008a – Wildlife and Fisheries p. 2-51 to 2-55; Appendices 8, 10, 14, 15, 17, 26, and 36
	Habitat, Species: WGFD: WY SWAP 2010 Habitat Section-Desert Shrublands p. III-3-8 to 3-10, Cliffs-Canyons-Caves and Rock Outcrops p. III-2-8 to 2-10
Persistent sepal yellowcress plant (*Rorippa calycina*)	BLM 2008a – Wildlife and Fisheries p. 2-51 to 2-55; Appendices 8, 10, 14, 15, 17, 26, and 36
	Habitat, Species: WGFD: WY SWAP 2010 Aquatic Basins p. III-13-17 to 13-19, Habitat Section-Riparian p. III-8-14 to 8-18, Wetlands p. III-10-11 to 10-13
Big Game Crucial Winter Range, Migration Corridors, and Associated Habitats	
Big Game Crucial Winter Range	BLM 2008a – Wildlife and Fisheries p. 2-51 to 2-55; Appendices 8, 10, 14, 15, 17, 26, and 36
	WGFD: BLM will request data from WGFD
	Habitat, Species: WGFD: Habitat Section Sagebrush Shrublands p. III-9-12 to 9-15, Foothill Shrublands p. III-4-10 to 4-12, Desert Shrublands p. III-3-8 to 3-10
	Radio or satellite telemetry to determine big game movement
	Pellet Count Surveys
	BLM JIO-PAPO 2012. Pinedale Anticline Project Office, Bureau of Land Management, Pinedale Field Office. <http://www.wy.blm.gov/jio-papo/papo/index.htm>
Big Game Migration Corridors	BLM 2008a – Wildlife and Fisheries p. 2-51 to 2-55; Appendices 8, 10, 14, 15, 17, 26, and 36
	Habitat, Species: WGFD: Habitat Section Sagebrush Shrublands p. III-9-12 to 9-15, Foothill Shrublands p. III-4-10 to 4-12, Desert Shrublands p. III-3-8 to 3-10
	BLM JIO-PAPO 2012. Pinedale Anticline Project Office, Bureau of Land Management, Pinedale Field Office. <http://www.wy.blm.gov/jio-papo/papo/index.htm>

Table I-2a: Summary of references for wildlife inventory and monitoring requirements, *continued*

Species / Associated Habitat	Inventory and Monitoring Requirements
Raptors and Associated Habitats	
Raptors (Non-Special Status Species and BLM Sensitive Species)	BLM 2008a – Wildlife and Fisheries p. 2-51 to 2-55; Appendices 8, 10, 14, 15, 17, 26, and 36
	Habitat, Species: WGFD: WY SWAP 2010 Species Accounts, Species of Greatest Conservation Need-other bird species
	Annually from April to July to determine nest activity. BLM or BLM-approved Operator-financed biologist. Standard form required for raptor nest monitoring
	At least every five years. BLM or BLM-approved Operator-financed biologist with Operator-provided financial assistance for aircraft rental.
	Field Protocol for Spatially-Balanced Sampling of Landbird Populations. Hanni, D.J., C.M. White, R.A. Sparks, J.A. Blakesley, G.J. Levandoski, and J.J. Birek. 2010. Unpublished report. Rocky Mountain Bird Observatory, Brighton, CO. 34pp.
	Survey Protocol, Avian Protection Plan: *Bureau of Land Management High Desert District Wildlife and Plant Survey Protocols for Wind Energy Development.* p. 3–11 for Fixed Point Count Surveys and Marine Surveillance Radar Surveys.
	Bureau of Land Management High Desert District Wildlife and Plant Survey Protocols for Wind Energy Development. Appendix G.
Songbirds, Waterfowl, and Shorebirds and Associated Habitats	
Songbirds, waterfowl, and shorebirds and associated habitats (Non-Special Status Species and BLM Sensitive Species)	BLM 2008a – Wildlife and Fisheries p. 2-51 to 2-55; Appendices 8, 10, 14, 15, 17, 26, and 36
	Habitat, Species: WGFD: WY SWAP 2010 Species Accounts, Species of Greatest Conservation Need-other bird species, Habitat Section-Riparian p. III-8-14 to 8-18 – other species
	Field Protocol for Spatially-Balanced Sampling of Landbird Populations. Hanni, D.J., C.M. White, R.A. Sparks, J.A. Blakesley, G.J. Levandoski, and J.J. Birek. 2010. Unpublished report. Rocky Mountain Bird Observatory, Brighton, CO. 34pp.
	Survey Protocol: *Bureau of Land Management High Desert District Wildlife and Plant Survey Protocols for Wind Energy Development.* pp3 – 11 for Fixed Point Count Surveys and Marine Surveillance Radar Surveys.
	Species Survey, Monitoring: *U. S. Shorebird Conservation Plan: A Comprehensive Monitoring Program for North American Shorebirds*. 2000. Pages 60-61, 80-81
Amphibians, Reptiles, and Fish and Associated Habitats	
Amphibians, reptiles, and fish and associated habitats (Non-Special Status Species and BLM Sensitive Species)	BLM 2008a – Wildlife and Fisheries p. 2-51 to 2-55; Appendices 8, 10, 14, 15, 17, 26, and 36
	Habitat, Species: WGFD: WY SWAP 2010 Species Accounts, Species of Greatest Conservation Need-other amphibian, reptile and fish species; WY SWAP 2010 Aquatic Basins p. III-13-17 to 13-19 – other fish species, Habitat Section-Riparian p. III-8-14 to 8-18 – other species
	Habitat Mapping, Acoustic Breeding Surveys, Visual Surveys Amphibians/Reptiles: *Bureau of Land Management High Desert District Wildlife and Plant Survey Protocols for Wind Energy Development*, p 7.
	AZ Game and Fish Department Fish Survey Techniques. 2009. <http://www.azgfd.gov/w_c/Fish_Survey_Techniques.shtml>
	Hydroacoustics: Lakes and Reservoirs (Taylor and Maxwell 2007) <http://www.stateofthesalmon.org/fieldprotocols/downloads/SFPH_p5.pdf>

Table I-2a: Summary of references for wildlife inventory and monitoring requirements, *continued*

Species / Associated Habitat	Inventory and Monitoring Requirements
General Wildlife Species and Associated Habitats	
General Wildlife Species	BLM 2008a – Wildlife and Fisheries p. 2-51 to 2-55; Appendices 8, 10, 14, 15, 17, 26, and 36
	Habitat, Species: WGFD: WY SWAP 2010 Species Accounts, Species of Greatest Conservation Need-crustacean and mollusk species
	General Wildlife Observation Data Sheet. Surveys will be conducted in adherence with protocol to be established by the BLM, other agencies and Operators and Operators may provide financial assistance for these investigations
	Additional inventory and monitoring measures may be applied for other species as specified in annual reports. BLM with participation by other agencies and Operators.

Table I-2b. Summary of references for wildlife protection measures, cause and effect studies, and adaptive management requirements: wildlife and associated habitats

Special Status Species; BLM Sensitive Species; Big Game Crucial Winter Range and Migration Corridors; Raptors; Songbirds, Waterfowl, and Shorebirds; Amphibians, Reptiles, and Fish; and General Wildlife Species and associated habitats located within and adjacent to the CD-C project area (Operators will be required to use the inventory and monitoring protocols identified below for each species in this table. Changes to the protocols will be based on decisions made by the BLM and will be discussed at the Monitoring without Borders Meetings held each year and other meetings as deemed appropriate)	
Species / Habitat	**Protection Measures, Cause and Effect Studies and Adaptive Management Requirements**
Threatened, Endangered, Candidate, and Proposed Species (Special Status Species) and Associated Habitats	
Black-footed Ferret (E) (*Mustela nigripes*)	BLM 2008a – Wildlife and Fisheries p. 2-51 to 2-55; Appendices 8, 10, 14, 15, 17, 26, and 36
	Habitat, Species: WGFD: WY Wyoming State Wildlife Action Plan- 2010 (WY SWAP 2010) Species Accounts p. IV-2-20 to 2-11; Habitat Section-Sagebrush Shrublands p. III-9-12 to 9-15, Desert Shrublands p. III-3-8 to 3-10
Ute Ladies'-Tresses Plant (T) (*Spiranthes diluvialis*)	BLM 2008a – Wildlife and Fisheries p. 2-51 to 2-55; Appendices 8, 10, 14, 15, 17, 26, and 36
	Habitat, Species: WGFD: WY SWAP 2010 Aquatic Basins p. III-13-17 to 13-19, Habitat Section-Riparian p. III-8-14 to 8-18, Wetlands p. III-10-11 to 10-13
Colorado River Fish Species: bonytail (*Gila elegans*), Colorado pikeminnow (*Ptychocheilus lucius*), humpback chub (*Gila cypha*), razorback sucker (*Xyrauchen texanus*)	BLM 2008a – Wildlife and Fisheries p. 2-51 to 2-55; Appendices 8, 10, 14, 15, 17, 26, and 36
	Habitat, Species: WGFD: WY SWAP 2010 Aquatic Basins p. III-13-17 to 13-19, Habitat Section-Riparian p. III-8-14 to 8-18, Wetlands p. III-10-11 to 10-13
BLM Sensitive Species (Plants/Animals) and Associated Habitats	
Bat species: long-eared myotis (*Myotis evotis*), fringed myotis (*Myotis thysanodes*), spotted bat (*Euderma maculatum*), Townsend's big-eared bat (*Corynorhinus townsendii*)	BLM 2008a – Wildlife and Fisheries p. 2-51 to 2-55; Appendices 8, 10, 14, 15, 17, 26, and 36
	Habitat, Species: WGFD: WY SWAP Species Accounts p. IV-2-41, p. IV-2-27, p. IV-2-77 and p. IV-2-84; spotted bat- Habitat Section-Sagebrush Shrublands p. III-9-12 to 9-15, Aspen/Deciduous Forest p. III-1-11 to 1-13, Cliffs-Canyons-Caves and Rock Outcrops p. III-2-8 to 2-10, Habitat Section-Riparian p. III-8-14 to 8-18, Wetlands p. III-10-11 to 10-13
	Bat Carcass Survey Protocol, Bat Protection Plan: *Bureau of Land Management High Desert District Wildlife and Plant Survey Protocols for Wind Energy Development*. Page 3 and Appendix A. Bat Carcass Survey
	Goodbar, J. R. 1999. Oil and Gas Drilling in Cave and Karst Areas: A Process of Mitigating Impacts. Proceedings of the 1997 Karst and Cave Management Symposium, 13th National Cave Management Symposium, Bellingham, Washington and Chilliwack and Vancouver Island, BC, Canada, October 7-10, 1997. pp. 195-197.
	Acoustic, Carcass, Mortality Surveys: SWCA Environmental Consultants. *Avian and Bat Protection Plan for the Spring Valley Wind Energy Facility*. 2010. Prepared for Spring Valley Wind LLC, 1600 Smith Street, Suite 4025, Houston, Texas 77002. Prepared by SWCA Environmental Consultants, 7373 Peak Drive, Suite 170, Las Vegas, Nevada 89128.
	Bat Conservation International. Media and Information Literature Database. Literature Library. www.batcon.org

Table I-2b. Summary of references for wildlife protection measures, cause and effect studies, and adaptive management requirements: wildlife and associated habitats, *continued*

Species / Habitat	Protection Measures, Cause and Effect Studies and Adaptive Management Requirements
Bat species, *continued*	Develop water sources for wildlife in coordination with the WGFD and the BLM water Development Handbook {I-1741-0} (Casper FO RMP)
	WGFD. Revised April 2010. *Recommendations for Development of Oil and Gas Resources within Important Wildlife Habitats*. Version 6.0.
Pygmy rabbit (*Sylvilagus idahoensis*)	BLM 2008a – Wildlife and Fisheries p. 2-51 to 2-55; Appendices 8, 10, 14, 15, 17, 26, and 36; RFO Wildlife Attachment
	Habitat, Species: WGFD: WY SWAP 2010 Species Accounts p. IV-2-70; Habitat Section-Sagebrush Shrublands p. III-9-12 to 9-15, Aspen/Deciduous Forest p. III-1-11 to 1-13
	BLM JIO-PAPO 2012. Pinedale Anticline Project Office, Bureau of Land Management, Pinedale Field Office. <http://www.wy.blm.gov/jio-papo/papo/index.htm>
	WGFD. Revised April 2010. *Recommendations for Development of Oil and Gas Resources within Important Wildlife Habitats*. Version 6.0.
Wyoming pocket gopher (*Thomomys clusius*)	BLM 2008a – Wildlife and Fisheries p. 2-51 to 2-55; Appendices 8, 10, 14, 15, 17, 26, and 36; RFO Wildlife Attachment
	Habitat, Species: WGFD: WY SWAP 2010 Species Accounts p. IV-2-97, Desert Shrublands p. III-3-8 to 3-10
	Surveys, Sampling Approach: *Bureau of Land Management High Desert District Wildlife and Plant Survey Protocols for Wind Energy Development*. Appendix I.
	WGFD. Revised April 2010. *Recommendations for Development of Oil and Gas Resources within Important Wildlife Habitats*. Version 6.0.
White-tailed prairie dog (*Cynomys gunnisoni*)	BLM 2008a – Wildlife and Fisheries p. 2-51 to 2-55; Appendices 8, 10, 14, 15, 17, 26, and 36
	BLM JIO-PAPO 2012. Pinedale Anticline Project Office, Bureau of Land Management, Pinedale Field Office. <http://www.wy.blm.gov/jio-papo/papo/index.htm>
	WGFD. Revised April 2010. *Recommendations for Development of Oil and Gas Resources within Important Wildlife Habitats*. Version 6.0.
Swift Fox (*Vulpes velox*)	BLM 2008a – Wildlife and Fisheries p. 2-51 to 2-55; Appendices 8, 10, 14, 15, 17, 26, and 36
	WGFD: WY SWAP 2010 Species Accounts, p. IV-2-81; Habitat Section-Sagebrush Shrublands p. III-9-12 to 9-15
	WGFD. Revised April 2010. *Recommendations for Development of Oil and Gas Resources within Important Wildlife Habitats*. Version 6.0.
Songbird: loggerhead shrike (*Lanius ludovicianus*), sage thrasher (*Oreoscoptes montanus*), Brewer's sparrow (*Spizella breweri*), sage sparrow (*Amphispiza belli*)	BLM 2008a – Wildlife and Fisheries p. 2-51 to 2-55; Appendices 8, 10, 14, 15, 17, 26, and 36
	Habitat, Species: WGFD: WY SWAP 2010 Species Accounts p. IV-1-29, p. IV-1-112 and p. IV-1-114; Habitat Section-Sagebrush Shrublands p. III-9-12 to 9-15, Foothill Shrublands p. III-4-10 to 4-12
	WGFD. Revised April 2010. *Recommendations for Development of Oil and Gas Resources within Important Wildlife Habitats*. Version 6.0.

Table I-2b. Summary of references for wildlife protection measures, cause and effect studies, and adaptive management requirements: wildlife and associated habitats, *continued*

Species / Habitat	Protection Measures, Cause and Effect Studies and Adaptive Management Requirements
Shorebirds: white-faced ibis (*Plegadis chihi*), long-billed curlew (*Numenius americanus*)	BLM 2008a – Wildlife and Fisheries p. 2-51 to 2-55; Appendices 8, 10, 14, 15, 17, 26, and 36
	Habitat, Species: WGFD: WY SWAP 2010 Species Accounts p. IV-1-85 and p. IV-1-136, Habitat Section-Riparian p. III-8-14 to 8-18, Wetlands p. III-10-11 to 10-13
	Develop water sources for wildlife in coordination with the WGFD and the BLM water Development Handbook {I-1741-0} (Casper FO RMP)
	WGFD. Revised April 2010. *Recommendations for Development of Oil and Gas Resources within Important Wildlife Habitats*. Version 6.0.
Waterfowl: trumpeter swan (*Cygnus buccinator*)	BLM 2008a – Wildlife and Fisheries p. 2-51 to 2-55; Appendices 8, 10, 14, 15, 17, 26, and 36
	Habitat, Species: WGFD: WY SWAP 2010 Species Accounts p. IV-1-125, Habitat Section-Riparian p. III-8-14 to 8-18, Wetlands p. III-10-11 to 10-13
	Develop water sources for wildlife in coordination with the WGFD and the BLM water Development Handbook {I-1741-0} (Casper FO RMP)
	Energy Development and Wildlife Conservation in Western North America, David E Naugle 2011.
	Wetlands Regional Monitoring Program Plan 2002, Part 2: Data Collection Protocols Wetland Birds, Wetland Bird Monitoring, Developed by the Bird Focus Group Wetland Regional Monitoring Program
	WGFD. Revised April 2010. *Recommendations for Development of Oil and Gas Resources within Important Wildlife Habitats*. Version 6.0.
Bald eagle (*Haliaeetus leucocephalus*)	BLM 2008a – Wildlife and Fisheries p. 2-51 to 2-55; Appendices 8, 10, 14, 15, 17, 26, and 36; RFO Wildlife Attachment
	Habitat, Species: WGFD: WY SWAP 2010 Species Accounts p. IV-1-8, Habitat Section-Riparian p. III-8-14 to 8-18, Wetlands p. III-10-11 to 10-13
	Field Protocol for Spatially-Balanced Sampling of Landbird Populations. Hanni, D.J., C.M. White, R.A. Sparks, J.A. Blakesley, G.J. Levandoski, and J.J. Birek. 2010. Unpublished report. Rocky Mountain Bird Observatory, Brighton, CO. 34pp.
	WGFD. Revised April 2010. *Recommendations for Development of Oil and Gas Resources within Important Wildlife Habitats*. Version 6.0.
Ferruginous hawk (*Buteo regalis*)	BLM 2008a – Wildlife and Fisheries p. 2-51 to 2-55; Appendices 8, 10, 14, 15, 17, 26, and 36
	Habitat, Species: WGFD: WY SWAP 2010 Species Accounts p. IV-1-55; Habitat Section-Sagebrush Shrublands p. III-9-12 to 9-15
	WGFD. Revised April 2010. *Recommendations for Development of Oil and Gas Resources within Important Wildlife Habitats*. Version 6.0.
Greater Sage-Grouse (C) (*Centrocercus urophasianus*)	BLM 2008a – Wildlife and Fisheries p. 2-51 to 2-55; Appendices 8, 10, 14, 15, 17, 26, and 36
	Habitat, Species: WGFD: WY SWAP 2010 Species Accounts p. IV-1-69 to 1-70; Habitat Section-Sagebrush Shrublands p. III-9-12 to 9-15, Desert Shrublands p. III-3-8 to 3-10
	Approved Resource Management Plan Amendment for Greater Sage-Grouse (ARMPA)/Record of Decision (BLM 2015b)
	BLM JIO-PAPO 2012. Pinedale Anticline Project Office, Bureau of Land Management, Pinedale Field Office. <http://www.wy.blm.gov/jio-papo/papo/index.htm>

Table I-2b. Summary of references for wildlife protection measures, cause and effect studies, and adaptive management requirements: wildlife and associated habitats, *continued*

Species / Habitat	Protection Measures, Cause and Effect Studies and Adaptive Management Requirements
Greater Sage-Grouse (C), *continued*	In order to resolve conflicts with vegetation treatments adjacent to and within the CD-C project area, refer to the nine (9) steps in the *Wyoming Guidelines for Managing Sagebrush Communities with an Emphasis on Fire Management* (Wyoming Interagency Vegetation Committee 2002:12)
	WGFD. Revised April 2010. *Recommendations for Development of Oil and Gas Resources within Important Wildlife Habitats*. Version 6.0.
Mountain plover (*Charadrius montanus*)	BLM 2008a – Wildlife and Fisheries p. 2-51 to 2-55; Appendices 8, 10, 14, 15, 17, 26, and 36; RFO Wildlife Attachment
	Habitat, Species: WGFD: WY SWAP 2010 Species Accounts p. IV-1-92, Habitat Section-Desert Shrublands p. III-3-8 to 3-10
	WGFD. Revised April 2010. *Recommendations for Development of Oil and Gas Resources within Important Wildlife Habitats*. Version 6.0.
Burrowing owl (*Athene cunicularia*)	BLM 2008a – Wildlife and Fisheries p. 2-51 to 2-55; Appendices 8, 10, 14, 15, 17, 26, and 36; RFO Wildlife Attachment
	Habitat, Species: WGFD: WY SWAP 2010 Species Accounts p. IV-1-33; Habitat Section-Sagebrush Shrublands p. III-9-12 to 9-15, Desert Shrublands p. III-3-8 to 3-10
	WGFD. Revised April 2010. *Recommendations for Development of Oil and Gas Resources within Important Wildlife Habitats*. Version 6.0.
Amphibians: northern leopard frog (*Rana pipiens*), Great Basin spadefoot toad (*Spea intermontana*)	BLM 2008a – Wildlife and Fisheries p. 2-51 to 2-55; Appendices 8, 10, 14, 15, 17, 26, and 36
	Habitat, Species: WGFD: WY SWAP 2010 Species Accounts p. IV-4-9, Habitat Section-Riparian p. III-8-14 to 8-18, Foothill Shrublands p. III-4-10 to 4-12, Wetlands p. III-10-11 to 10-13
	Develop water sources for wildlife in coordination with the WGFD and the BLM water Development Handbook {I-1741-0} (Casper FO RMP)
	Place water development s and salt and mineral supplements for livestock at least 500 feet from known or potential locations of this plant species (Casper FO RMP 2007)
	Improve floodplain connectivity and function of stream miles (Casper FO RMP 2007).
	WGFD. Revised April 2010. *Recommendations for Development of Oil and Gas Resources within Important Wildlife Habitats*. Version 6.0.
Fish: Colorado River cutthroat trout (*Oncorhynchus clarkii pleuriticus*), roundtail chub (*Gila robusta*), flannelmouth sucker (*Catostomus latipinnis*), and bluehead sucker (*Catostomus discobolus*)	BLM 2008a – Wildlife and Fisheries p. 2-51 to 2-55; Appendices 8, 10, 14, 15, 17, 26, and 36
	Habitat, Species: WGFD: WY SWAP 2010 Species Accounts p. IV-3-19, p. IV-3-68, p. IV-3-28 and p. IV-3-3; III-13-17 thru 13-19; Aquatic Basins p. III-13-17 to 13-19, Habitat Section-Riparian p. III-8-14 to 8-18, Wetlands p. III-10-11 to 10-13
	WGFD. Revised April 2010. *Recommendations for Development of Oil and Gas Resources within Important Wildlife Habitats*. Version 6.0.
Meadow milkvetch plant (*Astragalus diversifolius var. diversifolius*)	BLM 2008a – Wildlife and Fisheries p. 2-51 to 2-55; Appendices 8, 10, 14, 15, 17, 26, and 36
	Habitat, Species: WGFD: WY SWAP 2010 Aquatic Basins p. III-13-17 to 13-19, Habitat Section-Riparian p. III-8-14 to 8-18, Wetlands p. III-10-11 to 10-13
	Place water development s and salt and mineral supplements for livestock at least 500 feet from known or potential locations of this plant species (Casper FO RMP 2007)

Table I-2b. Summary of references for wildlife protection measures, cause and effect studies, and adaptive management requirements: wildlife and associated habitats, *continued*

Species / Habitat	Protection Measures, Cause and Effect Studies and Adaptive Management Requirements
Cedar Rim thistle plant (*Cirsium aridum*)	BLM 2008a – Wildlife and Fisheries p. 2-51 to 2-55; Appendices 8, 10, 14, 15, 17, 26, and 36
	Habitat, Species: WGFD: WY SWAP 2010 Habitat Section-Desert Shrublands p. III-3-8 to 3-10, Cliffs-Canyons-Caves and Rock Outcrops p. III-2-8 to 2-10
Gibbens' beardtongue plant (*Penstemon gibbensii*)	BLM 2008a – Wildlife and Fisheries p. 2-51 to 2-55; Appendices 8, 10, 14, 15, 17, 26, and 36
	Habitat, Species: WGFD: WY SWAP 2010 Habitat Section-Desert Shrublands p. III-3-8 to 3-10, Cliffs-Canyons-Caves and Rock Outcrops p. III-2-8 to 2-10
Persistent sepal yellowcress plant (*Rorippa calycina*)	BLM 2008a – Wildlife and Fisheries p. 2-51 to 2-55; Appendices 8, 10, 14, 15, 17, 26, and 36
	Habitat, Species: WGFD: WY SWAP 2010 Aquatic Basins p. III-13-17 to 13-19, Habitat Section-Riparian p. III-8-14 to 8-18, Wetlands p. III-10-11 to 10-13
	Place water development s and salt and mineral supplements for livestock at least 500 feet from known or potential locations of this plant species (Casper FO RMP 2007)
Big Game Crucial Winter Range, Migration Corridors, and Associated Habitats	
Big Game Crucial Winter Range	BLM 2008a – Wildlife and Fisheries p. 2-51 to 2-55; Appendices 8, 10, 14, 15, 17, 26, and 36
	WGFD: BLM will request data from WGFD
	Habitat, Species: WGFD: Habitat Section Sagebrush Shrublands p. III-9-12 to 9-15, Foothill Shrublands p. III-4-10 to 4-12, Desert Shrublands p. III-3-8 to 3-10
	BLM JIO-PAPO 2012. Pinedale Anticline Project Office, Bureau of Land Management, Pinedale Field Office. <http://www.wy.blm.gov/jio-papo/papo/index.htm>
	WGFD. Revised April 2010. *Recommendations for Development of Oil and Gas Resources within Important Wildlife Habitats*. Version 6.0.
Big Game Migration Corridors	BLM 2008a – Wildlife and Fisheries p. 2-51 to 2-55; Appendices 8, 10, 14, 15, 17, 26, and 36; RFO Wildlife Attachment
	Habitat, Species: WGFD: Habitat Section Sagebrush Shrublands p. III-9-12 to 9-15, Foothill Shrublands p. III-4-10 to 4-12, Desert Shrublands p. III-3-8 to 3-10
	BLM JIO-PAPO 2012. Pinedale Anticline Project Office, Bureau of Land Management, Pinedale Field Office. <http://www.wy.blm.gov/jio-papo/papo/index.htm>
	WGFD. Revised April 2010. *Recommendations for Development of Oil and Gas Resources within Important Wildlife Habitats*. Version 6.0.
Raptors and Associated Habitats	
Raptors (Non-Special Status Species and BLM Sensitive Species)	BLM 2008a – Wildlife and Fisheries p. 2-51 to 2-55; Appendices 8, 10, 14, 15, 17, 26, and 36
	Habitat, Species: WGFD: WY SWAP 2010 Species Accounts, Species of Greatest Conservation Need-other bird species
	WGFD. Revised April 2010. *Recommendations for Development of Oil and Gas Resources within Important Wildlife Habitats*. Version 6.0.

Table I-2b. Summary of references for wildlife protection measures, cause and effect studies, and adaptive management requirements: wildlife and associated habitats, *continued*

Species / Habitat	Protection Measures, Cause and Effect Studies and Adaptive Management Requirements
Songbirds, Waterfowl, and Shorebirds and Associated Habitats	
Songbirds, waterfowl, and shorebirds and associated habitats (Non-Special Status Species and BLM Sensitive Species)	BLM 2008a – Wildlife and Fisheries p. 2-51 to 2-55; Appendices 8, 10, 14, 15, 17, 26, and 36
	Habitat, Species: WGFD: WY SWAP 2010 Species Accounts, Species of Greatest Conservation Need-other bird species, Habitat Section-Riparian p. III-8-14 to 8-18 – other species
	Develop water sources for wildlife in coordination with the WGFD and the BLM water Development Handbook {I-1741-0} (Casper FO RMP)
	Place water development s and salt and mineral supplements for livestock at least 500 feet from known or potential locations of this plant species (Casper FO RMP 2007)
	WGFD. Revised April 2010. *Recommendations for Development of Oil and Gas Resources within Important Wildlife Habitats*. Version 6.0.
Amphibians, Reptiles, and Fish and Associated Habitats	
Amphibians, reptiles, and fish and associated habitats (Non-Special Status Species and BLM Sensitive Species)	BLM 2008a – Wildlife and Fisheries p. 2-51 to 2-55; Appendices 8, 10, 14, 15, 17, 26, and 36; RFO Wildlife Attachment
	Habitat, Species: WGFD: WY SWAP 2010 Species Accounts, Species of Greatest Conservation Need-other amphibian, reptile and fish species; WY SWAP 2010 Aquatic Basins p. III-13-17 to 13-19 – other fish species, Habitat Section-Riparian p. III-8-14 to 8-18 – other species
	Develop water sources for wildlife in coordination with the WGFD and the BLM water Development Handbook {I-1741-0} (Casper FO RMP)
	Place water development s and salt and mineral supplements for livestock at least 500 feet from known or potential locations of this plant species (Casper FO RMP 2007)
	Improve floodplain connectivity and function of stream miles (Casper FO RMP 2007).
	WGFD. Revised April 2010. *Recommendations for Development of Oil and Gas Resources within Important Wildlife Habitats*. Version 6.0.
General Wildlife Species and Associated Habitats	
General Wildlife Species	BLM 2008a – Wildlife and Fisheries p. 2-51 to 2-55; Appendices 8, 10, 14, 15, 17, 26, and 36
	Habitat, Species: WGFD: WY SWAP 2010 Species Accounts, Species of Greatest Conservation Need-crustacean and mollusk species
	Develop water sources for wildlife in coordination with the WGFD and the BLM water Development Handbook {I-1741-0} (Casper FO RMP)
	WGFD. Revised April 2010. Recommendations for Development of Oil and Gas Resources within Important Wildlife Habitats. Version 6.0.

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APPENDIX J: CULTURAL RESOURCES MANAGEMENT

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Identification of Cultural Resources J-1

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PROGRAM OBJECTIVES

The Bureau of Land Management (BLM) has developed a cultural resources program designed to inventory, evaluate, and manage cultural resources on BLM-administered public land and in areas of BLM responsibility. The BLM management of cultural resources (archaeological, historic, and socio-cultural properties) is in accordance with the provisions of the National Historic Preservation Act (NHPA) of 1966, as amended, and other applicable legislation.

IDENTIFICATION OF CULTURAL RESOURCES

The BLM requires cultural resource inventories for actions with federal responsibility that include surface disturbance as a part of the action. The purpose of inventories is to identify cultural resources prior to any ground-disturbing activity. This way, sites can be protected through project redesign or other BMPs prior to any threat of disturbance. Numerous laws and regulations mandate this policy. For a brief overview of selected laws and policies dictating BLM's treatment of cultural resources, please see the end of this appendix.

Three classes of cultural resource inventory have been established; Class III is the most intensive.

Class I inventories are completed with the use of existing data from cultural resource inventory files maintained by both the BLM and the Wyoming State Historic Preservation Office (SHPO). Class I inventories are conducted at two different levels: at the planning stage of an environmental impact statement (EIS) to produce a regional overview; and at the site-specific level for individual proposed projects to determine if previous cultural resource inventories have been conducted within the area of potential effect (APE). The purpose of Class I inventories is to provide cultural resource specialists and managers with an informed basis for understanding the nature of the archaeological record within the area in question.

Class II inventories are statistically-based sample surveys designed to aid in characterizing the probable density, diversity, and distribution of cultural properties in the area, to develop and test predictive models, and to answer appropriate research questions. Within individual sample units, survey aims, methods, and intensity are the same as those applied in a Class III survey. Class II surveys may be conducted in several phases, using different sample designs, to improve statistical reliability.

Class III intensive field surveys are conducted by professionals through pedestrian survey of an entire target area. The intent of a Class III inventory is to locate and record all historic properties and is consistent with standards in the Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation (48 FR 44716). Class III inventories conform to the prevailing professional survey standards for the region involved, provided that the regional standards meet or exceed the Secretary's Standards and Guidelines. Because a Class III survey is designed to produce a total inventory of the cultural properties observable within the target area, once it has been completed, no further survey work should be needed in the target area as long as the current standards are met. Areas with a high probability of containing buried cultural materials or known cultural materials may require additional work or professional monitoring and/or data recovery excavations. Areas that require additional work are analyzed on a case-by-case basis, depending on the proposed action and the types of cultural resources present in the project area.

BLM JURISDICTION ON PRIVATELY OWNED AND/OR SPLIT-ESTATE LANDS (INCLUDING THE CHECKERBOARD LAND PATTERN)

Survey

The BLM frequently authorizes permits and rights-of-way, or provides approvals for actions on federal lands in which portions of the overall project may take place on non-federal lands or the federal action may have contingent or cumulative effects on non-federal lands. Before the BLM can authorize (through permit, license, etc.) any project that may adversely affect significant cultural resources (i.e., historic properties), the BLM has the legal responsibility to take into account the effects of its actions on these resources. In order for the BLM to fully consider the effects of its actions, it also has the responsibility to gather the information necessary to know what cultural resources may be affected, evaluate the resources for eligibility for inclusion in the National Register of Historic Places, and mitigate adverse affects to historic properties where possible.

If a project requires the use of federally-owned surface lands as well as privately owned surface lands, there are two authorities that require federal agencies to apply the same NHPA Section 106 compliance standards to private lands as they do to federal lands. The regulations at 36 CFR, Part 800.4(b) require the federal agency to "take the steps necessary to identify historic properties within the area of potential effect." That this includes both federal and non-federal lands is implicit throughout the statute and the regulations, since the regulatory definition of "area of potential effect" is "the geographic area or areas within which an undertaking may directly or indirectly cause changes in the character or use of historic properties" [36 CFR, Part 800.16(d)]. It makes no distinction between federal and non-federal lands. More explicit, however, is Executive Order No. 11593, entitled "Protection and Enhancement of the Cultural Environment." Section 1(3) of the EO states that all federal agencies: " ... in consultation with the Advisory Council on Historic Preservation, institute procedures to assure that federal plans and programs contribute to the preservation and enhancement of *non-federally owned* sites, structures and objects of historical, architectural, or archaeological significance." The BLM's responsibility for inventory, evaluation, and protection of cultural properties on lands outside BLM administrative jurisdiction is limited according to the degree to which the Field Manager's decisions determine or control the location of surface-disturbing activities on those lands.

BLM makes this policy known to project proponents, who in turn are responsible for providing all of the information the BLM requires for making informed decisions. If cultural resource data is lacking from private lands so that the BLM authorized officer cannot make an informed decision, the BLM cannot allow the undertaking to proceed. Thus, it is the responsibility of the project proponent to acquire the appropriate information.

Within the checkerboard land pattern that encompasses much of the planning area, Wyoming BLM has set forth the policy that the entire project area, if it covers any federal lands, must be inventoried. The reasoning for this is that the distances between federal ownership and private ownership are so short, that the potential for the federal portion to not dictate the placement of the project on private is remote.

Split estate lands are defined as those lands where surface ownership transferred to private landowners from the federal government but the mineral rights were retained by the federal government. These situations arose either through patent under the 1914 amendment to the Homestead Act or purchase under the Stock-raising Act of 1916. Each of these Acts also allowed for the federal government to "reenter and occupy so much of the surface ... as may be required for all purposes reasonably incident to the mining or removal of coal or other minerals." At the time of purchase, the buyer agreed to these terms. Since compliance with the NHPA Section 106 process is required of a federal agency by statute and regulation prior to the federal action, then being able to complete that process is a purpose reasonably incident to the extraction of the minerals.

Site Management

As stated above, BLM has multiple authorities for requiring cultural resource inventories on private lands. This jurisdiction only holds forth with federal undertakings. Cultural resources that are located on private lands are recorded for the permanent record and appropriate mitigation measures are applied, in consultation with the private landowner. This jurisdiction comes from the requirement that the federal agency must take into account its effects on all historic properties. Once the federal undertaking has been fully processed, the federal responsibility for an historic property is completed. The historic property remains under the ownership of the landowner, thus BLM has no control over the historic property outside of the venue of a federal undertaking.

Evaluation of Cultural Resource Sites

Criterion for Eligibility

The BLM evaluates the significance of cultural resources identified during inventory in consultation with the Wyoming SHPO to determine if the resources are eligible for inclusion in the National Register of Historic Places (NRHP). Cultural resource properties may be considered eligible for listing in the National Register if they meet one or more of the following criteria identified in 36 CFR 60.4:

- **Criterion A.** An historic property is associated with an event or events that have made a significant contribution to the broad patterns of America's history.
- **Criterion B.** An historic property is associated with the lives of persons significant to our past.
- **Criterion C.** An historic property embodies the distinctive characteristics of a type, period, or method of construction, or represents the work of a master, or possesses high artistic value or represents a significant and distinguishable entity whose components may lack individual distinction.
- **Criterion D.** An historic property has yielded or may be likely to yield information important in prehistory or history.

To facilitate evaluation of cultural resource values in Wyoming, the BLM has devised guidelines for determining the eligibility of archaeological and historical sites and historic trails (BLM Manual 8110.32). The guidelines supplement the National Register criteria for evaluation (36 CFR 60.4) and provide consistency across all BLM jurisdictions. Application of the guidelines ensures that significant cultural resources are recognized and managed accordingly.

Aspects of Integrity

Integrity is the ability of a property to convey its significance. To be listed in the National Register of Historic Places, a property must not only be shown to be significant under the National Register criteria, but it also must have integrity. The evaluation of integrity is sometimes a subjective judgment, but it must always be grounded in an understanding of a property's physical features and how they relate to its significance.

Historic properties either retain integrity (this is, convey their significance) or they do not. Within the concept of integrity, the National Register criteria recognizes seven aspects or qualities that, in various combinations, define integrity.

To retain historic integrity a property will always possess several, and usually most, of the aspects. The retention of specific aspects of integrity is paramount for a property to convey its significance. Determining which of these aspects are most important to a particular property requires knowing why, where, and when the property is significant.

- **Location.** The place where the historic property was constructed or the place where the historic event occurred.
- **Design.** The combination of elements that create the form, plan, space, structure, and style of a property.

- **Setting.** The physical environment of an historic property.
- **Materials.** The physical elements that were combined or deposited during a particular period of time and in a particular pattern or configuration to form an historic property.
- **Workmanship.** The physical evidence of the crafts of a particular culture or people during any given period in history or prehistory.
- **Feeling.** The property's expression of the aesthetic or historic sense of a particular period of time.
- **Association.** The direct link between an important historic event or person and an historic property.

Contributing and Non-Contributing to NRHP Eligibility

Properties that encompass large areas can be deemed to have contributing and noncontributing portions. Contributing portions are seen to retain integrity of the values for which the property is considered eligible for the NRHP. Non-contributing portions are identified portions of the property which are not deemed to retain the integrity of values which would render the property eligible for the NRHP. The determination of contributing versus noncontributing portions of an eligible property can be made at any time after adequate evaluation has been conducted.

Historic trails including the Overland and Cherokee, the Rawlins to Fort Washakie Freight Road, and the Rawlins to Baggs Freight Road, are considered eligible for the National Register under Criterion A. However, some portions of the trails no longer retain the aspects of integrity necessary for eligibility. As there have been no encompassing inventories of entire trails within the Resource Management Plan Planning Area (RMPPA), portions of trails are evaluated to determine if they contribute to the eligibility of the property on a case-by-case basis. Trail segments are evaluated pursuant to the National Register criteria of integrity (location, design, setting, materials, workmanship, feeling, and association). If a predominance of criteria are met, the segment will be considered contributing to the properties' overall NRHP eligibility.

BLM Use Allocations

After determination of eligibility, significant cultural resource properties are further evaluated for assignment to one or more use categories. The BLM has established six use categories as follows:

- **Scientific Use.** This category applies to any cultural property determined to be available for scientific or historical study using currently available research techniques, including methods that would result in the property's physical alteration or destruction. Recommendations to allocate individual properties to this use must be based on documentation of the kinds of data the property is thought to contain and the data's importance for pursuing specified research topics.
- **Conservation for Future Use.** A cultural property included in this category is deemed worthy of segregation from all other land or resource uses, including cultural resource uses, which threaten the maintenance of its present condition or setting, and will remain in this use category until specified provisions are met in the future.
- **Traditional Use.** This category is to be applied to any cultural resource known to be perceived by a specified social and/or cultural group as important in maintaining the cultural identity, heritage, or well being of the group. Cultural properties assigned to this category are to be managed in ways that recognize the importance ascribed to them and seek to accommodate their continuing traditional use.
- **Public Use.** This category may be applied to a cultural property found to be appropriate for use as an interpretive exhibit in place, or for related educational and recreational uses by members of the general public.
- **Experimental Use.** This category may be applied to a cultural property judged well suited for controlled experimental study, to be conducted by BLM or others, concerned with the techniques of managing cultural properties, which would result in the property's alteration, possibly including loss of integrity and destruction of physical elements. It should not be applied to cultural properties with

strong research potential, traditional cultural importance, or good public use potential, if it would significantly diminish those uses.

- **Discharged from Management.** This category is assigned to cultural properties that have no remaining, identifiable use. Most often these are prehistoric and historic archaeological properties, such as small surface scatters of artifacts or debris, whose limited research potential is effectively exhausted as soon as they have been documented. Properties discharged from management remain in the inventory, but they are removed from further management attention and do not constrain other land uses.

When a cultural resource property is assigned to one or more use categories, a decision is made pertaining to the management of that property. The criteria and guidelines for the evaluation of cultural resources and the assignment of significant cultural resource properties to specific use categories would remain unchanged under all the alternatives addressed in this plan.

Determinations of Effect

Once the eligibility of an historic property has been determined, the BLM must then determine the effects a proposed undertaking may have on a cultural resource. Standard measures for reducing effects are to be considered part of the project design. Determination of effect must be made after standard treatment measures and best management practices (BMP) have been integrated into the project design. The final project design must incorporate all agreed upon treatment measures and be included in the Conditions of Approval or components of the Surface Use Plan, Plan of Operations, or Plan of Development.

No Historic Properties Affected. If no cultural resource sites eligible for listing in the NRHP are present in the proposed project area, there are historic properties present but the undertaking will have no effect upon them, or a proposed project will not be visible from an historic property or there is no contrast between the project and the setting, the BLM will find that the undertaking has no potential to affect historic properties.

No Historic Properties Adversely Affected. If a proposed project will cause effects to an historic property, but the effects will not diminish the aspects of integrity nor the characteristics that make the property eligible for listing in the National Register of Historic Places, only noncontributing portions of historic properties will be affected, or if setting is an important aspect of integrity for an historic property and the project will cause a weak contrast, the BLM will find that the undertaking has no potential to adversely affect historic properties.

Historic Properties Adversely Affected. An adverse effect is found when an undertaking may alter, directly, or indirectly, any of the characteristics of an historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. Consideration shall be given to all qualifying characteristics of an historic property, including those that may have been identified subsequent to the original evaluation of the property's eligibility for the National Register. Adverse effects may include reasonably foreseeable effects caused by the undertaking that may occur later in time, be farther removed in distance, or be cumulative.

Consultation

SHPO Consultation

According to the Programmatic Agreement between the Advisory Council on Historic Preservation (ACHP) and the BLM, the BLM is required to consult with the Wyoming SHPO on eligibility and effects to each cultural property. The Wyoming BLM and Wyoming SHPO have developed a Protocol for consultation that serves to streamline the process and reduce consultation time frames from the guidelines set forth in the 36 CFR 800 regulations. Under the Protocol between the Wyoming BLM and the Wyoming SHPO, those sites recommended as Eligible for listing under Criteria A, B, or C or the setting is an important aspect of integrity requiring case-by-case consultation with the Wyoming SHPO.

Additionally, the BLM has implied concurrence for determining eligibility and effects for sites eligible for listing under Criterion D of the NHPA. Determination of effects to sites follows the criteria outlined in 36 CFR 800.5.

Native American Consultation

In addition to consultation with the Wyoming SHPO office, the BLM conducts Native American Consultation in compliance with Section 106 of the NHPA, the American Indian Religious Freedom Act of 1978, and Executive Order No. 13007. The BLM has created a process for conducting Native American consultation for federal undertakings, as described in BLM Manual 8120 and BLM Manual H-8120-1. The BLM has worked extensively with tribes known to inhabit the region to establish a protocol for consultation. Consultation with Native American tribes occurs during the planning process of environmental impact statements and when individual projects are proposed that may impact properties that have traditional use (i.e., Traditional Cultural Properties [TCPs]) or are sacred to Native American cultures. When one of these site types is identified within proximity to a proposed undertaking, the project proponent and tribal governments are notified. Determinations of eligibility and effects the project may have on the site are determined in consultation with tribal representatives. The BLM does not authorize any undertaking that has the potential to affect TCPs or Native American Sacred Sites without first consulting with tribes. The likelihood of inadvertently affecting a TCP or sacred site is low because of the established protocols BLM has developed with tribal representatives.

Interested Parties

The BLM will solicit such input through the public participation opportunities afforded by BLM's land use planning and environmental review processes established under the National Environmental Policy Act (NEPA) of 1969 and the Federal Land Policy and Management Act (FLPMA) of 1976, and in accordance with regulations at 43 CFR Part 1610.3. Interested parties shall be invited to participate in the Section 106 consultation process if they have a demonstrated interest in a BLM undertaking or action on historic properties. Such interested parties may include, but are not limited to, local governments, grantees, permittees, owners of affected lands or land surfaces, Indian tribes, and other interested parties determined jointly by BLM and SHPO.

In making determinations of effect, BLM may request comments of interested parties. When BLM makes a determination of adverse effect, they will request comments of interested parties. BLM will maintain lists of interested parties based on their identified interests.

BLM and SHPO will consult to identify invited concurring parties based on their demonstrated interest and level of participation. Invited concurring parties will be provided the opportunity to sign a Memorandum of Agreement or Programmatic Agreement. Refusal by an invited concurring party to sign an agreement will not invalidate the agreement.

Management of Cultural Resources

Management objectives for significant cultural resource values provide a direct link between the assignment of properties to use categories and the achievement of the cultural resource program objectives. The basic management objectives for significant cultural resource values would remain unchanged under all of the alternatives addressed in this plan.

Specific management actions that could be taken to achieve these objectives at selected significant properties are described in the discussions of the various alternatives. Management objectives for significant properties that have not yet been identified or for which inventory data are insufficient as of this writing will remain unchanged, but management actions for these properties will be prescribed on a case-by-case basis and will be addressed in amendments to this plan when appropriate.

Standard Protective Measures

Within the framework described above, the BLM has developed protective measures to minimize adverse effects (as defined in 36 CFR 800.5[1]) on significant cultural resource values. Protective measures are used in response to the proposed actions of BLM programs involving surface disturbance. These measures include cultural resource inventories, evaluation of cultural resources located during inventory, setting assessments where applicable, best management practices and mitigation of potential adverse impacts on significant cultural resources.

A setting assessment is used to determine what physical features of a proposed undertaking will be visible from an historic property for which setting is an important aspect of integrity. Visibility of undertakings will vary. The scale of visual analysis should be commensurate with the scale of the undertaking. In the majority of cases, undertakings will not be seen beyond three miles; pipelines, fiber-optic and other ground level disturbance will not likely be seen beyond a mile. In rare cases, undertakings may be seen beyond five miles if they are unusually large or are skylined on the horizon, such as wind turbines and communication towers.

A setting assessment can also be used to determine whether a proposed undertaking will introduce audible elements to the historic property where setting is an important aspect of integrity. These proposed undertakings may include compressor stations, pumping stations, or wind turbines. An assessment of the existing audible elements will be documented and then the BLM archaeologist will work with the project proponent to ensure new audible elements do not result in an adverse effect. Best management practices and mitigation measures will be utilized to achieve this goal.

Best Management Practices

In situations where a proposed undertaking has the potential to affect the physical integrity of an historic property, there are numerous measures that can be applied to reduce or eliminate the effects. BLM archaeologists work with the contracting archaeologist and the project proponent to determine which practice would best suit the needs of all parties. Application of BMPs is dependent upon the nature of the undertaking, and the nature of the historic property.

Avoidance. Avoidance, through modification of the proposed undertaking, is the primary and preferred measure used to protect cultural resources. This can be accomplished at the project planning stage.

Monitoring. In situations where avoidance of adverse affects is not feasible, or there is a determination of no adverse effects, but the potential remains for adverse effects through inadvertent discovery, a BLM permitted archaeologist will monitor construction activities. The presence of a monitor is to ensure that buried cultural materials are immediately identified and that construction activities in that area are halted to avoid further impacts to the site. Prior to BLM authorization of the project, the project proponent submits a discovery plan to the BLM for review which outlines the way in which cultural resources will be treated and the responsibilities of the project proponent. This plan is reviewed by BLM archaeologists and submitted to SHPO for concurrence. In the case where monitoring results in a discovery situation, the discovery plan is enacted. Depending on the nature of the discovery the project may be allowed to proceed, redesigned, or data recovery may be required.

Standard Measures to Reduce Visual Contrast. When a proposed project is found to be within the contributing setting of an historic property, an assessment of potential impacts is conducted through viewshed analysis, on-site inspection, and photo inspection. For historic trails such as the Cherokee Trail, Overland Trail, Rawlins to Fort Washakie Road and Rawlins to Baggs Road, protection measures would be carried out similar to other historic properties if any project were found to be located within a quarter mile of a contributing portion of the historic trail. When a proposed project is outside of the quarter mile buffer of the trail, but found to be within the viewshed that contributes to NRHP eligibility, analyses of potential impacts to the integrity of the setting would be carried out in the same way as other properties

where setting is an aspect of integrity. Best management practices used to ensure that the contributing viewshed of historic properties are not adversely affected include:

- Consolidating project facilities among oil and gas developers—this also facilitates cumulative analysis.
- Developing coordinated road and pipeline systems.
- Reducing the amount of surface development by consolidating facilities (e.g., develop bottom hole wells using directional drilling from a single surface well location).
- Using low profile facilities.
- Proper sighting and location to maximize the use of topography and vegetation to screen development. Design projects to blend with topographic forms and existing vegetation patterns.
- Using environmental coloration or advance camouflage techniques to break up visual intrusion of facilities that cannot be completely hidden.
- Using broken linear patterns for road developments to screen roads as much as possible. This can include feathering or blending of the edges of linear rights-of-way to break up the linearity.
- For livestock control, using electric fencing with low-visibility fiberglass posts and environmental colors (e.g., sage green).
- Designing linear facilities and seismic lines to run parallel to key observation points rather than perpendicular.
- Modifying the orientation of facilities to present less of a visual impact (e.g., a facility with several tanks lined up so that one obscures the visibility of the others).

Mitigation

Mitigation measures are determined by the types of proposed actions, the nature of the potential effect and the qualities of the historic property that render it eligible for NRHP listing. Mitigation measures are applied when best management practices will not reduce or minimize adverse effects. Mitigation may include data recovery. Consultation with the Wyoming SHPO and the ACHP is required when proposed actions are expected to adversely affect properties eligible for the National Register and mitigation is determined to be the best course of action.

Data Recovery. There are two times during a project that data recovery may be implemented. The first is when it is determined prior to project construction that there will be an adverse effect to an NRHP eligible property. The project proponent, the BLM, and the SHPO work together to develop a data recovery plan which will mitigate the adverse effects. The second is after a discovery situation when it is determined that the project has already adversely impacted an historic property. Again, the project proponent, BLM authorized officer, and SHPO work to develop a plan that mitigates all effects of the construction. Data recovery in itself is a destructive process, thus it must be carried out in a way to successfully retrieve all pertinent information from the site.

HABS/HAER (Historic American Buildings Survey/Historic American Engineering Record). HABS/HAER documentation as a mitigation measure may be implemented if no other mitigation measure would adequately minimize the adverse effect. This documentation includes large format photography, drawings, and research of the property to document all aspects of the property prior to adverse effects.

Agreement Documents. In situations where data recovery or HABS/HAER documentation is not appropriate to mitigate adverse effects or multiple historic properties will be affected by a single undertaking, the BLM will work with the SHPO and the project proponent to develop an agreement document. Depending on the nature of the undertaking, this may result in a Memorandum of Agreement (MOA) or a Programmatic Agreement (PA). The agreement document will outline the manner in which

adverse effects will be mitigated, and the roles and responsibilities of each signatory. The agreement document stays in effect until all measures have been completed to the satisfaction of all parties.

Cultural Resource Laws and Regulations

American Antiquities Act of 1906 provides for permits to authorize scholarly use of properties, for misdemeanor-level penalties to control unauthorized use, and for presidential designation of outstanding properties as national monuments for long-term preservation.

National Historic Preservation Act of 1966

- Section 106 directs all federal agencies to take into account effects of their undertakings (actions and authorizations) on properties included in or eligible for the NRHP.
- Section 110 sets inventory, nomination, protection, and preservation responsibilities for federally owned cultural properties. Section 110 (c) requires each federal agency to designate a Preservation Officer to coordinate activities under the act.

American Indian Religious Freedom Act of 1978 establishes the policy of the United States to protect and preserve for the American Indian, Eskimo, Aleut, and Native Hawaiian the inherent right of freedom to believe, express, and exercise their traditional religions. Federal agencies are directed to evaluate their policies and procedures to determine if changes are needed to ensure that such rights and freedoms are not disrupted by agency practices.

Archaeological Resources Protection Act of 1979 provides felony-level penalties for the unauthorized excavation, removal, damage, alteration, defacement, or the attempted unauthorized removal, damage, alteration, or defacement of any archaeological resource, more than 100 years of age, found on public lands or Indian lands. The act also prohibits the sale, purchase, exchange, transportation, receipt, or offering of any archaeological resource obtained from public lands or Indian lands.

Native American Graves Protection and Repatriation Act of 1990 requires Native American consultation for the excavation and/or removal of "cultural items" including human remains, funerary objects, sacred objects, and objects of cultural patrimony. Consultation is also required if "cultural items" are discovered during land use activities.

Executive Order No. 13007: Indian Sacred Sites establishes access to and ceremonial use of Indian sacred sites by Indian religious practitioners on federal lands. The federal agencies shall avoid adversely affecting the physical integrity of such sacred sites and maintain confidentiality of said sites.

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APPENDIX K: HAZARDOUS MATERIALS

This generic list of materials was compiled from information provided by some of the CD-C project area Operators. The materials may potentially be used or produced during construction, drilling, production, and reclamation operations, but not always and not by each Operator. The materials may potentially be listed as *hazardous* or *extremely hazardous* depending on the amount used.

Product	Hazardous Substances	CAS# *	RCRA#	RQ** (lbs)
409	Monoethanolamine	141-43-5		
	n-Alkyl (C12-16) Dimethylbenzyl Ammonium Chloride	68424-85-1		
	n-Propoxypropanol	1569-01-3		
Acfrac Ceramax E	Crystalline Silica, Quartz	14808-60-7		
	Mullite	1302-93-8		
	Phenol/Formaldehyde resin	9003-35-4		
Adhesive, Polyguard 600 Liquid	Methyl Ethyl Ketone	78-93-3	U159	5,000
	Mineral Spirits	64742-88-7		
	Toluene	108-88-3	U109	10
Ajax, Oxygen Bleach Cleaner	Calcium Carbonate	471-34-1		
	Crystalline Silica	14808-60-7		
Amoco 300 Motor Oil SAE 30	MSDS Not Found	None		
Antifreeze 60/40 premix	Ethylene Glycol	107-21-1	None	5,000
	Diethylene Glycol	111-46-6		
AntiSeize Special Lubricating Compound 18014	Aluminum (as dust or fume)	7429-90-5		
	Copper (as dust or fume)	7440-50-8	None	5,000
	Graphite	7782-42-5		
	Petroleum Oil	64742-65-0		
BA-20 Buffering Agent	Acetic Acid	64-19-7	None	5,000
	Ammonium Acetate	631-61-8	None	5,000
BA-40L Buffering Agent	Potassium Carbonate	584-08-7		
Barite	Barium Sulfate	7727-43-7		
	Crystalline Silica, Quartz	14808-60-7		
Barite (Barium Sulfate, MI Bar)	MSDS Not Found	None		
Base, Belzone 1221 Super-E Metal	MSDS Not Found	None		
Battery Cleaner #80369	2-Butoxyethanol	111-76-2		
	Butane	106-97-8		
	Propane	74-98-6		
	Water	7732-18-5		
BC-140	Boric Acid	10043-35-3		
	Ethylene Glycol	107-21-1	None	5,000
	Monoethanolamine	141-43-5		
BE-5 Microbiocide	2-Methyl-4-Isothiazoline-3-one	2682-20-4		
	5-Chloro-2-Methyl-4-Isothiazolin-3-one	26172-55-4		
	Crystalline Silica, Quartz	14808-60-7		
	Diatomaceous Earth	61790-53-2		
	Magnesium Chloride	7786-30-3		
	Magnesium Nitrate	10377-60-3		
	2-Bromo-2-nitro-1,3-propanediol	52-51-7		

Product	Hazardous Substances	CAS# *	RCRA#	RQ** (lbs)
Big D Deodorant Urinal Screens	MSDS Not Found	None		
Bleach	Sodium hydroxide	1310-73-2	None	1,000
	Sodium hypochlorite	7681-52-9	None	100
Boothill Paraffinized Pellets	Bromadiolone	28772-56-7		
Borax Powdered Hand Soap	Sodium Borate Decahydrate (Borax)	1303-96-4		
	Sodium Soap	67701-11-5		
Bowl Cleaner, #2300	Hydrogen Chloride	7647-01-0	None	5,000
	Quaternary Ammonium Chloride	111-76-2		
	Water	7732-18-5		
Brake Parts Cleaner II, Misty A-00734	Acetone	67-64-1	U002	5,000
	Hexane	110-54-3		
Breakthrough (Washbay Pressure Washer Soap)	MSDS Not Found	None		
C9721A Toner	Copper Compund	Trade Secret		
	Styrene Acrylate Copolymer	Trade Secret		
	Wax	Trade Secret		
Calcium Chloride	Calcium Chloride	010043-52-4		
Calcium Chloride Solution	Calcium Chloride	010043-52-4		
Cal-Seal 60	Calcium Sulfate	None		
CarboHSP (Ceramic Proppant)	Corundum	1302-74-5		
	Mullite	1302-93-8		
Carbon Dioxide	Carbon Dioxide	124-38-9		
CarboProp	Corundum	1302-74-5		
	Mullite	1302-93-8		
CAT-3 Activator	EDTA/Copper Chelate	None		
CAT-3WB	EDTA/Copper Chelate	None		
	Methanol	67-56-1	U154	5,000
CAT-4	Diethylenetriamine	111-40-0		
CAT-4 (Amine)	MSDS Not Found	None		
Caustic Soda (Sodium Hydroxide)	Sodium hydroxide	1310-73-2	None	1,000
Cedar Fiber (Shredded Cedar, Cellulose)	MSDS Not Found	None		
Cement- Class G	Crystalline Silica, Quartz	14808-60-7		
	Portland Cement	65997-15-1		
CFR-2 Red Label (Cement Friction Reducer)	Polyvinylpyrrolidone	9003-39-8		
	Sulfonated Organic Salt Condensate	None		
CFR-3 (Cement Friction Reducer)	Sodium Formate	141-53-7		
	Sulfonic Acid Salt	None		
Chevron Delco 400 SAE 30/40 Motor Oil	Highly Refined Mineral Oil	Mixture		
	Zinc Alkyl Dithiophosphate	68649-42-3		
Chevron HDAX Low Ash Gas Engine Oil SAE 40	Highly Refined Mineral Oil	Mixture		
Chevron Hydraulic Oil AW ISO 32	Highly Refined Mineral Oil	Mixture		
Chevron Rykon AW ISO 10	Highly Refined Mineral Oil	Mixture		
Chevron SRI Grease NLG2	Highly Refined Mineral Oil	Mixture		
CI-25 (Inhibitor- Acid)	MSDS Not Found			
CL-11 Crosslinker	Isopropanol	67-63-0		
	Titanium Complex	None		

Product	Hazardous Substances	CAS# *	RCRA#	RQ** (lbs)
CL-22 Crosslinker	Borate Salts	None		
	Diesel	68476-34-6		
	Methanol	64-56-1	U154	5,000
CL-22M Crosslinker	Diesel	68476-34-6		
	Ulexite	1319-33-1		
CL-23 Crosslinker	Ammonium Chloride	12125-02-9	None	5,000
CL-28M Crosslinker	Zirconium Complex	None		
CL-29 Crosslinker	Formic Acid	64-18-6	U123	5,000
	Lactic Acid	10326-41-7		
	Tetraethylenepentamine	112-57-2		
	Zirconium Complex	None		
CL-31 Crosslinker	Potassium Hydroxide	1310-58-3	None	1,000
	Potassium Metaborate	13709-94-9		
Cla-Sta XP Additive	Polyepichlorohydrin, trimethyl amine quatemized	51838-31-4		
Clayfix-II Material	Alkylated Quaternary Chloride	None		
Cleaner/Degreaser, Belzona 9111	MSDS Not Found	None		
Compressed Gas, 25% Methane, 21% O2, N2	Methane	74-82-8		
	Nitrogen	7727-37-9		
	Oxygen	7782-44-7		
Condensate	Mixture of aliphatic hydrocarbons of carbon number >=4	Mixture		
	Benzene	71-43-2		
	Hydrogen Sulfide	7783-06-4		
	Natural Gas	8006-14-2		
	n-Hexane	110-54-3		
D-Air 3000L	Alkenes	None		
	Silica, amorphous precipitated	67762-90-7		
DAP Weldwood Contact Cement	Aliphatic Petroleum Distillate	64742-89-8		
	Methyl Ethyl Ketone	78-93-3	U159	5,000
	Toluene	108-88-3	U109	10
Dawn	Monoethanolamine	141-43-5		
D-CON Ready Mixed Baits	MSDS Not Found	None		
Degreaser, Heavy Duty (Aerosol #03095)	1,2-Butylene Oxide	106-88-7		
	Carbon Dioxide	124-38-9		
	Tetrachloroethylene (PERC)	127-18-4	U210	100
	Trichloroethylene (TCE)	79-01-6	U228	100
Delvac 1210 Motor Oil SAE 10W	Phosphorodithioic Acid, O, O-DI-C1-14-Alkyl Esters, Zinc Salt (2:1) ZDDP	68649-42-3		
Diacel LWL	Cellulose derivative	None		
Diesel Fuel	Diesel	68476-34-6		
Doc-3 Surfactant	Imidazoline	None		
	Isopropanol	67-63-0		
Dual Spacer	Aluminum Oxide	1344-28-1		
	Crystalline Silica, Quartz	14808-60-7		
	Diatomaceous Earth	61790-53-2		
	Silica, amorphous-diatomaceous Earth	68855-54-9		
Econolite Additive	Sodium Metasilicate, Anhydrous	6834-92-0		
Econoprop Proppant	Aluminum Silicate	1302-76-7		
	Crystalline Silica, Cristobalite	14464-46-1		

Product	Hazardous Substances	CAS# *	RCRA#	RQ** (lbs)
Electro Wash 2000	Ethanol	64-17-5		
	Ethyl Acetate	141-78-6	U112	5,000
	Isopropanol	67-63-0		
	Naphtha	64741-66-8		
Enamel, Cote All (Yellow, Red, Neutral)	Crystalline Silica	14808-60-7		
	Ethyl Benzene	100-41-4	None	1,000
	Mineral Spirits	64742-48-9		
Enamel, Engine Black #203	Butane	106-97-8		
	Carbon Black	1333-86-4		
	Dimethyl Ketone	67-64-1	U002	5,000
	Ethyl 3-Ethoxypropionate	763-69-9		
	Ethyl Acetate	141-78-6	U112	5,000
	Ethylbenzene	100-41-4	None	1,000
	Methyl Ethyl Ketone	78-93-3	U159	5,000
	Propane	74-98-6		
	Proprietary Resin	None		
	Xylene (W/ Anti-Static)	1330-20-7	U239	100
Enamel, Gloss Gray 610 Series 2	Alkyd Resin	None		
	Alkyd Resin Titanium Dioxide (total dust)	13463-67-7		
	Aluminum Oxides	1344-28-1		
	Amorphous Silica	7631-86-9		
	Mineral Spirits as Stoddard Solvent	8052-41-3		
Enamel, Gloss Protective Blue #7722830	1,2,4-Trimethylbenzene	95-63-6		
	Acetone	67-64-1	U002	5,000
	Aliphatic Hydrocarbon	64742-89-8		
	Aromatic Hydrocarbon	64742-95-6		
	Aromatic Solvent	64742-95-6		
	Ethylbenzene	100-41-4	None	1,000
	Ethylene Glycol Monobutyl Ether	111-76-2		
	Liquefied Petroleum Gas	68476-86-8		
	Magnesium Silicate	14807-96-6		
	N-Butyl Acetate	123-86-4	None	5,000
	Pigment Black 7	1333-86-4		
	Pigment Red 122	980-26-7		
	Pigment Violet 32	12225-08-0		
	Propylene Carbonate	108-32-7		
	Stoddard Solvent	8052-41-3		
	Titanium Dioxide	13463-67-7		
	Toluene	108-88-3	U109	10
	Xylene	1330-20-7	U239	100
Enamel, Industrial Tough Coat, OSHA Blue # 1510	1-Methoxy-2-Propanol Acetate	108-65-6		
	Acetone	67-64-1	U002	5,000
	Butane	106-97-8		
	Ethylbenzene	100-41-4	None	1,000
	Methyl Ethyl Ketone	78-93-3	U159	5,000
	Methyl Isobutyl Ketone	108-10-1	U161	5,000
	Propane	74-98-6		
	Titanium Dioxide	13463-67-7		
	Xylene	1330-20-7	U239	100

Product	Hazardous Substances	CAS# *	RCRA#	RQ** (lbs)
Enamel, Industrial Tough Coat, OSHA Red #2116	1-Methoxy-2-Propanol Acetate	108-65-6		
	Acetone	67-64-1	U002	5,000
	Butane	106-97-8		
	Ethylbenzene	100-41-4	None	1,000
	Methyl Ethyl Ketone	78-93-3	U159	5,000
	Methyl Isobutyl Ketone	108-10-1	U161	5,000
	Propane	74-98-6		
	Xylene	1330-20-7	U239	100
Enamel, Industrial Yellow, 944300, 9444402, 944504	Calcium Aluminum Silicate	1332-58-7		
	Magnesium Silicate	14807-96-6		
	Pigment Black 7	1333-86-4		
	Pigment Orange 5	3468-63-1		
	Pigment Red 3	2425-85-6		
	Pigment Yellow 74	6358-31-2		
	Stoddard Solvent	8052-41-3		
	Titanium Dioxide	13463-67-7		
Enamel, Interior-Exterior (Tile Gray #71)	(As Nuisance Particulates)	1317-80-2		
	(As Nuisance Particulates)	37244-96-5		
	Carbon Black	1333-86-4		
	Sodium Potassium Aluminum Silicate	37244-96-5		
	Titanium Dioxide	1317-80-2		
Enamel, Metallic (Silver) 400	Acetone	67-64-1	U002	5,000
	Aliphatic Hydrocarbon Solvent	64742-89-8		
	Ethylbenzene	100-41-4	None	1,000
	Mineral Spirits	64742-88-7		
	Propane	74-98-6		
	Toluene	108-88-3	U109	10
	V. M. & P. Naphtha	64742-89-8		
	Xylene	1330-20-7	U239	100
Enamel, Premium Gloss Protective Blue #7727830	1,2,4-Trimethylbenzene	95-63-6		
	Acetone	67-64-1	U002	5,000
	Aliphatic Hydrocarbon	64742-89-8		
	Aromatic Hydrocarbon	64742-95-6		
	Aromatic Solvent	64742-95-6		
	Ethylbenzene	100-41-4	None	1,000
	Ethylene Glycol Monobutyl Ether	111-76-2		
	Liquefied Petroleum Gas	68476-86-8		
	Magnesium Silicate	14807-96-6		
	N-Butyl Acetate	123-86-4	None	5,000
	Pigment Black 7	1333-86-4		
	Pigment Red 122	980-26-7		
	Pigment Violet 32	12225-08-0		
	Propylene Carbonate	108-32-7		
	Stoddard Solvent	8052-41-3		
	Titanium Dioxide	13463-67-7		
	Toluene	108-88-3	U109	10
	Xylene	1330-20-7	U239	100

Product	Hazardous Substances	CAS# *	RCRA#	RQ** (lbs)
Enamel, Premium Gloss Protective Blue # 7724830	1,2,4-Trimethylbenzene	95-63-6		
	Acetone	67-64-1	U002	5,000
	Aliphatic Hydrocarbon	64742-89-8		
	Aromatic Hydrocarbon	64742-95-6		
	Aromatic Solvent	64742-95-6		
	Ethylbenzene	100-41-4	None	1,000
	Ethylene Glycol Monobutyl Ether	111-76-2		
	Liquefied Petroleum Gas	68476-86-8		
	Magnesium Silicate	14807-96-6		
	N-Butyl Acetate	123-86-4	None	5,000
	Pigment Black 7	1333-86-4		
	Pigment Red 122	980-26-7		
Enamel, Premium Gloss Protective Blue # 7724830, continued	Pigment Violet 32	12225-08-0		
	Propylene Carbonate	108-32-7		
	Stoddard Solvent	8052-41-3		
	Titanium Dioxide	13463-67-7		
	Toluene	108-88-3	U109	10
	Xylene	1330-20-7	U239	100
Enamel, Premium Gloss Protective Green #7738830	1,2,4-Trimethylbenzene	95-63-6		
	Acetone	67-64-1	U002	5,000
	Aliphatic Hydrocarbon	64742-89-8		
	Aromatic Hydrocarbon	64742-95-6		
	Aromatic Solvent	64742-95-6		
	Ethylbenzene	100-41-4	None	1,000
	Ethylene Glycol Monobutyl Ether	111-76-2		
	Liquefied Petroleum Gas	68476-86-8		
	Magnesium Silicate	14807-96-6		
	N-Butyl Acetate	123-86-4	None	5,000
	Pigment Black 7	1333-86-4		
	Pigment Red 122	980-26-7		
	Pigment Violet 32	12225-08-0		
	Propylene Carbonate	108-32-7		
	Stoddard Solvent	8052-41-3		
	Titanium Dioxide	13463-67-7		
	Toluene	108-88-3	U109	10
	Xylene	1330-20-7	U239	100

Product	Hazardous Substances	CAS# *	RCRA#	RQ** (lbs)
Enamel, Premium Gloss Protective Red #7763830	1,2,4-Trimethylbenzene	95-63-6		
	Acetone	67-64-1	U002	5,000
	Aliphatic Hydrocarbon	64742-89-8		
	Aromatic Hydrocarbon	64742-95-6		
	Aromatic Solvent	64742-95-6		
	Ethylbenzene	100-41-4	None	1,000
	Ethylene Glycol Monobutyl Ether	111-76-2		
	Liquefied Petroleum Gas	68476-86-8		
	Magnesium Silicate	14807-96-6		
	N-Butyl Acetate	123-86-4	None	5,000
	Pigment Black 7	1333-86-4		
	Pigment Red 122	980-26-7		
	Pigment Violet 32	12225-08-0		
	Propylene Carbonate	108-32-7		
	Stoddard Solvent	8052-41-3		
	Titanium Dioxide	13463-67-7		
	Toluene	108-88-3	U109	10
	Xylene	1330-20-7	U239	100
Enamel, Premium Orange #789882	MSDS Not Found	None		
Enamel, Super Tough Coat (Black 729-0604)	2-(2-Methoxyethoxy) -ethanol	111-77-3		
	Carbon Black	1333-86-4		
Enamel, Tan	Crystalline Silica	14808-60-7		
	Ethyl Benzene	100-41-4	None	1,000
	Mineral Spirits	64742-48-9		
ES Coolant Blends	MSDS Not Found	None		
Ethylene Glycol Monobutyl Ether	Ethylene Glycol Monobutyl Ether	111-76-2		
FDP-S704-03	MSDS Not Found	None		
FDP-S714-04	MSDS Not Found	None		
FDP-S816-05	MSDS Not Found	None		
FE-1A Acidizing Composition	Acetic Acid	64-19-7	None	5,000
	Acetic Anhydride	108-24-7	None	5,000
Ferchek A Reducing Agent	Citric Acid	77-92-9		
	Hydroxylamine Hydrochloride	5470-11-1		
	Silica, Amporphous-Fumed	7631-86-9		
Ferrotrol 300L (Iron Control)	MSDS Not Found			
Finish, Gloss White V2192833	Acetone	67-64-1	U002	5,000
	Aliphatic Petroleum Distillate	64742-48-9		
	Ethylbenzene	100-41-4	None	1,000
	Liquefied Petroleum Gas	68476-86-8		
	Magnesium Silicate	14807-96-6		
	Titanium Dioxide	13463-67-7		
	Toluene	108-88-3	U109	10
	Xylene	1330-20-7	U239	100
Finish, Safety Red V2164838	Acetone	67-64-1	U002	5,000
	Ethylbenzene	100-41-4	None	1000
	Ethylene Glycol Monobutyl Ether	111-76-2		
	Liquefied Petroleum Gas	68476-86-8		
	N-Butyl Acetate	123-86-4	None	5,000
	Xylene	1330-20-7	U239	100

Product	Hazardous Substances	CAS# *	RCRA#	RQ** (lbs)
Flocelle 3/8"	MSDS Not Found	None		
FMS375 Foamer Stick	MSDS Not Found	None		
FMW3032 Foamer	MSDS Not Found	None		
Foam Soap, Aero green	2-bromo-2-nitropropane-1, 3-diol	52-51-7		
	Citric Acid	77-92-9		
	Cocamidopropyl Betaine	61789-40-4		
	D&C Green No.5	4403-90-1		
	FD&C Yellow No.5	1934-21-0		
	Fragrance	None		
	PPG-24-Glycereth-24	9082-00-2		
	Propylene Glycol	57-55-6		
	Sadium Laureth Sulfate	68585-34-2		
	Tetrasodium EDTA	64-02-8		
	Triclosan	3380-34-5		
	Water	7732-18-5		
FR-26LC	Hydrotreated Light Petroleum Distillate	64742-47-8		
	Hydrotreated Light Petroleum Distillate	64742-47-8		
	9-Octadecenamide, n, n-bis-2(hydroxy-ethyl)-,(Z)	93-83-4		
	Acrylamide Copolymer	None		
	Hydrotreated Light Petroleum Distillate	64742-47-8		
FR-56	Hydrotreated Light Petroleum Distillate	64742-47-8		
Future Floor Finish	Diethylene Glycol Methyl Ether	111-90-0		
	Modified Acrylic Copolymer	None		
	Tributoxy Ethyl Phosphate	000078-51-3		
	Water	7732-18-5		
Gasoila WFP (Water Finding Paste)	Triethanolamine	102-71-6		
Gasoline Gauging Paste	All Ingredients Non Hazardous	None		
GBW-30 Breaker	Carbohydrates	None		
	Hemicellulase Enzyme	9012-54-8		
Gel-Sta L Stabilizer	Sodium Thiosulfate	7772-98-7		
Gel-Sta Stabilizer	Sodium Thiosulfate	7772-98-7		
Gilsonite Resin	Natural Asphalt	12002-43-6		
Glade Spin Fresh (Toilet Paper Rollers)	Sodium Silico Aluminate	None		
	Sodium Siulfate	None		
Gone, Carpet Spot Cleaner	Dipropylene Glycol Butyl Ether	29911-28-2		
	Linear Alkyl Benzene Sulfonic Acid	68584-22-5		
	Perfume, Coloring and Additives less than 1%	None		
	Soft Water	7732-18-5		
GP Forward General Purpose Cleaner	Alochol Ethoxylates	68439-46-3		
	Propylene Glycol Methyl Ether	107-98-2		
Grease, #105 Motor Assembly	Calcium Thickener	68309-87-5		
	Mineral Oil	64742-52-5		
	Zinc Oxide	1314-13-2		
Grease, Chevron Ultra Duty EP	Highly Refined Mineral Oil	Mixture		
	Zinc Dialkyldithiophosphate	68649-42-3		
Grease, Super Lube #2	Additives	PROPRIETARY		
	Lubricant Base Oil (Petroleum)	Various		
	Zinc Compounds	PROPRIETARY		

Product	Hazardous Substances	CAS# *	RCRA#	RQ** (lbs)
HAI-60 Acid Inhibitor	Potassium Iodide	7681-11-0		
HAI-85M Acid Inhibitor	Copper Iodide	7681-65-4		
	Dimethyl Formamide	68-12-2		
	Ehtyl Octynol	5877-42-9		
	Isopropanol	67-63-0		
	Propargyl Alcohol	107-19-7	P102	1,000
	Quaternary Ammonium Salts	None		
Halad 322 Cement Additive	Cellulose derivative	None		
	Sodium hydroxide	1310-73-2	None	1,000
	Sulfonic Acid Salt	None		
	Modified Acrylic Copolymer	None		
	Sodium Hydroxide	1310-73-2	None	1,000
	Acrylic Resin	Mixture		
	Sodium hydroxide	1310-73-2	None	1,000
	MSDS Not Found			
Halad 9 Cement Additive	MSDS Not Found	None		
Halliburton Super Flush Additive	Crystalline Silica, Quartz	14808-60-7		
	Silica, amorphous-diatomaceous Earth	68855-54-9		
	Sodium Bicarbonate	144-55-8		
	Sodium Metasilicate, Anhydrous	6834-92-0		
Halliburton Weld A Converter	Penetaethylenehexamine	4067-16-7		
	Tetraethylenepentamine	112-57-2		
	Triethanolamine	112-24-3		
Halliburton Weld A Resin	Aluminum	7429-90-5		
	Butyl Glycidyl Ether	None		
	Calcium Carbonate	471-34-1		
	Crystalline Silica, Quartz	14808-60-7		
	Epoxy Resin	None		
Hand Cleaner, Fast Orange 23108	D-Limonene	5989-27-5		
	Ethoxylated C11-C16 Alcohol	127036-24-2		
	Pumice	1332-09-8		
	Silica Quartz	14808-60-7		
	Water	7732-18-5		
HC-2	Inner Salt of Alhyl Amines	None		
	Sodium Chloride	7647-14-5		
Hi-Dense No. 4 Weight Additive	Aluminum Oxide	1344-28-1		
	Crystalline Silica, Quartz	14808-60-7		
	Iron Oxide	1309-37-1		
High Performance Lubricant Syn Film 32	MSDS Not Found	None		
HI-M-PACT 5458 Kinetic Hydrate Inhibitor	MSDS Not Found	None		
	MSDS Not Found			
Howco Gel (Bentonite)	Bentonite	1302-78-9		
	Crystalline Silica, Cristobalite	14464-46-1		
	Crystalline Silica, Quartz	14808-60-7		
	Crystalline Silica, Tridymite	15468-32-3		
Howco Suds Sticks	Polyethylene Glycol	25322-68-3		
	Sodium Chloride	7647-14-5		
Howco-Suds Foaming Agent	MSDS Not Found			
HPT-1	No-Hazardous Substances	None		
HR-12 Additive	Modified Lignosulfonate	None		

Product	Hazardous Substances	CAS# *	RCRA#	RQ** (lbs)
HR-5 Additive	Modified Lignosulfonate	None		
HT Breaker	Tert-Butyl Hydroperoxide	75-91-2		
Hydraulic Jack Oil #80054	Distillates (petroleum), Hydrotreated Naphthenic	64742-53-6		
	Polymethacrylate Dispersion	Mixture		
Hydrochloric Acid (HCl)	MSDS Not Found	None		
Hydroclear Super SAE 30 Oil	Additives	PROPRIETARY		
	Lubricant Base Oil (Petroleum)	Various		
	p-dodecylphenol	74499-35-7		
Hydrochloric Acid	Hydrocloric Acid	7647-01-0	None	5,000
HYG-3	Fumaric Acid	110-17-8	None	5,000
HyTemp I (Inhibitor-Intensifier)	MSDS Not Found	None		
Injectrol Component A	Sodium Silicate	1344-09-8		
Injectrol G	Sodium Acid Pyrophosphate	7758-16-9		
	Sodium Silicate	1344-09-8		
Isobutylene	Isobutene	115-11-7		
Isopropyl Alcohol	Isopropanol	67-63-0		
Jump Start Starting Fluid #05761	Carbon Dioxide	124-38-9		
	Diethyl Ether	60-29-7	U117	100
	Heptane	142-82-5		
	Upper Cylinder Lubricant	64741-89-5		
K-34	Sodium Bicarbonate	144-55-8		
K-35	Sodium Carbonate	497-19-8		
KCL Potassium Chloride	Potassium Chloride	7447-40-7		
KEM Hi-Temp (Heat Resistant Ctg.) 1500 #10, #14	1,2,4-Trimethylbenzene	95-63-6		
	1,3,5-Trimethylbenzene	108-67-8		
	Cumene	98-82-8	U109	10
	Ethylbenzene	100-41-4	None	1000
	Light Aromatic Hydrocarbons	64742-95-6		
	Mineral Spirits	64742-88-7		
	Xylene	1330-20-7	U239	100
Kopr Kote (Anti-Seize Lubricant)	Metallic Copper	744-050-8		
	Nonhazardous Blend	829-805-49		
	Petroleum Oil	64742-65-0		
Kwik Seal Additive	No-Hazardous Substances	Mixture		
Kwik-Seal (Blend nut hulls, wood fiber, cellophane)	MSDS Not Found	None		
Leak detector, SNOOP	Surfactant	Not Available		
	Water	7732-18-5		
Lemon Oil Polish	Aliphatic Petroleum Distillate	64742-06-9		
	Paraffinic Petroleum Distillate	64742-65-0		
LGC-35 CBM	Paraffinic Solvent	None		
	Polysaccharide	None		
LGC-8M	Guar Gum	9000-30-0		
LGC-V	Diesel	68476-34-6		
	Guar Gum Derivative	None		
LGC-VI	Diesel	68476-34-6		
	Guar Gum Derivative	None		
Lime (Calcium Hydroxide)	MSDS Not Found	None		

Product	Hazardous Substances	CAS# *	RCRA#	RQ** (lbs)
Liquid Wrench Lubricant #L312	Carbon Dioxide	124-38-9		
	Naphthenic Petroleum Distillate	64742-52-5		
	Tetrachloroethylene	127-18-4	U210	100
Long Life Multi-Purpose Lubricant #1603	MSDS Not Found	None		
Losurf-259 Surfactant	Heavy Aromatic Petroleum Naphtha	64742-94-5		
	Isopropanol	67-63-0		
Losurf-300 Nonionic Surfactant	Ethoxylated Nonylphenol	None		
Lubricant, Power 4-HD-PSP-200 Synthetic Blend	MSDS Not Found	None		
Lubricant, Power 5-TC-30 Synthetic Blend	MSDS Not Found	None		
Lysol Plus Bleach	Alkyl (C12-C16) Dimethyl Benzyl Ammonium Chlorides	68424-66-1		
	Alkyl (C12-C18) Dimethyl Benzyl Ammonium Chloride	68391-01-5		
Marvel Mystery Oil	Chlorinated Hydrocrabons	00095-50-1	U109	10
	Mineral Spirits	08052-41-3		
	Napthenic Hydrocarbons	64742-52-5		
Matrixflo II	Dimethyl Glutarate	1119-40-0		
MC PDX-4500 Foaming Agent	MSDS Not Found	None		
Methanol	Methanol	67-56-1	U154	5,000
	MSDS Not Found			
MF-1	Sodium Acid Pyrophosphate	7758-16-9		
MI Gel (Sodium Montmorillonite)	MSDS Not Found	None		
Microbond Expanding Additive	Calcium Hydroxide	1305-62-0		
Microbond HT Cement	Magnesium Oxide	1309-48-4		
MO-67	Sodium hydroxide	1310-73-2	None	1000
Modified Gauging Paste-Methonol	Methanol	67-56-1	U154	5,000
Modified Water Finding Paste M-3	All Ingredients Non Hazardous	None		
Morflo III Surfactant	1-Methoxy-2-Propanol	107-98-2		
	Dodecylbenzene Sulfonic Acid	27176-87-0	None	1,000
Murphy's Oil Soap	None	None		
Musol A Solvent	Oxylated Alcohol	None		
Natural Gas	Ethane	74-84-0		
	Methane	74-82-8		
	Propane	74-98-6		
	MSDS Not Found			
NE-118 (Non-Emulsifying Agent)	MSDS Not Found	None		
Nitrogen Liquefied	Nitrogen	7727-37-9		
Nitrogen, Gas	Nitrogen	7727-37-9		
No 327 Armor Plate w/Moly-D	MSDS Not Found			
No. 1 Thinner	Mineral Spirits as Stoddard Solvent	8052-41-3		

Product	Hazardous Substances	CAS# *	RCRA#	RQ** (lbs)
Non-Flammable 19% O2, 25% LEL Pentane, H2S, N2	Carbon Monoxide	630-08-0		
	Hydrogen Sulfide	7783-06-4	U135	100
	Methane	74-82-8		
	Nitrogen	7727-37-9		
	Oxygen	7782-44-7		
Optiflo-HTE	Crystalline Silica, Quartz	14808-60-7		
	Walnut Hulls	Mixture		
Optiflo-II Delayed Release Breaker	Ammonium Persulfate	7727-54-0		
	Crystalline Silica, Quartz	14808-60-7		
Optiflo-III Delayed Release Breaker	Ammonium Persulfate	7727-54-0		
	Crystalline Silica, Quartz	14808-60-7		
Optiflo-LT Delayed Release Breaker	Citric Acid	77-92-9		
	Polyvinylidene Chloride	9002-85-1		
Orange Hand Cleaner, LC 25108	Castor Oil	8001-79-4		
	D-Limonene	5989-27-5		
	Ethoxylated C11-C16 Alcohol	127036-24-2		
	Propylene Glycol	57-55-6		
	Pumice	1332-09-8		
	Silica Quartz	14808-60-7		
	Water	7732-18-5		
Pacemaker T-68	Distillates, Petroleum, Hydrotreated heavy paraffinic	64742-54-7		
	Distillates, Petroleum, Solvent-refined heavy paraffinic	64741-88-4		
	Proprietary Ingredients	Mixture		
Paint & Varnish Remover, Kwik All Purpose	Ethylene Glycol Monobutyl	111-76-2		
	Isopropanol	67-63-0		
	Methanol	67-56-1	U154	5,000
	Methylene Chloride	75-09-2	U080	1,000
	Water	7732-18-5		
Paint Marking Orange V2344834, V2345828	Aromatic Hydrocarbon	64742-95-6		
	Hydrotreated Light Distillate	64742-47-8		
	Liquefied Petroleum Gas	68476-86-8		
	Magnesium Silicate	14807-96-6		
	Naphtha	8032-32-4		
	Polymer Anchored Green Dye Dispersion	Mixture		
	Toluene	108-88-3	U109	10
	Xylene	1330-20-7	U239	100
Paint, Interior-Exterior 1504	1-Butanol	71-36-3	U031	5,000
	1-Methoxy-2-Propanol Acetate	108-65-6		
	Acetone	67-64-1	U002	5,000
	Butane	106-97-8		
	Ethylbenzene	100-41-4	None	1,000
	Methyl Ethyl Ketone	78-93-3	U159	5,000
	Methyl Isobutyl Ketone	108-10-1	U161	5,000
	Propane	74-98-6		
	Titanium Dioxide	13463-67-7		
	Xylene	1330-20-7	U239	100
Paint, Interior-Exterior Black 1601	See Sherwin Williams (krylon) Paint, Interior-Exterior 1504	None		

Product	Hazardous Substances	CAS# *	RCRA#	RQ** (lbs)
Paint, Interior-Exterior Blue 3546	See Sherwin Williams (krylon) Paint, Interior-Exterior 1504	None		
Paint, Interior-Exterior Clear 1301	See Sherwin Williams (krylon) Paint, Interior-Exterior 1504	None		
Paint, Interior-Exterior Green 2001	See Sherwin Williams (krylon) Paint, Interior-Exterior 1504	None		
Paint, Interior-Exterior White 1501	See Sherwin Williams (krylon) Paint, Interior-Exterior 1504	None		
Paint, Interior-Exterior Yellow 1806	See Sherwin Williams (krylon) Paint, Interior-Exterior 1504	None		
Paint, Inverted Orange Marking Paint RDMI 1000	See Sherwin Williams (krylon) Paint, Interior-Exterior 1504	None		
Paint, Semi-Gloss House & Trim White 9500	Ethylene Glycol	107-21-1	None	5,000
	Proprietary Additive	None		
	Proprietary Pigment	None		
Paint, Spray Green 2324	See Sherwin Williams (krylon) Paint, Interior-Exterior 1504	None		
Paint, Spray OSHA Orange 2410	See Sherwin Williams (krylon) Paint, Interior-Exterior 1504	None		
Paint, Spray OSHA Yellow 1813	See Sherwin Williams (krylon) Paint, Interior-Exterior 1504	None		
Para-Dichlorobenzene Urinal blockers	p-Dichlorobenzene (a,b,c,d,e,f)	106-46-7	U109	10
Parts Cleaning Fluid, Agitene	Aliphatic Petroleum Distillate	64742-88-7		
	DPM (Dipropylene Glycol Methyl Ether)	34590-94-8		
PEN-88	Oxylated Alcohol	None		
Pine Sol	Alkyl alcohol ethoxylates	127036-24-2		
	Isopropyl alcohol	67-63-0		
	Pine oil	8002-09-3		
	Sodium petroleum sulfonate	68608-26-4		
Pledge, Lemon Scent	Butane	106-97-8		
	Isobutane	75-28-5		
	Isoparaffinic Hydrocarbon Solvent	64741-66-8		
	Propane	74-98-6		
	Silicones	63148-62-9		
	Water	7732-18-5		
Porter Guard Fast Dry Enamel	(As Nuisance Particulates)	37244-96-5		
	(As Silica, Crystalline and Quartz)	14808-60-7		
	(As Talc containing non-asbestos fibers)	12135-86-3		
	(As Talc containing non-asbestos fibers)	14567-73-8		
	(As Zinc Compounds)	1314-13-2		
	Antigorite	12135-86-3		
	Aromatic Naphtha	64742-95-6		
	Mica	12001-26-2		
	Naphtha	8052-41-3		
	Quartz	14808-60-7		
	Sodium Potassium Aluminum Silicate	37244-96-5		
	Talc	14807-96-6		
	Termolite	None		
	Xylenes	1330-20-7	U239	100
	Zinc Oxide	1314-13-2		

Product	Hazardous Substances	CAS# *	RCRA#	RQ** (lbs)
Pozmix A	Crystalline Silica, Cristobalite	14464-46-1		
	Fly Ash	68131-74-8		
Primer #30753	Acetone	67-64-1	U002	5,000
	Cyclohexanone	108-94-1	U057	5,000
	Methyl Ethyl Ketone	78-93-3	U159	5,000
	Tetrahydrofuran	109-99-9	U124	100
Primer, Red V2169838	Acetone	67-64-1	U002	5,000
	Basic Zinc Molybdate	61583-60-6		
	Ethylbenzene	100-41-4	None	1,000
	Liquefied Petroleum Gas	68476-86-8		
	Magnesium Silicate	14807-96-6		
	N-Butyl Acetate	123-86-4	None	5,000
	Stoddard Solvent	8052-41-3		
	Titanium Dioxide	13463-67-7		
	Xylene	1330-20-7	U239	100
	Zinc Phosphate	7779-90-0		
Primer, Sandable Gray 1318	2-Methyl-1-Propanol	78-83-1	U140	5,000
	Acetone	67-64-1	U002	5,000
	Butane	106-97-8		
	Calcium Carbonate	471-34-1		
	Propane	74-98-6		
	Talc	14807-96-6		
	Titanium Dioxide	13463-67-7		
	Toluene	108-8-3	U109	10
	V. M. & P. Naphtha	64742-89-8		
Primer/Sealer White 8520 Primer/Sealer, Interior Latex (White 728-9416)	Ethylbenzene	100-41-4	None	1,000
	Mineral Spirits	64742-88-7		
	Mineral Spirits 140-Flash	64742-88-7		
	Talc	14807-96-6		
	Titanium Dioxide	13463-67-7		
	Xylene	1330-20-7	U239	100
	Cristobalite	14464-46-1		
	Ethylene Glycol	107-21-1	None	5,000
	Kaolin	1332-58-7		
	Quartz	14808-60-7		
	Titanium Dioxide	13463-67-7		
Produced Water	Produced water	None		
Propane	Propane	74-98-6		
PVC Cement 1200	Acrylic Resin	96-33-3		
	Amorphous fumed Silica (non-hazardous)	112945-52-5		
	Cyclohexanone	108-94-1	U057	5,000
	Methyl Ethyl Ketone	78-93-3	U159	5,000
	PVC Resin (Non-Hazardous)	9002-86-2		
	Tetrahydrofuran	109-99-9	U124	100
PVC Solvent Cement	Acetone	67-64-1	U002	5,000
	Cyclohexanone	108-94-1	U057	5,000
	Methyl Ethyl Ketone	78-93-3	U159	5,000
	PVC Resin (Non-Hazardous)	9002-86-2		
	Tetrahydrofuran	109-99-9	U124	100

Product	Hazardous Substances	CAS# *	RCRA#	RQ** (lbs)
QD Contact Cleaner #02130	1,1-Difluoroethane (HFC-152a)	75-37-6		
	Hexane Isomers	Various		
	Methanol	67-56-1	U154	5,000
	n-Hexane	110-54-3		
	Synthetic Isoparaffinic Hydrocarbon	64741-66-8		
Raid	2-Phenethyl Propionate	None		
	Eugenol	None		
	Isoparaffinic Hydrocarbon Solvent	None		
	Propellant	None		
	Solvents	None		
Resolve	Isopropyl alcohol	67-63-0		
	Propylene Glycol Monomethyl Ether	107-98-2		
Reverse Demulsifier RBW0118D	MSDS Not Found	None		
Ro-Rep	MSDS Not Found	None		
Round-Up Weed Killer	Biocide			
	Glyphosate Isopropylamine salt	38641-94-0		
	Stabilizer			
	Surfactant			
	Water	7732-18-5		
Rush Safety Solvent	MSDS Not Found	None		
S-400 (Surfactant)	MSDS Not Found	None		
SAE 5AW-30 Motor Oil	Additives	PROPRIETARY		
	Lubricant Base Oil (Petroleum)	Various		
Salt, Oilfield Fine	Sodium Chloride	7647-14-5		
Salt, Ottawa	MSDS Not Found	None		
Sand- 40/60 Wedron Special Frac	Crystalline Silica, Quartz	14808-60-7		
Sand- Oklahoma No. 1- SSA-2	Crystalline Silica, Quartz	14808-60-7		
SandWedge NT	Heavy Aromatic Petroleum Naphtha	64742-94-5		
SCA-130 Inhibitor	Acetaidehyde	75-07-0		
	Aldol	107-89-1		
	Crotonaidehyde	123-73-9	U053	100
Scotchrap Brand Pipe Primer	Benzene	71-43-2	U109	10
	Butyl rubber	9010-85-9		
	Calcium Zinc Resinate	68334-35-0		
	Carbon Black	1333-86-4		
	Ethyl Alcohol	64-17-5		
	Kaolinite	1318-74-7		
	Mica-Group Minerals	12001-26-2		
	Peperylene-2-Methyl-2-Butene Polymer	26813-14-9		
	Quartz Silica	14808-60-7		
	Solvent Naphtha (Petroleum), Light Aliphatic	64742-89-8		
	Toluene	108-88-3	U109	10

Product	Hazardous Substances	CAS# *	RCRA#	RQ** (lbs)
Scrubs, Rough Touch	Cocoamide DEA	68603-42-9		
	Ethoxylated Alcohols (C12-15 Pareth-7)	68131-39-5		
	Isoparaffinic Hydrocarbon	64742-47-8		
	Mineral Oil (mist)	8042-47-5		
	Oleic Acid	61790-12-3		
	Propylene Glycol	57-55-6		
	Pumice (dust)	1332-09-8		
	Triethanolamine	102-71-6		
	Water	7732-18-5		
Sealant, #5 Pipe Thread #25431	Diacetone Alcohol	123-42-2		
Sealant, #5 Pipe Thread Special #26431	Diethylene Glycol Methyl Ether	111-90-0		
Sealant, 736 RTV	Ethyltriacetoxysilane	17689-77-9		
	Methyltriacetoxysilane	4253-34-3		
SGA-1 Gelling Agent	Acetic Acid	64-19-7	None	5,000
SGA-HT Gelling Agent	Branched Ethoxylated Nonylphenol	68412-54-4		
	Hydrotreated Heavy Naphthenic Distillate	64742-52-5		
SI-16 WSP	MSDS Not Found	None		
Silica Flour-SSA-1	Crystalline Silica, Quartz	14808-60-7		
Silicalite- Compacted	Silica, Amporphous-Fumed	7631-86-9		
Silicone Ad Sealant, Red High Temp RTV	Acetic Acid	64-19-7	None	5,000
	Dimethyl polysiloxane	63148-62-9		
	Distillates (petroleum), hydrotreated middle	64742-46-7		
	Ethyltriacetoxysilane	17689-77-9		
	Methyltriacetoxysilane	4253-34-3		
	Poly(dimethylsiloxane), hydroxy terminated	70131-67-8		
	Silica, amorphous (fumed)	7631-86-9		
Silicone Sealant, RD Pro RTV	Dimethylsiloxane, hydroxy-terminated	70131-67-8		
	Ethyltriacetoxysilane	17689-77-9		
	Iron (III) Oxide	1309-37-1		
	Methyltriacetoxysilane	4253-34-3		
	Non-hazardous ingredients	None		
	Polydimethylsiloxane	63148-62-9		
	Silica (as amorphous silica, total dust)	7631-86-9		
	Titanium Dioxide	13463-67-7		
Silicone, High T RTV #81409	Acetic Acid	64-19-7	None	5,000
	Amorphous Silica	7631-86-9		
	Distillates (petroleum), Hydrotreated Middle	64742-46-7		
	Ethyltriacetoxysilane	17689-77-9		
	Iron Oxide	1309-37-1		
	Methyltriacetoxysilane	4253-34-3		
	Poly (Dimethylsiloxane), Hydroxy Terminated	70131-67-8		
	Polydimethylsiloxane	63148-62-9		
	Titanium Dioxide	13463-67-7		
Skid Tex for Paint	Pumice	1332-09-8		
	Quartz	14808-60-7		

Product	Hazardous Substances	CAS# *	RCRA#	RQ** (lbs)
Slick Willie- OF WSP	MSDS Not Found	None		
Snapback Spraybuff Liquid	Diethylene Glycol monoethyl Ether	111-90-0		
Snow & Ice Melt	Calcium Chloride	010043-52-4		
	Potassium Chloride	07447-40-7		
	Sodium Chloride	7647-14-5		
Soda Ash (Sodium Carbonate)	MSDS Not Found	None		
Sodium Bicarbonate	MSDS Not Found	None		
Sodium Persulfate	Sodium Persulfate	7775-27-1		
Solidifier, Belzona 1221Super-e Metal	MSDS Not Found	None		
Solidifier, Belzona 1321 Ceramic S-Metal (Blue/Gray)	MSDS Not Found	None		
Soltex (Sodium Asphalt Sulfonate)	MSDS Not Found	None		
SP Breaker	Sodium Persulfate	7775-27-1		
SP-101 (Sodium Polyacrylate)	MSDS Not Found	None		
Spartan Pine Cleaner	Pine Oil	8002-09-3		
	Potassium Cocoate	61789-30-8		
	Sodium Xylene Sulfonate	1300-72-7		
SSO-21	Diethylene Glycol	111-46-6		
SSO-21M Winterized	Ethoxylated Nonylphenol	None		
	Ethylene Glycol Monobutyl Ether	111-76-2		
	Methanol	67-56-1	U154	5,000
Stannic Chloride	Tin Chloride	7646-78-8		
Starting Fluid, SFR-11	Carbon Dioxide	124-38-9		
	Ethyl Ether	60-29-7	U117	100
	n-Heptane	142-82-5		
Stihl 2 Cycle Universal Engine Oil #07813198903	Additive Package	Mixture		
	Dye	Mixture		
	Petroleum Distillates, Hydrotreated Heavy Paraffnic	64742-54-7		
	Petroleum Distillates, Solvent Dewaxed Heavy Paraffinic	64742-65-0		
	Residual Oils (petroleum), Hydrotreated	64742-57-0		
	Residual Oils (petroleum), Solvent Dewaxed	64742-62-7		
	Stoddard Solvent	8052-41-3		
Strawberry Fragrance Master	MSDS Not Found	None		
Stride Floral	MSDS Not Found	None		
Sugar Cane Sucrose	Carbohydrates	None		
Super CBL Additive	Aluminum	7429-90-5		
Super HS Bauxite (20-40 Mesh)	Aluminum Oxide	1344-28-1		
	Aluminum Silicate	1302-76-7		
	Phenol/Formaldehyde resin	9003-35-4		
Super Prop Propant	Phenol/Formaldehyde resin	9003-35-4		

Product	Hazardous Substances	CAS# *	RCRA#	RQ** (lbs)
Terminator	Alkyloxypolyethyleneoxyethanol	84133-50-6		
	Blend of n-Alkyl Dimethyl Benzyl and	68424-85-1		
	Di-n-alky Dimethyl Ammonium Chlorides	68424-94-3		
	Perfume, Coloring and Additives less than 1%	None		
	Soft Water	7732-18-5		
	Tetrasodium Ethylenediammine Teraacetate	64-02-8		
TFE Seal/ Valve Lubricant	MSDS Not Found	None		
Thinner #641	MSDS Not Found	None		
Time Mist Air Freshener	Acetone	67-64-1	U002	5,000
	C8-C9 Isoparaffnic Hydrocarbons	64742-48-9		
	Diethylene Glycol Methyl Ether	111-90-0		
	Perfume Oils-Supplier Trade Secret	None		
	Propane	74-98-6		
TLC-80	Aluminum Oxide	1344-28-1		
TLC-W3-Rock Salt	Crystalline Silica, Cristobalite	14464-46-1		
Toluene	Toluene	108-88-3	U109	10
Triethylene Glycol	MSDS Not Found	None		
Universal Solvent Blend	Acetone	67-64-1	U002	5,000
	Ester EEP	763-69-9		
	n-Butane	106-97-8		
	Propane	74-98-6		
Unleaded Gasoline	Benzene	71-43-2	U109	10
	Gasoline	None		
US-40 (Solvent)	MSDS Not Found	None		
Valuprop Ceramic Propant	Aluminum Silicate	1302-76-7		
Valve Flush	None	None		
Vanish Drop Ins	Acid Blue #9	3844-45-9		
	Hydroxyethyl Cellulose	9004-62-0		
	Pine Oil	8002-09-3		
	Sodium Dodecylbenzene sulfonate	25155-30-0	None	1,000
	Sodium Gluconate	527-07-1		
	Sodium Sulfate	7757-82-6		
	Sodium Tetraborate Pentahydrate	1330-43-4		
Versaprop (all mesh sizes)	Aluminum Oxide	None		
	Aluminum Silicate	None		
Versaset	Sodium Aluminate	1302-42-7		
Vicon NF Breaker	Chlorous Acid, Sodium Salt	7758-19-2		
	Sodium Chloride	7647-14-5		
Water Finding Paste	All Ingredients Non Hazardous	None		
WD 40 Aerosol	Aliphatic Petroleum Distillate	8052-41-3		
	Carbon Dioxide	124-38-9		
	LVP Hydrocarbon Fluid	64742-47-8		
	Non-hazardous ingredients	None		
	Petroleum Based Oil	64742-65-0		
WG-17 Gelling Agent	Cellulose derivative	None		
WG-31 Gelling Agent	Guar Gum	9000-30-0		

Product	Hazardous Substances	CAS# *	RCRA#	RQ** (lbs)
Windex, Blue	Ethylene Glycol n-hexyl ether	112-25-4		
	Isopropanol	67-63-0		
	Water	7732-18-5		
WLC-5 Fluid Loss Additive	Complex Carbohydrates	None		
Xylene	Ethyl Benzene	100-41-4	None	1,000
	Xylene	1330-20-7	U239	100
ZoneSealant 2000	Isopropanol	67-63-0		
ZoneSealant 3000	Keratins, Hydrolyzates	69430-36-0		

** Chemical Abstracts Service (CAS) registry number*

*** Reportable Quantity*

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APPENDIX L: DRAFT EIS COMMENTS AND RESPONSES

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INTRODUCTION

This appendix provides the BLM's response to comments received on the Continental Divide-Creston Natural Gas Development Project Draft EIS. The appendix includes:

- An overall summary of the public comment process—soliciting, receiving, and evaluating comments on the Draft EIS.
- Instructions for finding specific comment letters and e-mails (collectively referred to as comment letters).
- **Table L-1**, which contains respondent information for all comment letters received on the Draft EIS. A ***respondent*** is defined as the author of a comment letter and may be an individual, agency, business, or organization.
- **Tables L-2 and L-3**, which contain a listing of substantive comments arranged by category, and the agency response to each comment. Table L-2 includes comments in all categories except Air Quality, which are included in Table L-3.

PUBLIC COMMENT PROCESS

The CEQ regulations (40 CFR 1503.1) require that federal agencies invite review and comment on the Draft EIS. The BLM NEPA Handbook H-1790-1 specifies a comment period of at least 45 days. [And CEQ at 1506.10.] A notice of availability (NOA) was published in the Federal Register (Vol. 75, No. 14) by the BLM on December 7, 2012, announcing the availability of the Draft EIS for public review and comment. The original close of the 45-day comment period was January 18, 2013; however, the comment period was subsequently extended an additional 45 days until April 6, 2013 to allow additional time for comment.

Following the release of the Draft EIS, the BLM Rawlins Field Office (RFO) hosted a public meeting in Rawlins on January 15, 2013 to provide the public with an opportunity to comment on the information contained in the Draft EIS.

During the 90-day comment period, written comments were accepted through a variety of formats, including submission at the public meeting on January 15, 2013. Individuals who submitted oral comments at the public meeting were advised that for the comment to be considered and included in the document, it needed to be submitted in writing. Comment forms were provided at the public meeting.

In all, 8,657 comment letters and emails were received during the public comment period for the Draft EIS. Of these, 8,586 were email letters containing the exact same—or very similar—verbiage. These form letters were treated as a single unique comment. Unique comment letters were received from 71 other individuals and organizations: four federal agencies, four county agencies (Carbon and Sweetwater Counties), four Wyoming State agencies, 16 non-governmental organizations, 11 members of the oil and gas industry, and 33 private individuals. Original comment letters may be viewed by contacting the Rawlins Field Office (RFO).

COMMENT REVIEW PROCESS

All comment letters not identified as form letters were categorized by the type of respondent, as follows:

C	County Agency	In	Oil and Gas Industry
F	Federal Agency	O	Organization
S	State Agency	P	Private Individual

To create a unique ***Respondent ID*** for each comment letter, the comment letters were then numbered sequentially in the order received. For example, the Respondent ID for the Carbon County Board of

County Commissioners is C01, indicating it was the first comment letter received from a County. A complete list of respondents and their corresponding Respondent IDs is included in **Table L-1**.

BLM personnel reviewed all unique comment letters and broke them down into individual comments. Comments within each letter were sequentially numbered and the comment number was added to the Respondent ID to create a unique ***Comment Code***. For example, the first comment from the Carbon County Board of County Commissioners is C01-1. Comments were then identified by resource or discipline category for analysis and response.

Consistent with NEPA regulations (40 CFR 1503.4[b]), this appendix focuses on *substantive comments* on the Draft EIS. Substantive comments include those that:

- question, with reasonable basis, the accuracy of information in the EIS or EA;
- question, with reasonable basis, the adequacy of, methodology for, or assumptions used for the environmental analysis;
- present new information relevant to the analysis;
- present reasonable alternatives other than those analyzed in the EIS or EA; and/or
- cause changes or revisions in one or more of the alternatives.

Comments that are not considered substantive include comments in favor of or against the Proposed Action or alternatives without reasoning that meets the criteria listed above, comments that only agree or disagree with BLM policy or resource decisions without justification or supporting data that meet the criteria listed above, comments that do not pertain to the project area or the project, and comments that take the form of vague, open-ended questions.

The CEQ regulations recognize several options for responding to substantive comments, including:

- modifying one or more of the alternatives as requested;
- developing and evaluating suggested alternatives;
- supplementing, improving, or modifying the analysis;
- making factual corrections; or
- explaining why the comments do not warrant further agency response.

Responses to substantive comments to the Draft EIS are described in **Table L-2**. Each entry in the table is a distinct comment extracted from a comment letter and contains the Comment Category (see the list of category abbreviations below), Subcategory, Comment Code, Comment, and its Response. Please note that unique comments are generally quoted verbatim from the original letter, as indicated by quotation marks. Those that were especially lengthy and/or that represented similar points of view were paraphrased. Text quoted directly from the Draft EIS is shown in italics.

Comment Category Abbreviations

ALT	Alternatives (General)
ALT A	Alternative A
ALT B	Alternative B
ALT C	Alternative C
ALT D	Alternative D
ALT E	Alternative E
AQ	Air Quality
BMP	Best Management Practices, Conditions of Approval
CH1	Purpose and Need, Issues, Regulatory Background
CR	Cultural Resources
GEO	Geology and Paleontology
GN	General, administrative, Resource Management Plan, chapter introductions, miscellaneous
H&S	Health and Safety
HAZ	Hazardous Waste
INV	Invasive Species
NO	Noise
OG	Oil & Gas and Other Minerals
PA	Proposed Action
RCL	Reclamation
REC	Recreation, LWCs, ACECs
RG	Range
SE	Socioeconomic
SL	Soils
SS	Sensitive Species
T&E	Threatened, Endangered, Candidate, and Proposed Species
TR	Transportation and Access
VEG	Vegetation
VRM	Visual Resource Management
WH	Wild Horses
WL	Wildlife
WR-G	Water Resources - Groundwater
WR-S	Water Resources - Surface

Responses referring readers to information contained in another comment/response entry cite the referenced Comment Code. For example, a response guiding the reader to see the response to C01-1 is referring the reader to the first comment from Respondent C01, the Carbon County Board of County Commissioners.

Table L-1. Draft EIS Respondents

Respondent ID	Respondent Name	Agency/Company
F01	Bohan, Suzanne J.	US EPA
F02	Jiron, Daniel J.	USDA Forest Service
F03	Field Supervisor	USDI Fish & Wildlife
F04	Air Resources Division	USDI National Park Service
S01	Mead, Matthew H.	Office of the Governor
S02	Fearneyhough, Jason	Wyoming Dept. of Agriculture
S03	Wagner, John	Wyoming DEQ WQD
S04	Emmerich, John	Wyoming Game & Fish
C01	Chapman, Leo	Carbon County Board of County Commissioners
C02	Connelly, Kent	Coalition of Local Governments
C03	Johnson, Wally W.	Sweetwater County Commissioners
C04	Rolston, Rich & Joel Bousman	Wyoming County Commissioners Assn.
O01	Bannon, Joy & Michael Saul	Wyoming Wildlife Federation
O02	Wischmann, Lesley	Alliance for Historic Wyoming
O03	Rutledge, Brian & Daly Edmunds	Audubon Rockies - Policy Office
O04	Molvar, Erik on behalf of Jonathan Ratner	Biodiversity Conservation Alliance
O05	States, Jim B.	Platte Valley Trout Unlimited
O06	Novak, Anne	Protect Mustangs
O07	Kathrens, Ginger & Suzanne Roy	The Cloud Foundation
O08	Kathrens, Ginger & Suzanne Roy	The Cloud Foundation; RSGA decree attachment
O09	Thagard, Neil	Theodore Roosevelt Conservation Partnership
O10	Purves, Cathy	Trout Unlimited
O11	Campbell, Judd	Voices of the Valley
O12	Dan Thompson, PhD	Wildlife Society - Wyoming Chapter
O13	Mong, Tony & Dan Thompson	Wildlife Society - Wyoming Chapter
O14	Lee, Chesie	Wyoming Assn. of Churches
O15	Williams, Megan	Wyoming Outdoor Council
O16	Dewell, Pamela	Wyoming Stock Growers Land Trust
In01	Lawson, Chrissy	Anadarko
In02	Robinson, Tom	BP America Production Company
In03	Robinson, Tom	BP America Production Company attachment to letter
In04	Austin, Gary	CD-C Proponents (via BP)
In05	Bolles, Randy	Devon Energy
In06	Michael Keller	Fidelity Exploration & Production
In07	Joe Redman	QEP Energy Co.
In08	Smith, Heather	Samson Resources Company
In09	Rinke, T.J.	Williams Production
In10	Westbrook, Shay	Yates Petroleum Corp., by Gene R. George & Associates
In11	Wagner, Esther / Claire Moseley	Petroleum Assn. of Wyoming / Public Lands Advocacy
P01	Malone, Adolphus	Peter Hansen Ranch
P02	Burke, Birgit Fowler	
P03	Schmid, Pat	
P04	Mathia, Carol	
P05	Van Valkenburg, J.	
P06	O'Keefe, Michael	
P07	Koritnik, Mary and Joe	
P08	Bloomquist, Cynthia Gove (Larsen)	
P09	Russom, Rich	

Respondent ID	Respondent Name	Agency/Company
P10	Rucker, Isabel	
P11	Lynch, Janet	
P12	Jasper, Robert	
P13	Hughes, Barbara	
P14	Sample form letter	
P15	Becklund, Kerry	
P16	Kartes, Jane	
P17	Mcneill, Sheryle	
P18	Levy, Barbara	
P19	Fullbright, Audette	
P20	Spencer, Sue	
P21	Cleveland, Heidi	
P22	Raynolds, Linda	
P23	Irwin, Michele	
P24	Patterson, Thor & Lora	
P25	Litwin, Patrice	
P26	Berto, Connie	
P27	Allen, Robert	
P28	Cook, Edith	
P29	Malone, Martha & Baby Boy	
P30	Douglas, Dianne	Bison Connect
P31	No name provided	Basic Energy
P32	Kennedy, T.	Basic Energy
P33	Wells, J. L.	Basic Energy

Table L-2. Comments and Responses (see Table L-3 for Air Quality)

Category	Sub-Category	Comment		Comment	Response
		Code	No		
ALT	1/4-mile buffer	S04	14	We recommend 1/4-mile buffer around Red Wash, springs, wells, and wetlands, increasing to 1/2-mile perennial streams including Muddy Creek. This buffer would incorporate SGCN amphibian and reptile average home range and migration distances and would minimize sediment and salinity input into the Colorado River Drainage. Exceptions should only granted based on analysis of site-specific engineering and mitigation plans. Only actions that could not be avoided and that would provide protection for the resource identified should be approved.	Alternative B proposes to have 0.25-mile buffers around sensitive water resources such as Red Wash and Muddy Creek. This would require the initiation of an RMP amendment; this requirement has been clarified in the Final EIS. However, due to the abundance of private lands bordering Muddy Creek, the ability of the BLM to implement and enforce such a buffer would be limited.
ALT	Against Alternative D, feasibility	In05, In08	2	We are opposed to Alternative D, which would require 100% directional drilling. There is a significant degree of uncertainty as to where O&G resources can be most appropriately developed in CD-C. BLM would preclude or at least significantly curtail future operation in the area. It would be virtually impossible to adequately develop the federal government's resources from a single drilling location within most areas. Operators would be unable to develop and effectively drain the federal resources within their lease.	Thank you for your comment.
ALT	Alkaline wetland communities	S04	13	A transportation and development plan needs to be completed within the first year after signature of the ROD, to include avoidance areas such as the alkaline wetland communities at Chain Lakes. The Preferred Alternative should identify avoidance of surface-disturbing and disruptive activity within 0.25 mile of any Chain Lakes alkaline wetland community or the ordinary high water mark of other playas.	The Transportation Plan (Appendix N) will be implemented once the ROD is signed. Management of the Chain Lakes WHMA is part of the Rawlins RMP and will be addressed in a separate management plan. Alternative B proposes to avoid the Chain Lakes and other playas by 0.25 miles, and would require the completion of an RMP amendment in order to be implemented, as indicated in the revised text of Alternative B in the Final EIS.
ALT	Alternative B	O07	1	"...if this project proceeds, we urge the BLM to implement Alternative B [and] Wild horses must be added to the list of resources to be protected. "	Wild horses would indirectly benefit from the provisions in Alternative B that are directed towards livestock and wildlife. At this point, adding wild horses specifically as a resource to be protected in Alternative B would result in a significant change between the Draft EIS and the Final EIS.
ALT	Alternative B	O02	2	"..we would prefer... no action... [However, Alternative B] 100% directional drilling will diminish the need for more extensive Class III resource surveys [due to diminished surface disturbance]."	Thank you for your comment

Category	Sub-Category	Comment		Comment	Response
		Code	No		
ALT	Alternative D	O03	9	Audubon supports Alternative D, with modifications. Alternative B and C both contain protective measures that should be added.	Thank you for your comment.
ALT	Alternative D	O04	68	Under this project, there is an opportunity for BLM to approve all 8,950 wells and achieve complete fluid mineral resource development while still providing an adequate level of protection for sensitive lands and wildlife habitats. This balance would be based on Alternative D, with the addition of elements of other alternatives and additional mitigation measures as outlined above to provide greater protection for habitats of mule deer, pronghorn, sage grouse, pygmy rabbit, Wyoming pocket gopher, Muddy Creek aquatic habitats, and other BLM Sensitive Species. We would urge BLM to adopt this “doing it right” approach to minimize the additional impacts of oil and gas development on sensitive wildlife species in this area. We appreciate the opportunity to comment on this project; please notify us of all future opportunities for public involvement in this effort.	Thank you for your comment.
ALT	Alternative D	C01	5	Carbon County generally supports Alternative D: Directional Drilling, which appears to have the least impact on the affected environment while allowing full development of the resource. Carbon County supports the objectives of Alternative D to minimize surface disturbance, reduce habitat loss and wildlife disruption.	The Preferred Alternative (Alternative F) incorporates design features that are intended to minimize impacts to identified sensitive resources, in particular impacts to the Muddy Creek and Bitter Creek watersheds. By limiting the number of well pads to eight per section, surface disturbance should be reduced and directional drilling encouraged. A dust control plan **(Appendix P**) has been incorporated as part of Alternative F. Because this is an infill project, most road development will be limited to the construction of resource and/or local roads. The larger arterial roads have already been constructed. To aid in transportation planning, the CD/WII Transportation Plan has been updated and included (**Appendix N**) as part of the Preferred Alternative. Specific measures for the Muddy Creek watershed have been incorporated into Alternative F as design features.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
ALT	Alternative D	C01	8	A combination of alternatives, with particular emphasis on Alternatives B and D, may be acceptable if it is necessary to provide development flexibility while minimizing impacts.	The Preferred Alternative (Alternative F) incorporates design features that are intended to minimize impacts to identified sensitive resources, in particular impacts to the Muddy Creek and Bitter Creek watersheds. By limiting the number of well pads to eight per section, surface disturbance should be reduced and directional drilling encouraged. A dust control plan **(Appendix P**) has been incorporated as part of Alternative F. Because this is an infill project, most road development will be limited to the construction of resource and/or local roads. The larger arterial roads have already been constructed. To aid in transportation planning, the CD/WII Transportation Plan has been updated and included (**Appendix N**) as part of the Preferred Alternative. Specific measures for the Muddy Creek watershed have been incorporated into Alternative F as design features.
ALT	Alternative D	F03	1	The Service recommends maximizing use of directional drilling while minimizing the size of well pads and other facilities, like Alternative D.	See response to C01-8 above.
ALT	Alternatives A and D	In01	1	Although BLM included directional drilling as a separate alternative, we do not believe 100-percent vertical or directional drilling should be separate alternatives, especially in light of APC's and other operators' commitment to drill directional where feasible from a technological and economical perspective.	The CD-C operators did not specify that any particular method of drilling would be used. Alternative A merely examines the possibility that all drilling would be done using conventional vertical drilling technology. It represents as well the likely maximum amount of surface disturbance the project might produce.
ALT	Alternatives B and D	O10	1	Trout Unlimited supports a combination of Alternative B with Alternative D, creating stronger protection measures while still allowing full access to the natural gas resources.	Thank you for your comment.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
ALT	Horizontal drilling	C02	8	"...the Draft EIS developed Alternatives that...appears to preclude horizontal drilling while allowing directional drilling without any explanation."	It is not BLM's intent to preclude horizontal drilling and such an intention is not expressed in the Draft EIS. The development of this EIS was based on the Proposed Action and the Project Description in Appendix B that was submitted by the Operators. No mention of oil development or the use of horizontal drilling was made in the project description. The Proposed Action and alternatives were developed based on the presumption that the Operators were intending to develop natural gas, not oil. Therefore, horizontal drilling and the development of oil is not analyzed in this EIS. If Operators intend to develop oil, then applications for such would be analyzed under a separate NEPA document to address the different impacts associated with the development of oil.
ALT	Low impact	O14	2	"We advocate for the use of lower impact directional drilling to concentrate rigs, pumps, roads, trucking. And pads in central locations [to minimize] surface disturbance [and project-related activities]."	Alternative B encourages these provisions and Alternative D would consolidate drilling pads and concentrate drilling activities, in addition all the Action Alternatives would incentivize the use of directional drilling technology.
ALT	Mitigate the loss of AUMs	C01	22	The development of off-site water wells to mitigate the loss of AUM' s would also be consistent with the Carbon County goal to retain ranching and agriculture as the preferred land uses in rural areas.	Thank you for your comment.
ALT	Population thresholds	S04	4	Page 2-9, Population Thresholds: Thresholds are not based on habitat only, they are also affected by other factors. It should not be WGFD's responsibility to be the alarm bell for population thresholds for BLM-permitted activities. Rather, the ROD should identify those thresholds that will or will not affect future permitting/development activities. The presence of fee mineral estate where stipulations to protect wildlife populations don't apply compounds the potential for decline. The Draft EIS doesn't identify levels of acceptable decline. The ROD should identify when declines are acceptable and when the declines will affect future activities.	Please see the revised text. Under this alternative, the BLM would now make the determination as to when populations are being affected and for initiating the development of mitigation plans.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
ALT	Preferred Alternative	O04	3	Overall, we support the implementation of Alternative D with certain modifications. Permitting 6,126 additional well pads presents an unacceptable level of impact even within a developed field, and represents unnecessary and undue degradation of public lands and wildlife habitats, because most of these impacts are readily avoidable through the requirement of directional drilling from existing well pads or well clustering at a maximum density of one well pad per square mile in the case of presently undeveloped areas. We understand that some oil and gas lessees will be more eager to implement this alternative than others, but all must understand the BLM's obligation to manage these lands for multiple uses (not the sole benefit of the oil and gas industry) and the limitations on the rights of mineral lessees, which all exploration and development only to the extent approved by BLM and subject to Conditions of Approval that are applied at the project-level scale. It is the agency's obligation to arrive at a Decision that best balances the needs of all public lands users, not the Decision that is most acceptable to all oil and gas operators participating in the Project.	Thank you for your comment.
ALT	Preferred Alternative	C02	4	"The Draft EIS...does not identify a Preferred Alternative. The assumption that it need not identify a Preferred Alternative at the project level is wrong. The CEQ rules do not exempt a project proponent EIS from the requirement to identify the Preferred Alternative, if there is one. See also BLM NEPA Handbook, H-1790-1, 9.7.2, 9.7.3...Failure to disclose it violates the transparent decision-making obligations that BLM owes the public. "	CEQ regulations at 40 CFR 1502.14(e) direct that a Preferred Alternative be identified in the draft statement if one exists. As stated in the draft EIS in Section 2.1, "The BLM does not have a Preferred Alternative for the CD-C Natural Gas Development Project at this time. The BLM believes that the Proposed Action and the action alternatives all have elements that would address the project purpose and need and will review public comment on the Draft EIS before determining a Preferred Alternative. A Preferred Alternative will be designated in the Final EIS."
ALT	Preferred Alternative	C02	5	Failure to identify and analyze the Preferred Alternative renders the Draft EIS process insufficient.	Please see the response to Comment C02-4 above.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
ALT	Preferred Alternative	In05, In08	14	BLM did not select a Preferred Alternative even though Wyoming IM 2008-019 requires one.	CEQ regulations at 40 CFR 1502.14(e) direct that a Preferred Alternative be identified in the draft statement if one exists. As stated in the Draft EIS in Section 2.1, "The BLM does not have a Preferred Alternative for the CD-C Natural Gas Development Project at this time. The BLM believes that the Proposed Action and the action alternatives all have elements that would address the project purpose and need and will review public comment on the Draft EIS before determining a Preferred Alternative. A Preferred Alternative will be designated in the Final EIS."
ALT	Preferred Alternative	S01	1	The Governor requests that the BLM work with cooperating agencies to develop a Preferred Alternative.	Thank you for your comment.
ALT	Preferred Alternative	S01	2	The Governor encourages the BLM to create a Preferred Alternative that does not prohibit any one drilling technique and that recognizes the variety of surface conditions, reclamation potential, and reservoir characteristics, including other formations, that exist within the project area.	The Preferred Alternative (Alternative F) incorporates design features that are intended to minimize impacts to identified sensitive resources, in particular impacts to the Muddy Creek and Bitter Creek watersheds. By limiting the number of well pads to eight per section, surface disturbance should be reduced and directional drilling encouraged. A dust control plan **(Appendix P**) has been incorporated as part of Alternative F. Because this is an infill project, most road development will be limited to the construction of resource and/or local roads. The larger arterial roads have already been constructed. To aid in transportation planning, the CD/WII Transportation Plan has been updated and included (**Appendix N**) as part of the Preferred Alternative. Specific measures for the Muddy Creek watershed have been incorporated into Alternative F as design features.
ALT	Preferred Alternative	C03	3	Identify Preferred Alternative: Within the Draft EIS, Sweetwater County strongly encourages the BLM to identify a Preferred Alternative.	See response to IN05-14 above.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
ALT	Preferred Alternative	O12/ O13	2	If the BLM has a Preferred Alternative this should be make known to the public. If a Preferred Alternative is stated there needs to be adequate time for public input.	CEQ regulations at 40 CFR 1502.14(e) direct that a Preferred Alternative be identified in the draft statement if one exists. As stated in the draft EIS in Section 2.1, ”The BLM does not have a Preferred Alternative for the CD-C Natural Gas Development Project at this time. The BLM believes that the Proposed Action and the action alternatives all have elements that would address the project purpose and need and will review public comment on the Draft EIS before determining a Preferred Alternative. A Preferred Alternative will be designated in the Final EIS.”
ALT	Preferred Alternative	O12/ O13	6	Due to the extent of the project and amount of disturbance estimated to result and lack of acceptable and adequate reclamation techniques in the existing fields, the operators should be required to use less intrusive development techniques. This would include utilization of multiple well pads which would result in less disturbance per well. The operator's proposal calls for 42% of the wells to be drilled from multiple well pads, but current technologies could potentially increase this percentage, thus decreasing the level of disturbance.	The Agency Preferred Alternative requires Operators to consider the use of closed-loop drilling in the sensitive watershed of Muddy Creek and Bitter Creek. However, not all development can occur using closed-loop drilling and some exceptions would have to be granted. Operators are currently drilling upwards of 85 percent of their wells directionally; it would be difficult for the BLM to incentivize directional drilling as the majority of the drilling occurring in the field office is being completed through a directional drilling program.
ALT	Preferred Alternative	O12/ O13	25	There does not seem to be notice of a Preferred Alternative in the document for public discussion.	See response to O12-2 above
ALT	Preferred Alternative	S03	1	The WQD recommends a Preferred Alternative in the Final EIS that combines the water protection features of Alternative B (avoidance areas around streams; monitoring and reporting or erosion BMPs; Muddy Creek monitoring), the multi-well drilling of Alternative D, and the reclamation incentives of Alternative C.	Alternative F, the Agency Preferred Alternative incorporates design features that are intended to minimize impacts to identified sensitive resources, in particular impacts to the Muddy Creek and Bitter Creek watersheds. By limiting the number of well pads to 8 per section, surface disturbance should be reduced and directional drilling encouraged. A dust control plan has been incorporated as part of the Agency Preferred Alternative (see **Appendix P**). Because this is an infill project, most road development will be limited to the construction of resource and/or local roads. The larger arterial roads have already been constructed. To aid in transportation planning, the CD/WII Transportation Plan has been updated and included as part of the Agency Preferred Alternative (**Appendix N**). Specific measures for the Muddy Creek watershed have been incorporated into the Preferred Alternative as design features (**Appendix O**).

Category	Sub-Category	Comment		Comment	Response
		Code	No		
ALT	Preferred Alternative	S04	1	WGFD recommends that BLM and the cooperators develop a Preferred Alternative that will be reviewed by the public. The Preferred Alternative should incorporate: a disturbance cap; a program to address reclamation research, technique and tracking; consolidation of drilling activities; schedule for a review of the project and its conformance with the ROD conducted by the cooperating agencies; a requirement that the CD-C ROD be reviewed again when it is time to revise the RMP.	Alternative F, the Agency Preferred Alternative incorporates design features that are intended to minimize impacts to identified sensitive resources, in particular impacts to the Muddy Creek and Bitter Creek watersheds. By limiting the number of well pads to 8 per section, surface disturbance should be reduced and directional drilling encouraged. A dust control plan has been incorporated as part of the Agency Preferred Alternative (see **Appendix P**). Because this is an infill project, most road development will be limited to the construction of resource and/or local roads. The larger arterial roads have already been constructed. To aid in transportation planning, the CD/WII Transportation Plan has been updated and included as part of the Agency Preferred Alternative (**Appendix N**). Specific measures for the Muddy Creek watershed have been incorporated into the Preferred Alternative as design features (**Appendix O**).
ALT	Preferred Alternative, mgmt. flexibility	In01	3	Flexibility in deciding which mitigation measures should apply in site-specific approvals for the Project must be included in the programmatic environmental analysis and ROD. Should a decision be issued without such flexibility, the BLM would be creating undue burdens, expenses, and administrative work that is not supported in sounds science, judgment or policy. Neither BLM nor the operator can reasonably be expected to anticipate all conditions that may be encountered during development. Thus, the Final EIS and record of decision should include means, such as exceptions, that can be used to address unforeseen technical or operational challenges. Permits issued under the Project cannot be bound to mitigation that is unnecessary or impractical given site specific circumstances.	The RMP grants the RFO the flexibility of considering exception requests on a case-by-case basis.
ALT	Proposed Action	In04	8	The Proposed Action should be selected since it delivers the socioeconomic benefits while limiting surface disturbance and long-term environmental impacts.	Thank you for your comment. All alternatives have been analyzed.
ALT	Proposed Action	In06	1	Fidelity strongly supports the Proposed Action outlined in the CD-C Draft EIS and believes it is a reasonable and effective plan for this project.	Thank you for your comment.
ALT	Proposed Action	In07	1	BLM should identify the Proposed Action as its Preferred Alternative in the Final EIS.	Thank you for your comment.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
ALT	Proposed Action	C03	2	Proposed Action: Sweetwater County encourages the BLM to support, in its record of decision, a drilling program that closely adheres to the parameters of the Proposed Action, which allows for maximum field development and resource recovery and establishes a predictable environment for oil and gas field development to occur in... The record of decision should establish a drilling program that adheres to the principals of the National Environmental Protection Act and properly balance resource development with protecting the natural environmental and providing for the needs of the state and local communities.	Please see updated text. The Preferred Alternative would allow for the development of 8,950 wells and would incorporate design features to resolve resource conflicts that were identified by the BLM interdisciplinary team and by comments received from the public.
ALT	Proposed Action	In10	1	While the BLM has identified a range of alternatives to the Proposed Action, the BLM does not have a Preferred Alternative for the CD-C Natural Gas Development Project. It is unfortunate the BLM did not follow its own Guidance and identify a Preferred Alternative. This gives the CD-C Draft EIS a lack of direction and subjects the BLM and the document to unnecessary criticism. Although the BLM believes the Proposed Action and the action alternatives all have elements that would address the project purpose and need, only the Proposed Action provides a reasonable combination of access and environmental protection.	CEQ regulations at 40 CFR 1502.14(e) direct that a Preferred Alternative be identified in the draft statement if one exists. As stated in the draft EIS in Section 2.1, ”The BLM does not have a Preferred Alternative for the CD-C Natural Gas Development Project at this time. The BLM believes that the Proposed Action and the action alternatives all have elements that would address the project purpose and need and will review public comment on the Draft EIS before determining a Preferred Alternative. A Preferred Alternative will be designated in the Final EIS.”
ALT	Proposed Action	In10	6	Implementing the Proposed Action and limiting restrictions on natural gas development operations to only those necessary, will allow the CD-C Natural Gas Development Project to provide domestic natural gas resources to heat homes, fuel the economy, create new wealth and create thousands of new jobs.	Thank you for your comment
ALT	Relaxed timing restrictions	C01	21	It may be possible to relax timing restrictions and surface use limitations (wildlife stipulations) when multiple wells (directional drilling) are drilled from a single well pad if it can be demonstrated that the associated impacts to the physical and human environment are mitigated. For example, water from off-site water producing wells should be put to beneficial use to offset or mitigate the loss of livestock grazing values and wildlife habitat. The water resource could be managed by a "partnership" of the CD-C permittee & operator(s), BLM, the livestock allotment holder and other interested State and Local agencies.	Thank you for your suggestion. Seasonal timing stipulations are required by the Rawlins RMP, and would be implemented regardless of alternative. In order to allow for year-round drilling in the project area, the project proponents would need to receive blanket exemptions to seasonal wildlife stipulations. This was considered in the Focused Development Alternative that was dropped from detailed study for two reasons, one of which concerned the legality of exempting Operators from the seasonal wildlife stipulations for lengthy periods of time.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
ALT	Valid existing rights	In06	2	Fidelity would like to remind BLM that the Draft EIS needs to be structured to support valid existing lease rights. Some of the management options seem to impose new restrictions, such as no surface occupancy, on leases that were granted with surface occupancy.	No valid existing rights would be infringed upon by the selection of any of the alternatives. This has been clarified in the Final EIS.
ALT	Impact analysis	C02	75	Draft EIS p. 2-25 - 2-30 Table 2.4-2 Comment: The table is very subjective and provides no quantitative information. The use of high, intermediate and low impact tells the public little. The Draft EIS should either define the three level of impacts or provide a more quantitative analysis of the types of impacts caused by each alternative.	**Table 2.4-2** summarizes and compares the impacts of the Proposed Action and all alternatives on all the specified resources. As such, it is necessary to use descriptions that succinctly describe the comparative impacts that are detailed at more length in Chapters 4 and 5.
ALT A	Alternative comparisons	In05	20	We appreciate the BLM's inclusion of Alternative A, one hundred percent directional [sic] drilling solely as a means to quantify potential impacts and allow reasonable comparisons with the other alternatives. Some level of vertical drilling will always be necessary in O&G fields. The inclusion of this alternative was appropriate with NEPA. We do not, however, support the selection of Alternative A given the significant increase of surface disturbing activities associated therewith and the many operators already utilizing directional drilling under appropriate circumstances.	Thank you for your comment.
ALT A	Impact analysis	C02	21	Also, the Draft EIS incorrectly assumes that increased surface disturbance automatically leads to more impacts....Surface disturbance is only one type of impact caused from natural gas development. The conclusion that Alternative A will have a greater impact based solely on this one factor is faulty.	The Draft EIS recognizes in many places that other types of impacts will occur. However, surface disturbance remains the single best indicator of the degree of impact produced by an alternative.
ALT B	Valid existing rights	C02	12	Alternative B was never scoped, which is a violation of NEPA procedures. It exceeds all of the lease stipulations thus violating the lease terms.	Alternative B was developed in response to issues raised during scoping to provide additional protections to certain high-value resources.
ALT B	1/4-mile buffer	In04	11	Page 2-7, first paragraph, Enhanced Resource Protection. The avoidance zone around Chain Lakes wetlands and other playas has been increased to 0.25 mile from 500'. We cannot find justification for implementing this buffer.	Thank you for your comment. This recommendation was made as a result of CD-C cooperator and interdisciplinary team specialist input, and in response to scoping comments from the public.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
ALT B	Access require-ments	C02	55	Draft EIS p. 2-7: The development plan....should aim at reducing surface disturbance and disturbance associated with vehicle traffic and other human activity and should include, at a minimum: Comment: Operators will need access to the well sites and they cannot depend entirely on remote monitoring. Any use or maintenance of access roads will also require coordination with local land owners, permittees, and local governments.	Thank you for your comment.
ALT B	Access require-ments	C02	58	Draft EIS p. 2-8 Comment: Any use or maintenance of access roads will also require coordination with local land owners, permittees, and local governments.	Thank you for your comment.
ALT B	Access require-ments	C02	59	Draft EIS p. 2-8 Comment: Any rights-of-way that are granted over well sites should not override the county and public road rights-of-way. When approving the well sites and travel plans, existing roads and road layer maps should be utilized	Thank you for your comment.
ALT B	Advisory groups	C02	13	WGFD should not be given authority [under Alt. B] to unilaterally impose development conditions. It exceeds BLM and WGFD authority, violates BLM regulations, and ignores process and procedures that apply to BLM but not to WGFD.	Please see the updated text of Alternative B.
ALT B	Advisory groups	In06	6	In multiple places, the Draft EIS refers to technical team (page 2-9) or an interagency CD-C working group (page 2-10). The Draft EIS gives no information as to who would be assigned to these groups, how they would determine necessary mitigation, or how long they would take to prepare a plan. BLM should provide more information on these groups.	Please see the updated text. The CD-C consultation and coordination group has been clarified.
ALT B	Advisory groups	In10	12	It isn't clear how the interagency CD-C consultation group would be constructed or function or it's authority. How will membership be determined? Are operators allowed to participate? How funded? It is unclear what would trigger action by this group. The term impacts is broad and it can be difficult to associate impacts with a particular source. Other activities could be impacting fish habitat and the process doesn't account for this possibility. Also, how are the three types of groups mentioned in the document related?	Please see the updated text. The CD-C consultation and coordination group has been clarified.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
ALT B	Advisory groups	In10	13	With the consultation group, implementation of projects may be required reactively without warning or justification. Unpredictable and reactive regulation places an unreasonable burden on operators. We request BLM eliminate the interagency consultation process until it can be clearly defined and agreed upon by all interested parties and utilize predictable and reasonable stipulations to protect sensitive fish habitat. We request BLM clearly define impact thresholds that will trigger interagency consultation and that BLM include operator representation on the consultation group.	Please see the updated text. The CD-C consultation and coordination group has been clarified.
ALT B	Alternative B terms too restrictive	In05, In08	86	We are opposed to Alt. B's proposed wildlife mgt. It would unreasonable restrict oil and gas development and eliminate operation certainty within the project area. It is likely inconsistent with existing policies regarding off-site mitigation and is unreasonably vague. The interagency group is not well defined. All these details must be clarified in the Final EIS.	None of the wildlife thresholds would unreasonably restrict oil and gas development. In addition, if off-site mitigation were used to mitigate impacts from natural gas development as outlined in Alternative B, that mitigation would be consistent with BLM policies. Off-site mitigation as discussed in a programmatic document such as the CD-C must necessarily be vague, as the site-specific impacts from the development of a natural gas well pad are not yet known. The type of off-site mitigation and where it might be implemented would be nearly impossible to determine at the programmatic level. Please see the updated text regarding the consultation and coordination group.
ALT B	Artificial nests	C02	69	Draft EIS p. 2-15 c. Controlled Surface Use and Timing Limitation stipulations would be applied to any nests that become occupied by raptors. CLG Comment: The proposal for artificial nests should be limited or deleted to avoid creating predator roosts.	Thank you for your comment.
ALT B	Big game	In04	16	Page 2-9, second full paragraph; reference is made to a technical team would prepare a mitigation plan if the WGFD were to express concern that a species population were declining at an accelerated rate. This idea is incompletely described. What is the composition of the team? What is the basis on which declines are considered “accelerated”? What if it has nothing to do with oil and gas? Is there a time limit to prepare a mitigation plan? What burden of proof is required of the WGFD that their claims are valid?	Please see the updated text. The CD-C consultation and coordination group's duties have been further defined. The **Wildlife Mitigation and Monitoring Plan** (**Appendix I)** would be implemented to monitor relevant wildlife species and to determine what impact, if any, oil and gas development is having on those wildlife species. The development of a mitigation plan would be undertaken on a site-specific basis.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
ALT B	Big game	In04	17	Page 2-9, second bullet, *Population Thresholds*, states *New well pads would not be authorized without Operator participation in habitat-improvement projects*. Again, what are the criteria for habitat improvement projects? Has the BLM identified these yet? Would energy development operators be denied APD's if they do not want to participate in livestock watering projects?	The types of mitigation or habitat improvements would be determined on a site-specific basis. Because the specific locations of wells, roads, and other facilities is not known at this time, the BLM does not know which specific resources or wildlife species may be affected by surface disturbance. Therefore, to lay out the type of habitat improvement, where it would be located, and how it would be done would unnecessarily restrict the type of mitigation that could be used. Specific habitat improvement projects would be determined at the APD level, when and if necessary. Also, the language regarding denial of new APDs has been removed.
ALT B	Big game	In04	18	Page 2-9, 4th Bullet: The statement is made Fences identified to be a problem for big game migration would be modified to meet BLM fence standards. New fences would be allowed in big game migration corridors, provided they meet BLM fence standards. It should be noted that fencing may be required as part of reclamation and for safety purposes. These fences are not long linear barriers; ranch fencing is not the responsibility of the operators.	Your concern is noted. Thank you for your comment.
ALT B	Big game	In04	19	Page 2-10, Enhanced Resource Protections, second bullet: Noise-reduction technology, such as hospital grade mufflers, sound walls or soundproof buildings, or adding silencers to cooling fans, would be required at compressor stations. Stating that silencers be added to cooling fans is misleading. Cooling fans mitigated through the use of multi-blade fans rather than acoustically designed shrouds are quieter. It would be more appropriate to require noise reducing techniques for cooling fans…..	The text has been modified to read, "Noise-reduction technology, as approved and evaluated by the BLM, would be required at compressor stations."

Category	Sub-Category	Comment		Comment	Response
		Code	No		
ALT B	Big game	In04	20	Page 2-10, Surface Disturbance Thresholds, second paragraph: Vegetation treatments such as herbicide treatments, seeding, prescribed burning, cutting/chopping for regeneration, planting shrubs or trees, fencing, establishing food plots, etc. would be considered habitat improvement projects. What data are there that water developments are limiting to antelope and mule deer within CWR? Please explain the benefits of vegetation treatments such as herbicide treatments, seeding, prescribed burning, cutting/chopping for regeneration, which are geared more toward warm season forage for livestock than for CWR. How will these habitat improvement projects be identified and what type of environmental analysis will be needed?	Habitat improvement projects, when and if necessary, would be identified at the site-specific level upon receipt of an APD, as would the specific benefits of the habitat improvement project. The ongoing **Wildlife Mitigation and Monitoring Plan (Appendix I)** would aid in the determination of whether oil and gas development were impacting wildlife in a negative way. If this were the case, then habitat improvement projects and other mitigations would be required.
ALT B	Big game	In04	21	Page 2-11, Surface disturbance thresholds, first paragraph: Aerial surveys are performed every two to three years and ≤26% of the herd units are within the CD-C project area. It seems that mitigation actions focused on energy development that do not consider other uses as contributing to decline are unfair, especially given the small areas of CWR involved.	Please see updated text stating that a causal relationship between oil and gas operations and big game impacts would have to be identified prior to implementation of the mitigation measures identified in Alternative B.
ALT B	Buried power lines	In06	4	Page 2-13, first bullet, *burying new power lines and using low-profile facilities within 1 mile of an occupied lek or in winter concentration areas*. Technical, logistical, and economic concerns and the ability to obtain easements across both federal and fee lands may make accomplishing this task unfeasible. BLM should remove this enhanced resource protection measure from consideration.	The requirement referred to in the comment has been removed from the Final EIS.
ALT B	CD-C Consultation Group	C01	25	Environmental Consequences, Page 4-92: Carbon County supports the concept of establishing a CD-C Consultation Group (Interagency and Industry) that would review and respond to evolving energy development issues.	The Preferred Alternative incorporates the formation of a consultation and coordination group that would respond to evolving energy issues and share information and data with the BLM, cooperators, permittees, landowners, and other relevant public.
ALT B	Chain Lakes and Playas	In10	17	We have leases within 0.25 mile of wetlands and playas in the project area. The RMP establishes a 500 foot setback. Expanding the buffer to 0.25 miles is excessive and will limit our ability to develop our leasehold in the project area (valid existing rights issue).	No valid existing rights would be infringed upon through the selection of any of the alternatives.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
ALT B	Cluster development	C02	56	Draft EIS p. 2-7 Consideration of cluster development of production facilities: The statement that BLM would consider cluster development does not address how it would fit into APD process or full field development which are governed by regulation. The Draft EIS should use the word "consolidated" not cluster.	The term "cluster" has been changed to "consolidated."
ALT B	Conclusions	In05, In08	89	The BLM indicates that despite its unreasonable and potentially illegal mitigation or monitoring requirements under Alternative B, Alternative B is still expected to have a high impact on wildlife populations. Because the Proposed Action would still lead to high impacts, the BLM must justify the unnecessary restrictions required by Alternative B.	The restrictions in Alternative B were developed to respond to disruption of already impacted crucial winter range and migration corridors and reduction of habitat. The metric used in determining impact is based on surface disturbance per section, and by not reducing the number of well pads allowed but focusing on reclamation success and habitat improvement, it fell within the high impact category.
ALT B	Develop-ment plans	In05, In08	23	We are concerned about the requirement for overall development plans when submitting APDs within the project area. Oil and gas development in the project area remains very uncertain and operators still have much to learn about development in the project area. New information is gained from ongoing development which modifies drilling plans and locations for future wells. Thus, even if operators were required to submit a plan of operations for a specific geographic area or a lease, those plans would constantly change and be modified as each well is developed. Development operations in the project area are not as static and predictable as BLM intends under this alternative. BLM must eliminate the requirement for operators to strictly comply with development plans under Alternative B. Rather, simply encourage operators to submit geographic area development plans when appropriate. This requirement is particularly troubling because the RFO has routinely resisted attempts by operators to submit multiple APD packages with master drilling plans or geographic area development plans despite BLM policies requiring such plans. If BLM intends to implement this portion of Alternative B, it should first ensure that its staff is willing to review master drilling plans and geographic area plans.	The purpose behind submitting overall development plans would be to encourage future planning and through development plans and proper planning, reduce the amount of surface disturbance and overall disruption to the project area. The BLM understands that development plans change and that development of natural gas is not a static process. There would be some flexibility inherent in the overall development plans.
ALT B	Dust	In04	12	Page 2-7, 2.2.3 Enhanced Resource Protections: The general requirements on dust abatement, education, and remote monitoring are vague and need further clarification.	Please see the updated text. A **Fugitive Dust Control Plan (Appendix P)** has been developed and clarifies the BLM's intention with controlling fugitive dust.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
ALT B	Economic feasibility	In04	38	The additional resource protections proposed under Alternative B, make this Alternative technically and economically unreasonable. With the exclusions and protections, there will not be adequate time for operator's to maintain effective drilling and development programs.	Based on several comments on the Draft EIS, the RFO reviewed the likely effect of the requirements of the CD-C alternatives on drilling rates and total number of wells drilled in the project area. The review concluded: (1) Existing seasonal activity constraints already affect decisions about directional drilling under the Proposed Action as much as they would under the alternatives; (2) The alternatives encourage greater use of directional drilling, a technology that operators are already adopting on their own; (3) While some of the alternative requirements are likely to increase costs, the cost increases would likely be such that they are within the normal realm of operational cost increases (such as those that arise from the switch to directional drilling) or of natural gas price changes; (4) Requirements that emphasize improved reclamation are based on the premise that the project's 15-year development period provides sufficient time to achieve reclamation goals; and (5) Alternative D, Directional Drilling, is likely to result in a decline in drilling rates and well numbers. This has been reflected in the Final EIS. The impact analysis in the Final EIS recognizes this determination.
ALT B	Editorial	C02	62	Draft EIS p. 2-8 Generally, two threshold levels are specified: A lower level, usually 5 percent of protected habitat within a lease and/or right-of-way,.... **CLG Comment:** The Draft EIS uses 5%, but is this more or less since it uses the term "usually" to qualify the standard?	The text in Alternative B has been revised by the removal of the word *usually*.
ALT B	Editorial	In10	11	The provision that the buffers apply on public land only is confusing because state land is also public land. Please clarify that the provision applies to 'federally owned surface'.	As described in Section 2.1 and elsewhere in the EIS, Although the development activities anticipated in the Proposed Action and in the alternatives would take place on federal, state, and private lands, BLM authority applies only to the activities that would occur on BLM-administered lands.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
ALT B	Feasibility	In07	3	Portions of Alternatives B are unworkable. It includes 5% and 10% disturbance thresholds. How does BLM plan on tracking disturbance and reclamation across the area? A determination regarding wildlife thresholds is given to the WGFD. How will the WGFD determine CD-C and reference/control area population levels? How will they determine cause and effect? Many of the enhanced resource protections (e.g., increased setback distances) are not supported by research. There is an assumption in some portions of the document that off-site mitigation can be mandated by BLM.	The BLM will track disturbance and reclamation based on reclamation monitoring reports submitted by the Operators. The WGFD would not be responsible for determining wildlife thresholds nor would it determine CD-C reference/control area population levels. The BLM is aware that off-site mitigation cannot be mandated by the BLM and would work with the Operators to determine where off-site mitigation should be implemented in order to have the most benefit, should it become necessary.
ALT B	Feasibility	In10	2	The additional resource protections proposed under Alternative B, make this alternative technically and economically unreasonable. With the exclusions and protections under this alternative, there will not be adequate time for operator's to maintain effective drilling and development programs. Consequently, Alternative B is not consistent with the BLM's multiple-use mandate under the Federal Land Policy and Management Act (FLPMA) because it would unduly preclude leasing and development of existing leases.	Based on several comments on the Draft EIS, the RFO reviewed the likely effect of the requirements of the CD-C alternatives on drilling rates and total number of wells drilled in the project area. The review concluded: (1) Existing seasonal activity constraints already affect decisions about directional drilling under the Proposed Action as much as they would under the alternatives; (2) The alternatives encourage greater use of directional drilling, a technology that operators are already adopting on their own; (3) While some of the alternative requirements are likely to increase costs, the cost increases would likely be such that they are within the normal realm of operational cost increases (such as those that arise from the switch to directional drilling) or of natural gas price changes; (4) Requirements that emphasize improved reclamation are based on the premise that the project's 15-year development period provides sufficient time to achieve reclamation goals; and (5) Alternative D, Directional Drilling, is likely to result in a decline in drilling rates and well numbers. This has been reflected in the Final EIS. The impact analysis in the Final EIS recognizes this determination.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
ALT B	Fence modifica-tions	C02	64	Draft EIS p. 2-9 Fences identified to be a problem for big game migration would be modified to meet BLM fence standards. New fences would be allowed in big game migration corridors, provided they meet BLM fence standards. **CLG Comment**: Add the qualifier, "as opportunities exist." Fence modifications must be a site specific decision that addresses the actual controversies while still meeting the ultimate grazing purposes. BLM cannot expect grazing permittees to pay for these changes or the operators either. Fences are a BLM program financed through range improvement budgets and there is no extra funding to pay for the changes provided.	The text referred to in the comment is part of the RMP; the text of the Final EIS has not been revised.
ALT B	Fencing	C02	28	Further, fences identified to be a problem for big game migrations should only be modified "where opportunities exist." Id. at 2-9, 4-98.	Thank you for your comment. The text will remain unchanged.
ALT B	Ferruginous hawk	In04	29	Page 2-13, Surface Disturbance Threshold: Operators in all leases that exceed 10 percent of surface disturbance within 1 mile of ferruginous hawk nests would be required to participate in a development/mitigation plan before additional APDs would be issued. Does this threshold apply to federal and fee lands and if so, does the restriction apply only to federal leases/activities occurring on federal leases. Given our need to provide sage grouse conservation, has any recognition been given to the matter that hawks are predators on sage grouse?	Recognition that hawks are predators on Greater Sage-Grouse was considered in the development of the alternative. The analysis for Alternative B in Chapter 4 now recognizes that the extent of private and state holdings within the buffer area would undermine the effectiveness of this provision.
ALT B	Ferruginous hawk	In04	30	Page 2-14, *2.2.3.3 Ferruginous Hawks*, The same concerns with regard to WGFD criteria for the letter of concern, burden of proof, and accountability need to be addressed.	Habitat improvement projects, when and if necessary, would be identified at the site-specific level upon receipt of an APD. The ongoing **Wildlife Mitigation and Monitoring Plan (Appendix I)** would aid in the determination of whether oil and gas development were impacting wildlife in a negative way. If this were the case, then habitat improvement projects and other mitigations would be required.
ALT B	Ferruginous hawk	In04	31	Page 2-15, first line: Please explain the preference for artificial nests on natural substrates.	Artificial nests would be placed on natural substrates (i.e. bluffs or outcroppings) as opposed to artificial substrates (i.e. utility poles) to encourage the species and distract them from sites such as hydrocarbon stock tanks.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
ALT B	Ferruginous hawk	In04	32	Page 2-15, fourth sentence: There is a burden of proof that declines are due to failures to reproduce and not mortality in migration or on wintering grounds before requiring energy operators to engage in mitigation.	Habitat improvement projects, when and if necessary, would be identified at the site-specific level upon receipt of an APD. The ongoing **Wildlife Mitigation and Monitoring Plan (Appendix I)** would aid in the determination of whether oil and gas development were impacting wildlife in a negative way. If this were the case, then habitat improvement projects and other mitigations would be required.
ALT B	Ferruginous hawk	In04	33	Page: 2-15, Population Thresholds: 2. Ten man-made nests would be built outside of existing monitoring territories on natural substrates… and 3. Two artificial nesting structures would be placed outside of existing monitoring territories… following receipt of WGFD's letter of concern. Any nest installation, man-made or artificial, should take into account sage grouse management goals to avoid areas of sage grouse priority/core areas.	Recognition that hawks are predators on Greater Sage-Grouse was considered in the development of the alternative. If the alternative were considered as part of the ROD, that fact would be given site-specific consideration.
ALT B	Ferruginous hawks	C02	67	Draft EIS p. 2-14 No disturbance within 1,200 feet of a ferruginous hawk nest. The distances could vary depending on factors such as nest activity, species, natural topographic barriers and line-of-sight distances. **CLG Comment:** Is this consistent with RMP? Also, these limits should apply to active or occupied nest sites.	The text matches the RMP. Nest activity is one of the mitigating factors.
ALT B	Ferruginous Hawks	In05, In08	44	Devon is also opposed to the proposed management for ferruginous hawks in Alt. B. The proposed mitigation measures are vague, ambiguous, and will be impossible to administer. The proposed surface disturbance threshold of ten percent within one mile of a ferruginous hawk nest could create an unfair and potentially disastrous race for surface disturbance between various operators. It would also create an unfair advantage to operators who already had operations in the area as they would be allowed to continue their O&G activities while other lessees would be foreclosed from development activity unless they participated in an unknown and undefined "mitigation plan."	Please see the updated text. No valid existing rights would be infringed upon; if the surface disturbance were to reach 10 percent within one mile of a nest then mitigation would need to be considered. There would be no "race for surface disturbance" created by this alternative.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
ALT B	Ferruginous Hawks	In05, In08	45	BLM does not indicate how it would consider private and state lands in the calculation of surface impacts within one mile of a nest. With the checkerboard land pattern, operators on private or state land could effectively foreclose future development on federal lands by exceeding the disturbance threshold. This management structure is untenable, unfair, and potentially illegal. If operators were foreclosed from developing their leases for long periods of time, there could be a potential takings claim.	Management identified in this EIS would only apply to activities associated with the development of federal mineral estate. Surface disturbance thresholds would only take into consideration the disturbance associated with federal surface. Development on private/ state would not be affected by these thresholds. This has been clarified in the Final EIS.
ALT B	Ferruginous Hawks	In05, In08	46	We are concerned with BLM's ability to implement the mitigation measures proposed in the event the WGFD expressed a formal opinion regarding the ferruginous hawk population. Alt. B would require operators to install several man-made nests and nesting structures. BLM does not explain how the agency would determine which operators would be responsible for installing the structures or how costs should be apportioned between various companies. It would be unfair to force a single operator to install these nesting structures when the potential impacts may have been caused by numerous operators. Given the number of operators, BLM must develop an equitable means of imposing mitigation measures.	Any potential mitigation would be designed and installed on a site-specific basis, at which time the specifics of how costs may (or may not) be apportioned between companies would be identified. An equitable means of distributing mitigation measures between appropriate Operators would be established when and if necessary. This has been clarified in the Final EIS.
ALT B	Ferruginous Hawks	In05, In08	47	BLM's proposal to require off-site mitigation is not consistent with the most recent guidance in BLM IM 2008-204. The IM makes it clear that it "is not the intent of this policy to solicit or require applicant-committed mitigation that exceeds the impact...."	Please see BLM IM 2013-142, Interim Draft Policy - Regional Mitigation, which replaces BLM IM 2008-204. The more recent IM indicates the BLM's newer direction which is a greater emphasis on regional and off-site mitigation in planning for a landscape scale.
ALT B	Ferruginous Hawks	In05, In08	48	We question the appropriateness of installing additional nest structures for hawks given the fact that they prey on sage-grouse. The construction of additional nests may further reduce SG populations.	Any construction of nest structures for hawks would be considered and approved on a case-by-case basis. If it were determined that the construction of a nest structure in a particular area would result in increased mortality for Sage-Grouse, then the nesting structure would not be constructed in that particular area.
ALT B	Fugitive dust	C02	71	Draft EIS p. 2-17 During the production phase, as well as the construction phase, control by Operators of fugitive dust on well sites, pipelines, and access roads as needed. CLG Comment: Vehicles are minor factor in the distribution of weeds. Birds, wildlife, and wind are far more significant. Delete this entirely as it's burdensome and completely ineffective.	Thank you for your comment.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
ALT B	Habitat improve-ments	In04	14	Page 2-9, top of page, *A higher threshold level, usually 10 percent of protected habitat within a lease, would require habitat improvement projects in addition to the above requirements.* This would require habitat improvement projects but the criteria on which they are needed, how they would be done, and where located is not provided. Clarification is needed.	The types of mitigation or habitat improvements would be determined on a site-specific basis. Because the specific locations of wells, roads, and other facilities are not known at this time, the BLM does not know which specific resources or wildlife species may be affected by surface disturbance. Therefore, to lay out the type of habitat improvement, where it would be located, and how it would be done would unnecessarily restrict the type of mitigation that could be used. Specific habitat improvement projects would be determined at the APD level, when and if necessary.
ALT B	Impact Analysis	C02	23	The Draft EIS further states that the Applications for Permit to Drill (APDs) "would not be processed or approved until BLM has received and approved a mitigation plan [for wildlife]."... The Draft EIS ignores the need to determine the causal factor in wildlife declines. There were extensive discussions about the need to document a determination of causation before imposing specific mitigation....It appears that oil and gas development is already the predetermined cause of species population declines within the project area. However... other causal factors could....cause species population decline, such as drought, harsh winter, increase in predators, disease (West Nile), and hunting seasons. Failure to address causation falls within the definition of "arbitrary and capricious" because BLM is not addressing all relevant factors. 5 U.S.C.§ 702	Please see the updated text of Alternative B. The language referred to in the comment has been removed. In addition, text has been added to make it clear that development of natural gas would have to be the causal factor.
ALT B	Lease Rights/ Mitigation	In05, In08	21	Alternative B purports to give the BLM limitless authority to impose COAs on a site-specific basis, regardless of whether such conditions are consistent with an operator's existing lease rights. BLM doesn't have unlimited authority to impose mitigation measures that are contrary to lease rights and cannot impose unreasonable mitigation measures given our existing lease rights.	No valid existing rights would be infringed upon by the selection of any of the alternatives. This has been clarified in the Final EIS.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
ALT B	Least restrictive stipulations	In10	9	The draft ignores BLM policy which directs that "the least restrictive stipulation that effectively accomplished the resource objectives or uses for a given alternative should be used." Also, Sec. 363 of the Energy Policy Act of 2005 also requires that lease stipulations are applied consistently and to ensure the least restrictive stipulations are used. In the Preferred Alternative, Yates urges BLM to adhere to its own policy and use the least restrictive stipulation possible to accomplish resource objectives. Alt B stipulations are overly restrictive and fail to comply with this policy.	The BLM is also required to implement and follow the provisions of NEPA and of FLPMA, which require the BLM to approve land use applications with the least amount of environmental damage and impacts possible.
ALT B	Liquids transfer	C02	60	Draft EIS p. 2-8 Consideration of pipelines for transporting liquids offsite or installation of larger-capacity storage tanks to reduce the number of truck trips to well sites; CLG Comment: We do not understand what the Draft EIS means. If BLM required increased tank diameter on multi well pad, then it would need a larger pad, or if taller then there will be other adverse environmental impacts, e.g. higher predator perches and disruption of the view.	The intent of the item is to reduce the number of vehicle trips required for transportation of liquids. Pipelines and larger tanks would achieve that intent.
ALT B	Livestock	C02	32	The Draft EIS states that livestock grazing is a resource that will receive enhanced resource protection, but then livestock forage is specifically excluded as a resource requiring consideration in the development plans submitted with the Applications for Permit to Drill (APDs). Id. at 2-7. Livestock forage is an important part of vegetation and is shared by all forms of wildlife, including sage grouse and wild horses. All resources should be discussed in the development plan....	The development plans are intended to assist with planning, in an effort to reduce the overall surface disturbance of the project. Indirectly, forage would be protected through the use of development plans that would increase planning and ideally, reduce overall disturbance in the project area. In addition, Alternative B does include specific measures that would address impacts to livestock and to livestock operators.
ALT B	Livestock	C02	33	The Coalition agrees that BLM should notify affected grazing permittees of new APDs, but BLM should also seek the grazing permittees input on development projects that affect the land they graze. See id. at 2-17. The Coalition recommends BLM identify a contact person and phone number that can be called as issues arise.	The BLM notifies the public of any proposed development activities that occur on public land through posting the EA to the NEPA register. In addition, a consultation and coordination group is being analyzed under the Preferred Alternative that would foster more communication between the BLM, grazing permittees, and oil and gas operators.
ALT B	Livestock	C02	36	The Draft EIS must also determine causation before it designates one activity or resource as the cause for failing to meet rangeland standards.	This point is recognized in the text of the revised Alternative B: "If it were determined that a species population… were declining at an accelerated rate… due to natural gas development."

Category	Sub-Category	Comment		Comment	Response
		Code	No		
ALT B	Livestock grazing	In05, In08	52	BLM does not explain what criterion or scientific information it would (use to) determine if water wells are actually impacted by O&G operations. We don't object to certain compensation if its activities actually harm livestock operations, but there must be a causal link, not simply a presumption.	Alternative B anticipates water well development to redistribute livestock if substantial forage has been affected in an area due to natural gas development. A causal link would be identified; this has been clarified in the Final EIS.
ALT B	Livestock grazing	In10	24	"No adverse effects" is a broad restriction that could be misinterpreted to prevent changes caused by operations that aren't problematic or a limitation to livestock watering in the area, such as a modification of trailing routes. We request BLM modify this mitigation requirement to provide them with some flexibility in the protection of livestock water features and allow for an acceptable degree of impact or change in the use of such features.	All such mitigations would be developed on a site-specific basis.
ALT B	Livestock grazing	In10	25	We are not opposed to meetings with permittees, open communication is helpful and a good way to identify and resolve potential conflicts before they arise. However, we may have confidential information that we would prefer to not disclose during such meetings. We request BLM specify that confidential information may not be released until APDs are in the approval process.	No confidential information would be shared by the BLM.
ALT B	Livestock grazing	In10	26	We have no problem notifying affected grazing permittees and providing a map when our operations will impact their grazing operations. It is unclear who is responsible for providing such notice to the permittee (BLM or Operator). We suggest and request BLM handle this by forwarding notice and the map (included in the APD) to the grazing permittees when BLM receives an APD in an allotment.	Please see the updated text. This requirement has been removed as it is something that is already done.
ALT B	Livestock surface disturbance	In04	35	Page 2-17, 2.2.3.6 Livestock Grazing, Surface Disturbance Thresholds: If the surface disturbance due to natural gas development were to reach 5 percent of an allotment, several actions would be triggered as described in the subsequent bullets listed below". How is this threshold integrated into the other thresholds? To maintain consistency, the 5% threshold should be integrated into the high and low density thresholds.	The 5 and 10 percent thresholds are specific to Alternative B and would not come into effect under other alternatives.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
ALT B	Livestock water features	In04	36	Page 2-17, Enhanced Resource Alternative Protections: If water features are adversely affected by activities of natural gas Operators, the Operators would be responsible for drilling, maintaining, and monitoring new stock water wells and/or improving existing water wells, as determined by BLM and the grazing permittees. How will this process be administered? What are the criteria? What is the science basis? Who will make the impacts and mitigation decisions?	If the Operator is responsible for damaging existing infrastructure, then the Operator would be responsible for fixing it. Monitoring and maintaining of existing infrastructure would not be the responsibility of the Operator. Text has been updated.
ALT B	Migration corridors	In10	31	Migration corridors have been vaguely identified with arrows. In application, the location of these corridors is difficult to identify on the ground. Additionally, migration corridors are subject to change from year to year for a variety of reasons. It is difficult and arbitrary to implement protective measures for a resource that has not been clearly identified and that is subject to change. It is unreasonable to adopt additional protective measures for migration corridors. A measure that is effectively implemented one year may become useless and irrelevant the next year when migration patterns change. We request BLM eliminate special protection for mule deer migration corridors as proposed in Alt B.	Migration corridors are established over thousands of years and do not change significantly on an annual basis. If change does occur, it is likely a result of either surface disturbance or disruptive activities. The data for migration corridors in the CD-C project area is not yet complete but stipulations for protecting migration corridors will be adhered to.
ALT B	Migration corridors	C02	65	Draft EIS p. 2-10. Migration corridors would be monitored to determine which fences restrict movement and fences modified to reduce impacts to migrating big game species CLG Comment: The Draft EIS appears to impose mitigation that exceeds the project. The energy companies cannot be expected to solve all public land problems. Permittee or BLM-built and maintained fences exist independent of energy development and the lessees should not be required to modify the fences.	If the Operator is responsible for damaging or altering existing infrastructure, including fences and water developments, then the Operator will be expected to repair the damage. If, for example, an Operator needs to move a fence or construct a road through an existing fence line, the Operator would be required to either install a cattle guard or a gate at the access point. Lessees would not be required to modify fences that they have not impacted. Only fences that have been impacted by the lessee would need to be repaired or replaced by the lessee.
ALT B	Migration corridors, fencing	In10	32	We are not opposed to meeting BLM fence standards in migration corridors, but ranchers are also installing fences in the area and should be held to the same standards. Our experience is that BLM fencing standards may not be acceptable to private landowners and/or permittees creating a potential conflict of interest. Also BLM does not have authority to impose fencing standards on private surface on non-well site facilities. We suggest BLM clarify that the application of fence standards is limited to locations and facilities on federally owned surface.	BLM fence standards apply to BLM-permitted activities on public land managed by the BLM and on federal mineral estate. This does not need to be clarified.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
ALT B	Muddy Creek	In04	13	Page 2-8, third bullet, Muddy Creek and Bitter Creek watershed plans, *No new road crossings of Muddy Creek*. If new crossings of Muddy Creek aren't allowed, significant incremental surface disturbance will be incurred to build a road until it can somehow cross the creek.	The construction of lengthy arterial roads are not anticipated as indicated in **Appendix B: Project Description** and the Proposed Action. Therefore, the necessity of crossing Muddy Creek or creating lengthy parallel roads is low. Most of the road infrastructure that includes arterial and collector roads has already been constructed; and the part of the project area that borders Muddy Creek is already heavily developed. Therefore, the necessity of building a new crossing of Muddy Creek would be extremely low.
ALT B	Muddy Creek	In05, In08	25	BLM must justify the significant new mitigation measures proposed for the Muddy Creek watershed, particularly the prohibition on new road crossings of Muddy Creek. With appropriate engineering and construction practices, adverse impacts could largely be avoided. Additional mitigation measures can be identified through the Section 404 process. Also, requiring operators to avoid crossing Muddy Creek may require far more extensive surface disturbing operations for reroutes which may adversely impact other resources. BLM should ensure it has flexibility to manage all resources in the area and Devon encourages the BLM to revise the direct prohibition on crossing Muddy Creek.	Muddy Creek is a major tributary to the Little Snake River and is in the Colorado River Basin. In addition, the Proposed Action states that because this is an infill development project, new road construction would not be significant. Therefore, the BLM does not agree that not allowing any additional road crossings of Muddy Creek would result in extensive surface disturbance, because the areas around Muddy Creek are already extensively developed and the construction of lengthy new arterial and collector roads would not be necessary.
ALT B	Muddy Creek	In05, In08	26	BLM must provide more detail regarding the type of monitoring and data requirements proposed for the Muddy Creek watershed. Not all operators are familiar with the requirements for Atlantic Rim. The proposal to have operators submit additional data in monitoring is unnecessarily vague and ambiguous. As such, Devon cannot support this proposal.	Please see updated text. A **Muddy Creek Watershed Monitoring Plan** has been included as **Appendix O**.
ALT B	Muddy Creek and Bitter Creek watersheds	In05, In08	49	We are opposed to the proposed mitigation requirements under Alt. B for the Muddy Creek Watershed. The increase of NSO around streams and wetlands from 500 feet to 2,640 feet is not consistent with the existing Rawlins RMP. BLM has not justified this increase in mitigation or demonstrated how it would be consistent with existing lease rights. Since it is not consistent with the RMP, it cannot be adopted by the BLM	Please see the updated text. It has been acknowledged that an RMP amendment would be undertaken should Alternative B be selected.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
ALT B	Muddy Creek and Bitter Creek watersheds	In05, In08	50	BLM must provide more information and detail regarding the monitoring requirements currently required on Upper Muddy Creek as part of the Atlantic Rim ROD. Without more information, we cannot calculate how our operations might be impacted. Further, the BLM must justify the need to increase this monitoring within CD-C given ongoing studies by the University of WY regarding the Muddy Creek watershed. We understand that UW has engaged in a lengthy, detailed study of the area that continues to this day. BLM must also justify the proposed monitoring in light of the proposed NSO. How can both mitigation measures be justified?	The studies being conducted by UW are not similarly designed as the studies that are being conducted by the BLM. Therefore, comparisons between the studies would not be feasible. In addition, the BLM will be responsible for monitoring on Muddy Creek and has taken over the monitoring being conducted on Upper Muddy Creek. Muddy Creek is home to sensitive fish and is on the 303(d) list for Threatened and Impaired waters. The protections that have been in place for mitigating impacts to the creek are not stringent enough; therefore, more mitigation is necessary in order to reduce and/or control these impacts.
ALT B	Muddy Creek and Bitter Creek watersheds	In05, In08	51	We are opposed to the prohibition on discharge of produced water within specified watersheds. Numerous other agencies regulate water resources and that the discharge or water associated with O&G development activities can be beneficial for certain resources. Given the fact that all produced waters are subject to control requirements by WDEQ, BLM should not interfere and prohibit such discharges.	The surface discharge of produced water is not prohibited. The **Operators' Project Description (Appendix B)** specified there would be no surface discharge of produced water; therefore, it is not analyzed in this document. Any proposals for the surface discharge of produced water would be analyzed by the BLM under a separate NEPA document.
ALT B	Muddy Creek buffer	In04	6	We strongly oppose the creation of these arbitrary buffers along Muddy Creek because: 1) No information is presented that provides justification for a 0.25 mile (or 0.5 mile) buffer; 2) Creation of a buffer complicate linear projects crossing Muddy Creek; 3) In a country-wide search, it is difficult to find a stream buffer this wide; 4) BLM has not included exemption criteria and nationwide 404 permits allow stream channels to be crossed provided certain criteria are met. 5) Regulatory mechanisms already exist to address this issue. We suggest BLM focus on the conditions of the stream channel and riparian habitat.	Thank you for your comment. All alternatives have been analyzed.
ALT B	Muddy Creek buffer	In06	10	Page 2-16, 2.2.3.4, *For protection of amphibians and their habitats, avoidance of surface-disturbing and disruptive activities within 0.25 mile of Red Wash, springs, wells, and wetlands. The required avoidance distance would be further increased on perennial streams to 0.5 mile.* There is no explanation why these buffers are necessary and no data or technical basis for either buffer. If buffers are incorporated in the Final EIS, technical back-up should be included.	Impacts to sensitive amphibians, fish, and the water quality of Muddy Creek have been identified in Chapter 4, and concerns were raised during public scoping about further degrading the water quality of Muddy Creek. Therefore, additional measures to address these impacts and concerns are necessary.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
ALT B	Muddy Creek monitoring	In04	34	Page 2-16, Enhanced Resource Alternative Protections, second bullet: The BLM proposes to expand the Upper Muddy Creek Basin monitoring to the lower basin. What is required in the Upper Muddy Creek Basin? Who pays for this monitoring and how expensive is it? How have the results been utilized? Prior to any expansion of monitoring, the existing data should be reviewed. Data from years of monitoring exist. We recommend that these data be analyzed prior to imposition of any new data collection protocols.	Please see updated text. The BLM will be responsible for data collection and monitoring on Muddy Creek.
ALT B	Muddy Creek road crossings	C02	61	Draft EIS p. 2-8 No new road crossings of Muddy Creek; CLG Comment: The provision is duplicative. The ban on no new road crossings for Muddy Creek is not necessary.	Text has not been revised. Impacts to Muddy Creek from road crossings were identified as a concern during scoping and the Draft EIS comment period.
ALT B	Muddy Creek road crossings	In10	16	Muddy Creek extends for several miles across the southern part of the project area and runs through or adjacent to several leases held by Yates. Conducting operations on these leases will require the ability to cross Muddy Creek in a reasonable number of locations. If new road crossings are not allowed in areas that are a significant distance from an existing crossing, unnecessary surface disturbance will be incurred to build a road that follows the creek until it can be crossed. Yates requests the BLM retain flexibility to allow construction of additional road crossings on a case-by-case basis when it can be justified to reduce surface disturbance and allow reasonable access to production facilities.	Based on the project description and the analysis in the EIS, the need for large new roads appears to be very minimal. Creating a crossing of Muddy Creek would be a large infrastructure development and seems to go beyond the description of minor access roads. If major access roads are required for this project, such as one that might cross Muddy Creek, then the project description in **Appendix B** needs to be revised to describe major access roads.
ALT B	Mule deer	In04	9	Page 2-6, first bullet, *Mule deer crucial winter/yearlong range and migration corridors*. Since page 2-10, *Population Thresholds*, indicates herd numbers are well above WGFD objectives, why are mule deer crucial winter/yearlong range and migration corridors an issue?	Mule deer CWR, etc. were included because impacts to winter range are a concern due to the limited amount and sensitivity of this habitat.
ALT B	Mule deer	In05, In08	36	On p. 2-10 BLM describes mule deer populations as well above the WGFD population objectives. Why, then, were mule deer selected as a resource necessitating additional protection? (also see comment 22)	Mule deer were included as a high-value resource that could be affected if future development were more intensive than expected or if development were to result in impacts that were not anticipated or that occurred at a faster pace than anticipated. The text has also been updated to reflect more recent estimates of the mule deer population.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
ALT B	Mule deer	In10	30	Mule deer population in the Baggs Herd Unit are well over the population objective and the project area only contains a small percentage of the CWR for the herd unit. It is hard to justify mule deer within the project area as a high-value resource in need of special protection with these conditions.	Mule deer were included as a high-value resource that could be affected if future development were more intensive than expected or if development were to result in impacts that were not anticipated or that occurred at a faster pace than anticipated.
ALT B	Noise	In06	7	Page 2-13 , second bullet, use of noise-reduction technology so that noise would not exceed 49 decibels measured at 30 feet from the source at all drilling, production and compressor sites. It does not make sense to set a compliance point at the well site, where it would be impossible to implement, when the actual concern is the amount of noise at the lek.	The revised Alternative B has no specific noise limitation.
ALT B	Noise	In06	8	Page C-II, Construction, Item 21, to protect the identified ferruginous hawk nests, Greater Sage-Grouse leks and wintering big game habitat, the project proponent will install housing and/or muffler(s) around equipment that exceeds 55 dBA. This is also unreasonable as virtually all noise from any type of site construction will exceed this level; placing mufflers is neither safe nor feasible.	This is an existing COA that can currently be utilized in the RFO under the RMP.
ALT B	Noise regulation	C02	15	Alternative B would adopt a noise limit when BLM has no legal authority to regulate noise. This far exceeds BLM regulatory authority and needs to be dropped.	The revised Alternative B has no specific noise limitation.
ALT B	Off-site mitigation	In05, In08	33	Devon does not believe the BLM's proposal to require off-site mitigation is consistent with the BLM's most recent guidance regarding off-site or compensatory mitigation in IM 2008-204 (Sept. 30. 2008), which makes it clear that it "is not the intent of this policy to solicit or require applicant-committed mitigation that exceeds the impact of the applicant's proposed project... a certain level of adverse impact may be acceptable and should be identified during the environmental reviews and acknowledged in the decision document."	Please see WO IM-2013-142, which clarifies the regional mitigation and off-site mitigation responsibilities of the BLM and includes a handbook for implementation of regional and off-site mitigation.
ALT B	Opposition	In05, In08	15	We are strenuously opposed to Alternative B and believe the BLM should either drastically modify this alternative or eliminate the alternative entirely from detailed consideration. As currently presented, Alternative B is poorly drafted, vague and would be impossible for the BLM to manage and the operators to plan development. Alternative B would drastically curtail oil and gas development and should not be selected.	Thank you for your comment. All alternatives will be analyzed.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
ALT B	Pipelines	In05, In08	24	Another mitigation measure is consideration of pipelines for transporting liquids off-site or for installation of larger capacity storage tanks to reduce the number of truck trips to the well sites. BLM has been the largest impediment to the use of centralized production facilities due to its refusal to approve off-lease measurement and comingling which has prohibited the widespread use of consolidated facilities, given the checkerboard pattern prevalent within the project area. Before attempting to require consolidated production facilities, BLM should first revise and streamline its procedures to authorize this type of mitigation measures. Also, in the absence of appropriate topography, operators would have to install additional pumps and compression facilities to transport produced water and hydrocarbons to consolidated facilities. This equipment increases surface disturbance and produces exhaust. Larger tanks may have adverse visual impacts and create additional to species such as sage-grouse if utilized as raptor perches.	Consolidation of facilities is considered in Alternative B and Alternative F, Agency Preferred Alternative.
ALT B	Population thresholds	C02	63	Draft EIS p. 2-9 Population Thresholds CLG Comment: The Draft EIS needs to tie impacts to wildlife and bird populations to causal factors from gas development. As written, the Draft EIS assumes, without data, that energy development is the cause. Certainly drought, predators, disease, hunting, and other herbivore grazing behaviors are also important factors and continue to impact wildlife and bird populations.	This point is recognized in the text of the revised Alternative B: "If it were determined that a species population... were declining at an accelerated rate... due to natural gas development."
ALT B	Population thresholds	C02	68	Draft EIS p. 2-14 Population Thresholds **CLG Comment:** This is poorly written and not well-documented.	Thank you for your comment.
ALT B	Power washing	C02	24	One of the Enhanced Resource Protection for livestock in Alternative B is to power-wash field vehicles before they enter or move within the project area. Field vehicles still need to be defined. Does it include light trucks used for personnel transportation or ATVs? How will this be enforced?	All vehicles associated with oil and gas operations that access the project area would be required to power wash their vehicles to deal with weeds as part of this alternative.
ALT B	Power washing	C02	25	Power washing is unlikely to have any benefit and would greatly increase adverse environmental impacts through runoff and use of water.	Power washing of field vehicles can be effective in reducing the spread of invasive species.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
ALT B	Power washing	C02	26	Power washing will fail in reducing noxious weeds. It is well-established that noxious weeds spread by wind, birds, and wildlife. Sakai, et al., The Population Biology of Invasive Species, ANNU. REV. ECOL. SYST. 2001, 32:305–32 at 312. The Draft EIS offers no mitigation to limit such distribution but instead attempts to impose an expensive and inadequate mitigation measure on a minor or de minimus source of seed distribution.	Thank you for your comment.
ALT B	Power washing	C02	70	Draft EIS p. 2-17 Thorough power-washing by Operators of all field vehicles...before entering the project area or when moving from one part of the project area to another. CLG Comment: As noted above, CLG recommends this be deleted since it is expensive and ineffective. In addition, the Draft EIS fails to analyze how many vehicles, the types of vehicles, the amount of water needed, and handling of runoff, to list a few issues. This proposal is not well thought out, needs to be revised for feasibility, or just deleted. Vehicles are a minor contributor to noxious weeds. Wind, birds and wildlife account for the overwhelming majority of vectors to spread weeds.	Power washing of field vehicles can be effective in reducing the spread of invasive species. Thank you for your comment.
ALT B	Power washing	In10	27	The requirement for power-washing is unnecessary and unduly burdensome. What is the justification? The ability to power-wash a vehicle assumes that water and electricity are available. This will not be the case at locations throughout the project area. We request BLM eliminate this requirement.	Generators could be used as a power source for power washing of vehicles.
ALT B	Problems	O04	6	We have no confidence that the assembly of a technical team to establish a mitigation plan would fix the problem if formally identified. Our experience with the JIO and PAPO processes indicates that these teams spent a great deal of money without ever demonstrating a single increase in wildlife populations or viability with all of the off-site mitigation measures that they approved. It is better to prevent or minimize impacts to habitats rather than try to call together a committee to address a problem after impacts have occurred.	Please see the updated text. The role and formation of the CD-C consultation and coordination group has been clarified in the document.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
ALT B	Problems	O04	7	The specific Enhance Resource Protections proposed in this alternative also fail to address fundamental biological realities regarding thresholds of impacts. For example, while prohibiting man camps, removing unnecessary fences, and requiring mufflers on noisy equipment within big game crucial ranges (Draft EIS at 2-10) are all well and good, these measures would be rendered meaningless by the fact that the intensity of development proposed under Alternative B would drive big game off these winter ranges entirely. This is underscored by the fact that a 10% surface disturbance threshold would be reached in crucial ranges before habitat improvement projects would be required. Draft EIS at 2-10. Is there any example documented in science where mule deer are using lands industrialized by the oil and gas industry that have reached this 10% disturbance threshold. Far better for BLM to put together a package of meaningful mitigation measures, such as displacing surface-disturbing project elements entirely away from crucial winter ranges and migration corridors.	The BLM is under the obligation to allow for the development of natural gas in the project area, as almost the entire project area has been leased. Impacts to mule deer and other sensitive species and resources will occur; however, it is the BLM's responsibility to ensure that these impacts are mitigated to the degree possible. Alternative B includes mitigation measures that would be implemented in an effort to reduce such impacts.
ALT B	Problems	O04	8	In other cases, the Enhanced Resource Alternative protections are simply the basic measures that one would expect BLM to undertake in any case, under any alternative, as part of doing its job.	The protection measures identified in Alternative B are not entirely measures that the BLM would always undertake. Some are new and some have been taken from appendices to the RMP that identify potential BMPs that may be applied on a site-specific basis. This alternative would require their use rather then making them voluntary.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
ALT B	Problems	O12/ O13	14	It is ludicrous that mitigations for population impacts will only be taken into consideration if "The WGFD were to express formal written concern that any of the herds within the project area was declining at an accelerated rate." We know that when migration corridors and critical winter range are removed from a population deleterious effects are soon to follow. Once again the proposed mitigation plans are far from sufficient. Addressing failures of reclamation, developing water and proposing vegetation treatment are not going to return acceptable and functional winter range or migration corridors to affected populations. Also depending on well development plans, limiting wells to four per section in CWR will still result in severe fragmentation of habitats and will have little to no benefits to wildlife. The last statement in 2.2.3.1 has little validity unless the energy production proponents of this project are willing to conduct scientifically significant and valid research into ALL populations that will be effected by the development. The statement "If population status of a species were to change...additional protective measures would be developed" implies that sufficient population data has been collected prior to the development, using population status as a benchmark for adaptive management is unacceptable. Also missing in this statement is the cumulative effects of all adjacent developments and how the effects of each individually will be measured and addressed. If these concerns are not addressed prior to the onset of development it will be extremely difficult to determine fault for any population status changes and very easy to redirect blame on other adjacent disturbances.	Development has been occurring in the project area for a number of decades prior to the finalization of this EIS. Data have been collected over at least the last decade for various species in the project area and have recently been compiled into a report available on the CD/WII website. However, please see updated text in the Final EIS that has removed the WGFD's responsibility for identifying declines.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
ALT B	Problems	O12/ O13	26	From an ungulate standpoint potential disruption of CWR due to proposed development could have long term negative impacts on already stressed herds (especially mule deer). The No Action Alt. would be the most beneficial from a wildlife habitat standpoint, but since this is likely not to happen, it would appear that the use of directional drilling would have the smaller footprint of wildlife habitat degradation when compared to other alternatives. I would assume WGFD would have the most up to date data relative to CWR in the proposed area of development. The Proposed Action related to mitigation for ungulate winter range impacts only if WGFD writes a formal letter stating unacceptable impacts take the burden of monitoring away from BLM and other signatories of this proposal and likely inadvertently will allow drastic impacts due to habitat fragmentation and reduction. A letter written after the fact won't suffice to properly mitigate the activities, the damage will already have occurred.	Thank you for your comment.
ALT B	Pronghorn and Mule deer	In05, In08	34	BLM must provide more information on how it will analyze potential impacts to PH and MD migration corridors. How will migration corridors be identified or mapped. Need information on how large the corridors are as well as objective scientific information to determine when - or if - surface disturbance is actually adversely impacting migration. We understand there has already been significant controversy and difficulty implementing the performance-based criterion utilized in the Atlantic Rim area relating to migration corridors and we would not want to see similar mistakes repeated in CD-C.	The **Wildlife Mitigation, Monitoring, and Protection Plan (Appendix I)** is designed to assist both the BLM and Operators with determining potential impacts that the development of natural gas may have on mule deer and pronghorn migration corridors.
ALT B	Pronghorn and Mule deer population thresholds	In05, In08	37	BLM must modify the population threshold criteria for PH and MD, as well as other wildlife resources, to indicate that the WGFD can only consider potential impacts of O&G development when evaluating population thresholds. Otherwise O&G operators would effectively "bear the brunt" of any and all impacts to wildlife such as drought, fire or disease. Further, allowing WGFD to express a formal opinion and, thus, effectively control O&G development within the area gives them inappropriate control over O&G operations on BLM lands. WGFD could effectively coerce and control O&G operations on federal lands with the threat of issuing a formal population opinion. This management approach is entirely inappropriate. (see also 28)	Alternative B has been amended; please see updated text. The WGFD would not determine how and when natural gas development would take place on federal lands. The WGFD would have no decision-making authority that would supersede that of the BLM. Finally, no valid existing rights would be infringed upon by the implementation of any of these alternatives.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
ALT B	Pronghorn and Mule deer reclamation credits	In05, In08	35	BLM has indicated that areas that have been successfully reclaimed would be credited against the surface disturbance thresholds, but has not provided any specific information or criteria on how these will be calculated. Even the guidance in Appendix E does not demonstrate how BLM will evaluate or analyze successful reclamation. Additional information is needed to comment on this. As drafted, Devon is opposed to the surface limits described in Alt. B.	Rollover reclamation would be credited to the Operator when the interim reclamation objective criteria are met, as stated in the IRO Appendix. The **IRO (Appendix M)** would be implemented should Alternative C be selected. **Appendix E** details how reclamation would be implemented if the Proposed Action, Alternative B, D, or F were selected.
ALT B	Reclamation	In04	37	Will successful reclamation under threshold performance allow a second well pad in areas limited to 1 pad/section?	Alternative B does not limit the number of well pads based on successful reclamation. The Greater Sage-Grouse element of Alternative B has been removed in the Final EIS.
ALT B	Remote well monitoring	In10	29	Remote well monitoring may not be feasible under some circumstances and during certain times of year. Remote well monitoring may require communication towers, which may be precluded by other restrictions (e.g. VRM, sage grouse, and raptor stips). We request BLM only require remote well monitoring when it is reasonable and practical to do so.	The use of remote well monitoring would be determined on a site-specific basis and would be included in the COAs for the site-specific APD and Environmental Assessment.
ALT B	Sage-Grouse	O04	28 & 29	Under Alternative the CD-C EIS, No Surface Occupancy buffers are prescribed for the lands within 0.6 mile of leks. The 0.6-mile buffer NSO buffer has no basis in science. True, male sage grouse use the area within 0.6 mile of the lek as a “loafing area” during the breeding season. But it is abundantly clear based on the science that the placement of an oil and gas well, whether actively drilling or in post-drilling production, as close as 0.6 mile from the lek will have deleterious effects on the sage grouse breeding population on that lek (See Holloran 2005). See letter for additional information. The 0.6-mile metric from the lek boundary is not a biologically useful management tool for limiting the placement of surface facilities for oil and gas. The National Technical Team Report includes a full review of the scientific literature on this subject and recommends an NSO buffer of 4 miles when leasing is allowed at all. The limit of one energy development per 640 acres is in line with NTT recommendations, however, diluting the calculation using a DDCT area is not in line with NTT recommendations.	The Greater Sage-Grouse element of Alternative B has been removed. Please see **Section 2.2.7.9** of the Final EIS for a description of Greater Sage-Grouse management in the CD-C project area. Management of Greater Sage-Grouse under all alternatives will be consistent with the BLM Approved Resource Management Plan Amendments for Greater Sage-Grouse, and the Wyoming Greater Sage-Grouse Conservation Strategy.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
ALT B	Sage-Grouse	In04	10	Page 2-7 first paragraph Basic Protection: The seasonal constraint is applied in all identified sage grouse habitat. Why is this being applied in all sage grouse habitat considering the Executive Order (EO) and the 2 mile seasonal radius stipulated in the WY BLM IM sage grouse non-core. Core and non-core habitat should be managed pursuant to the EO and IM's.	Please see **Section 2.2.7.9** of the Final EIS for a description of Greater Sage-Grouse management in the CD-C project area. Management of Greater Sage-Grouse under all alternatives will be consistent with the BLM Approved Resource Management Plan Amendments for Greater Sage-Grouse, and the Wyoming Greater Sage-Grouse Conservation Strategy.
ALT B	Sage-Grouse	In04	23	Page 2-11, Area of Concern: As this process unfolds and the RFO RMP amendment is finalized, the requirements for sage-grouse conservation in the RFO may change from the current condition. The Wyoming Core Area strategy (SWED 2011) applies to all activities, proposed in a designated core area, that require a permit from any State of Wyoming regulatory agency. The Wyoming conservation strategy for Greater Sage-Grouse continues to evolve and the requirements that would be applied to proposed activities in all seasonal sage-grouse habitats will change as the strategy changes. This statement suggests that the situation for sage grouse is dynamic until the BLM revises its RMP's and that the state strategy maybe be dynamic as well. Companies will be commenting on the RMP revisions for sage grouse, but until it is released we reserve the right to supplement these comments with those we plan to submit with the Rawlins RMP revision. We also take exception to the statement that Wyoming's state policy is dynamic and subject to change. It is our understanding that the State of Wyoming will be maintaining the Executive Order until the Sage Grouse listing decision in 2015.	Please see response to IN04-10 above.
ALT B	Sage-Grouse	In04	24	Page 2-13, first bullet: *Burying new power lines and using low-profile facilities within 1 mile of an occupied lek or in winter concentration areas;* it may not be possible to bury power lines because of concerns over other species, technical, logistical or economic concerns and the ability to obtain easements across both federal and fee lands.	Thank you for your comment. All resource concerns will be taken into account when considering facility placement.
ALT B	Sage-Grouse	In04	25	Page 2-13, third bullet: No more than one oil and gas or mining location per 640 acres and no more than 5 percent habitat disturbance (related to all programs or applicable sources of disturbance).The BLM cannot impose this standard in non-core areas. It violates IM WY-2012-019 and the Governor's Executive Order.	Please see response to IN04-10 above.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
ALT B	Sage-Grouse	In04	27	Page 2-13, middle of the page: If surface disturbance were to reach 10 percent or 2 oil and gas or mining locations per 640 acres of non-core sage-grouse lek, nesting/early brood-rearing habitat, or winter concentration areas in a lease, habitat improvement projects would be required. The BLM cannot impose this requirement in non-core areas. It violates IM WY-2012-019 and the Governor's Executive Order. This is a consistent concern in the Draft EIS. There seems to be little recognition being given to the Wyoming Executive Order and the concept with core and non-core areas for sage grouse. Non-core areas are directed to be available for existing and planned oil and gas activities. This does not seem apparent with the tone of the language found in the Draft EIS.	Please see **Section 2.2.7.9** of the Final EIS for a description of Greater Sage-Grouse management in the CD-C project area. Management of Greater Sage-Grouse under all alternatives will be consistent with the BLM Approved Resource Management Plan Amendments for Greater Sage-Grouse, and the Wyoming Greater Sage-Grouse Conservation Strategy.
ALT B	Sage-Grouse	In04	28	Page 2-13, Population thresholds, Timing and Distance Restrictions (Non-core areas to conform with core areas): The BLM cannot impose this standard in non-core areas. It violates IM WY-2012-019 and the Governor's Executive Order. This standard should be deleted in the Final EIS. No difference is provided between core and non-core. These measures should be applied to non-core and this should be stated in the Final EIS.	Please see response to IN04-27 above.
ALT B	Sage-grouse	In05, In08	41	BLM should revise its statement on p. 2-13 that it has the authority to apply a number of protective measures to minimize impacts upon SG and their habitats to be consistent with the existing precedent from IBLA. Although IBLA acknowledged that the BLM may impose mitigation measures to protect GSG, the Board noted the agency could only do so when such mitigation requirements are based on site-specific concerns and detailed analyses. Absent site-specific research and analyses, BLM cannot simply ignore existing lease rights, requirements in the RMP, BLM policy or regulations at 43 CFR 3101.1-2. It would be inappropriate and potentially illegal to do so.	Please see response to IN04-27 above.
ALT B	Sage-grouse	In05, In08	42	We strenuously oppose the sound restrictions limiting potential sound levels to 49 decibels only 30 feet from the source. It is not technically possible.	The noise restriction has been removed from Alternative B.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
ALT B	Sage-grouse	In05, In08	43	We are also concerned about the proposal to require all power lines to be buried. In many situations burial of power lines will cause significantly greater surface disturbance and may cause additional impact to big game, cultural and paleontological resources. Given the difficult reclamation conditions in the area, BLM should not assume the burial of power lines will have less impact on wildlife and other resources.	The potential for the burial of power lines would be considered on a case-by-case basis and all potential impacts to wildlife and other resources would be assessed prior to implementation.
ALT B	Sage-Grouse EO	C02	14	Alternative B exceeds the Executive Order 2011-5 for sage grouse.	Please see **Section 2.2.7.9** of the Final EIS for a description of Greater Sage-Grouse management in the CD-C project area. Management of Greater Sage-Grouse under all alternatives will be consistent with the BLM Approved Resource Management Plan Amendments for Greater Sage-Grouse, and the Wyoming Greater Sage-Grouse Conservation Strategy.
ALT B	Sage-Grouse EO	C04	5	Alternative B is not consistent with the State of Wyoming Sage-Grouse Executive Order's (EO) core area strategy. Actions which require core area protections outside of core areas, or actions which add additional protective stipulations inside of core areas, are inconsistent with the EO and therefore contrary to the agreement that the stakeholders reached.	Please see response to C02-14 above.
ALT B	Sage-Grouse EO	C04	6	Where the sage-grouse EO is silent, we ask that the BLM abide by WY-2012-019 instructional memorandum.	Please see response to C02-14 above.
ALT B	Sage-Grouse EO	C04	7	Limiting development to one oil and gas location per 640 acres throughout the CD-C planning area under the guise of sage-grouse protection is contrary to the intent of the EO.	The potential limitation of one well pad per section is not aimed at the protection of only Greater Sage-Grouse, but rather the goal of reducing surface disturbance and thus impacts on all resources. In addition, please see updated text regarding Greater Sage-Grouse.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
ALT B	Sage-Grouse EO	In05, In08	38	We are extremely concerned about and opposed to BLM's proposed management for GSG in Alt. B. It is not consistent with Wyoming's GSG core area protection policy in EO 2011-5 or BLM IM WY-2012-019. BLM should revise its proposed GSG management to be consistent with the current policies. In development of the Preferred Alt., BLM should not select any portion of the strategy contained in Alt. B. Since BLM notes that management of GSG may be impacted by the ongoing revision to its land use plan, and given the uncertainty created by the plan amendment, Devon reserves the right to submit additional comments regarding the CD-C Draft EIS when the draft plan amendment for the RFO is completed.	Please see **Section 2.2.7.9** of the Final EIS for a description of Greater Sage-Grouse management in the CD-C project area. Management of Greater Sage-Grouse under all alternatives will be consistent with the BLM Approved Resource Management Plan Amendments for Greater Sage-Grouse, and the Wyoming Greater Sage-Grouse Conservation Strategy.
ALT B	Sage-Grouse EO	In05, In08	39	BLM needs to define and explain how it will define SG habitat including nesting/early brood-rearing habitat and winter concentration areas. Currently the BLM has not identified these areas or provided a map of them. This is particularly concerning for winter concentration areas, which are not defined or mapped in the Draft EIS, despite the fact the operators funded wildlife studies to locate and identify winter concentration areas during the pendency of the CD-C EIS. It is irresponsible and inappropriate for the BLM not to make this data available in the Draft EIS. They should also explain whether they will utilize the general definitions for sage-grouse in EO 2011-5 or another set of criterion. Without this information, Devon cannot adequately assess how the proposed restrictions under Alt. B will impact its operations. Far more detail regarding these definitions must be included in the Final EIS.	Please see updated text and **Section 2.2.7.9** of the Final EIS for a description of Greater Sage-Grouse management in the CD-C project area. Management of Greater Sage-Grouse under all alternatives will be consistent with the BLM Approved Resource Management Plan Amendments for Greater Sage-Grouse, and the Wyoming Greater Sage-Grouse Conservation Strategy.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
ALT B	Sage-Grouse EO	In05, In08	40	We are strenuously opposed to BLM's proposal to limit O&G activities within the entire CD-C project area to not more than one O&G location per 640 acres and no more than five percent habitat disturbance. This proposal is not consistent with EO 2011-5 or IM WY-2012-019. BLM would effectively impose core area protection measures on lands not identified as core. We are opposed to the proposed surface disturbance cap prohibiting more than two O&G locations per 640 acres in non-core SG areas. Such a prohibition is contrary to both the EO and IM. It is irresponsible for the BLM to propose an alternative that is so clearly inconsistent with both the EO and IM. The WY sage grouse policy was carefully revised and endorsed by the USFWS and BLM has not identified sufficient reason to ignore the policy.	Please see **Section 2.2.7.9** of the Final EIS for a description of Greater Sage-Grouse management in the CD-C project area. Management of Greater Sage-Grouse under all alternatives will be consistent with the BLM Approved Resource Management Plan Amendments for Greater Sage-Grouse, and the Wyoming Greater Sage-Grouse Conservation Strategy.
ALT B	Sage-Grouse EO	In06	3	Page 2-7, 2.2.3, Enhanced Resource Protections, all identified sage-grouse habitat is subject to seasonal constraints outlined under the Basic Protection paragraph; and page 2-13, if surface disturbance were to reach 10 percent or 2 oil and gas or mining locations per 640 acres of non-core sage-grouse lek, nesting/early brood-rearing habitat, or winter concentration areas in a lease, habitat improvement projects would be required. The Executive Order (EO) and BLM IM WY -2012-019 do not include the same constraints. These requirements would violate the EO and thus should be deleted from the Final EIS.	Please see **Section 2.2.7.9** of the Final EIS for a description of Greater Sage-Grouse management in the CD-C project area. Management of Greater Sage-Grouse under all alternatives will be consistent with the BLM Approved Resource Management Plan Amendments for Greater Sage-Grouse, and the Wyoming Greater Sage-Grouse Conservation Strategy.
ALT B	Sage-Grouse EO	In10	22	Several of the protections in Alt B are not consistent with stipulations provided for under EO 2011-5. A highly qualified professional team spent significant time and resources developing the EO to establish a policy that would effectively protect sage grouse from potential impacts of oil and gas development operations. USFWS supports this strategy. As such, the protections in Alt B or other sage grouse stipulations that go beyond the EO are unnecessary and have not been justified by BLM. Following this statement are a list of items in Alt B and comments on why they are not needed.	The Greater Sage-Grouse element of Alternative B has been removed. Please see **Section 2.2.7.9** of the Final EIS for a description of Greater Sage-Grouse management in the CD-C project area. Management of Greater Sage-Grouse under all alternatives will be consistent with the BLM Approved Resource Management Plan Amendments for Greater Sage-Grouse, and the Wyoming Greater Sage-Grouse Conservation Strategy.
ALT B	Seasonal restrictions	C02	27	a. Pronghorn Antelope and Mule Deer There should be exceptions, waivers, and modifications for seasonal restrictions on construction, drilling, and other activities from November 15 through April 30.	Whether or not to approve an exception request will be at the discretion of the BLM wildlife biologist and authorized officer on a site-specific basis. Information pertaining to exceptions, waivers, and modifications can be found in the Rawlins RMP Appendix 9.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
ALT B	Selection of resources	In05, In08	22	BLM must justify why certain resources were selected to receive enhanced protection. Most mule deer herds are currently above or very close to WGFDs population objective. Given these levels, there seems no reason to create additional mitigation measures for mule deer. Also, why do ferruginous hawks need additional protections given the significant protections provided under the MBTA and RMP. Finally, BLM has not adequately explained why additional monitoring or mitigation measures are necessary for Muddy Ck. and Bitter Ck. given extensive monitoring already on-going in the Atlantic Rim Project Area.	The mule deer herd numbers have been updated to more accurately illustrate the declining herd numbers. The project area is habitat to a large population of ferruginous hawks; therefore, additional measures to ensure the population does not decline are necessary. Muddy Creek and Bitter Creek are tributaries to the Colorado River; segments of Muddy Creek are on the 303(d) list for Threatened and Impaired waters, and additional natural gas development may contribute to detrimental impacts. Monitoring of Muddy Creek will be the responsibility of the BLM.
ALT B	Selenium/ salinity	In10	14	The RMP establishes stipulations for protection of fish which are reasonable and adequate. We suggest retaining these to protect sensitive fish species in Muddy Creek and its drainage.	Thank you for your comment. The scoping process and the Draft EIS comments identified numerous concerns regarding not only the species of sensitive fish but also the potential impacts to water quality as a result of this project. The buffers analyzed in Alternative B are not in place solely for sensitive fish.
ALT B	Selenium/ salinity	In10	15	Prohibiting all surface discharge of produced waters in the Muddy Creek and Bitter Creek watersheds is overbroad. Some surface discharge of water with satisfactory selenium and salinity concentrations will not negatively impact surface waters and should be permitted. Similarly, surface discharge in some locations within the drainage will not have the potential to negatively impact surface waters within the drainage. Such discharges should be permitted. Yates requests the BLM limit this salinity and selenium stipulation to restrict only surface water discharges that will potentially negatively impact surface waters in the drainage.	The **Operators' Project Description (Appendix B)** states that no surface discharge of produced waters is anticipated. If the Operators would like to amend this, they should do so in their project description. There is no analysis of surface discharge in this document. However, should a proposal for surface discharge be brought to the RFO, it will be analyzed under a separate NEPA document.
ALT B	Sensitive species protections	O04	9	We recommend applying the additional sensitive species protective measures in Alternative B as outlined at Draft EIS page 4-121; while most of these measures are not so fundamental that they would overcome the impacts of well and road construction and siting, every little bit helps with regard to protecting BLM Sensitive Species.	Thank you for your comment.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
ALT B	Surface disturbance	In04	15	Page 2-9, second full paragraph, Disturbance that is counted against the threshold includes all disturbance... that serve the Operator's lease and off-lease rights-of-way on adjacent BLM lands that also service the lease. This could be problematic for leases that may have long roads and pipeline connections that extend out several miles. Clarification should be provided that pipeline routes should not be included as part of the surface disturbance if 70% revegetation has been achieved.	Page 2-19, under the description of Alternative C, states that "[a]ll pre-existing and current surface disturbance associated with natural gas well pads, their access roads, and gathering pipelines would count against the cap." If a location or disturbance has reached successful interim reclamation as described in **Appendix M**, then that disturbance would not count against the cap.
ALT B	Surface disturbance thresholds	In05, In08	27	BLM must provide more information on how it intends to apply the surface disturbance threshold and how it has sufficient resources to implement it. BLM cannot mandate or assume the operators will provide funding. Such funding must be provided voluntarily. As such, BLM must explain how it has the resources to enforce and manage this alternative if not funds are volunteered. BLM also needs to explain how it will manage the surface disturbance thresholds. While analyzing surface disturbance within a lease may be possible, it could be very difficult to manage measure, or mitigate surface disturbance thresholds when applied to rights-of-way. Some questions include: what width will be used, disturbed acres or something broader; operators have little control over how disturbance is measured outside of their leasehold, but within a proposed right-of-way; could one operator use up the threshold and then another not be allowed a right-of-way? Attempting to apply the surface disturbance thresholds for rights-of-way is infeasible and must be eliminated from Alt. B.	The surface disturbance threshold would be applied as described in Alternative B. The Operators are required to submit reclamation monitoring data, as-builts, and other information pertaining to any approved surface disturbances. The BLM would be responsible for maintaining the database associated with existing and proposed disturbance in the project area. No funds for tracking would be expected from Operators; however, Operators would be expected to supply the BLM with accurate and timely information concerning their respective development in the project area as required by federal regulations. Rights-of-way would be included in the threshold measurement; this is surface disturbance and would potentially have impacts to the identified sensitive resources. No valid rights to develop the resource would be infringed upon. This has been clearly articulated in the Alternative.
ALT B	Surface disturbance thresholds	In10	28	There are dozens of well locations within the Cyclone Rim allotment. A large portion of this area has been leased to Yates and other Operators. To some degree the same can be said for the 3 allotments in the southern end of the area (Continental, South Flat Top and Red Creek). Exceeding the 5% and 8% surface threshold in Alt B is a possibility. We request BLM limit actions triggered by exceeding the thresholds to those that are practical and workable from the operators perspective. At this time, it does not appear that the Proposed Actions are unreasonable.	All alternatives are reasonable; hence their inclusion in the Draft EIS. If the 5 or 10 percent thresholds are exceeded, then mitigation would need to occur.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
ALT B	Taking	In05, In08	32	In Alt. B the BLM proposes to limit or prohibit development on certain oil and gas leases when it believes various thresholds have been reached. Depriving the lessee of the opportunity to develop its oil and gas leases is inconsistent with the terms of the lease as a contract and also inconsistent wit BLM's regulations that provide the lessee the opportunity to use as much of the lease as necessary to develop and transport the resources. These actions may constitute a taking in violation of the Fifth Amendment. Additionally, any alternative that would substantially modify Devon's lease rights could subject the BLM to a rescission and restitution claim. BLM must avoid adopting alternatives that would result in the unconstitutional taking of Devon's property and contract rights.	No valid existing rights would be infringed upon by the selection of any of the alternatives. This has been clarified in the Final EIS.
ALT B	Technical team	In04	22	Page 2-11, second paragraph: If the Wyoming Game and Fish Department (WGFD) were to express formal written concern that a species population, within the project area were declining at an accelerated rate compared to the rest of the population, a technical team would be assembled to prepare a mitigation plan as described above. Comment: What is the composition of the technical team? What is the basis on which declines are considered “accelerated”? What if it has nothing to do with oil and gas? To preclude APD’s on these criteria until a specific and known conclusion is reached should be reconsidered.	Please see the updated text. The CD-C consultation and coordination group's duties have been further defined. The **Wildlife Mitigation and Monitoring Plan (Appendix I)** would be implemented to monitor relevant wildlife species and to determine what impact, if any, oil and gas development is having on those wildlife species. The development of a mitigation plan would be undertaken on a site-specific basis.
ALT B	Technical team	In05, In08	31	In this section is the first time the term "technical team" is mentioned. There is no information on the members of the team or how it will be implemented. BLM needs to specify whether the team will be a FACA committee and whether the "technical team" is the same as the "interagency CD-C working group or the "interagency CD-C consultation group. This needs to be clarified. Also Devon encourages BLM not to utilize a FACA committee given the procedural difficulties and mandates imposed thereby. We also urge BLM to delete this 'technical team' from Alternative B.	Please see the updated text. The CD-C consultation and coordination group's duties have been further defined. The group will not be chartered under FACA as it would not require the group's consensus to change management direction. Operators would not be included in the group. Management decisions will not be delegated to the group and the BLM will make the ultimate decision on any proposed management actions.
ALT B	Travel plan	C02	57	Draft EIS p. 2-8 A travel plan that minimizes vehicular traffic for monitoring and servicing wells and other facilities and that includes closures and/or time-of-day restrictions for production roads during the winter season; CLG Comment: One road would not be adequate, especially if there are different facilities or operators. Necessity or need should be the determinative factor.	Thank you for your comment. The travel plan as described in Alternative B does not indicate that only one new road would be authorized.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
ALT B	Unintended consequen-ces	In07	6	Page 4-93, Fish, last paragraph. The unintentional consequence of these protections being applied only to BLM land could be to increase drilling activities on private and state land could occur under any action alternative with increased restrictions and/or for any potential species/area on which additional protections may be applied. This potential consequence should be identified wherever it might apply. Consideration should be given to the Proposed Action as opposed to encouraging private land commitments that operators and the state are not in a position to make.	Thank you for your comment.
ALT B	Valid existing rights	In05, In08	16	The combination of enhanced mitigation measures and thresholds triggering additional mitigation is most likely contradictory to the express terms of Devon's valid existing lease rights and the Rawlins RMP. For example, the alternative proposes to increase surface occupancy stipulations around Chain Lakes and wetlands from 500 feet to 0.25 miles. Such a requirement is inconsistent with the express terms of the RMP and valid existing rights.	No valid existing rights would be infringed upon by the selection of any of the alternatives. This has been clarified in the Final EIS.
ALT B	Valid existing rights	In10	10	Yates holds leases within the 1/2 mile buffer of perennial streams within the area. Full development of such leases will be significantly limited by expanding the surface avoidance distance from 500 feet to 1/2 mile around perennial streams. Similar concerns apply to the 1/4 mile buffer around springs, wells and wetlands. The buffers established in the RMP are adequate to protect these resources. Larger buffers are excessive and will unnecessarily restrict operations. In some situations, these large buffers will make development of a lease impractical if not impossible. They also infringe on valid existing rights. We request BLM retain the RMP buffers and use site specific mitigation measures on a case-by-case basis to protect the resource.	No valid existing rights would be infringed upon through the selection of any of the alternatives.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
ALT B	WGFD determina-tions	C02	66	Draft EIS p. 2-10 If surface disturbance reached 10 percent of pronghorn or mule deer CWR and migration corridors in a lease, habitat improvement projects would be required in addition to the requirements above. The BLM would establish an interagency CD-C working group and consult with them to determine which projects would be beneficial. CLG Comment: WGFD's delegated authority is too broad to demand changes in the production or operation. As written, the WGFD could make a demand for a change without independent data supporting a determination of causation. It is an improper delegation, fails to follow APA procedures and cannot lawfully be part of the Preferred Alternative. The working group should include land owners, permittees, and local governments as well as state and federal agencies.	Please see updated text.
ALT B	WGFD role	In05, In08	28	Devon is strenuously opposed to the population threshold concept for several reasons. First BLM needs to explain and justify why it is transferring its responsibility to manage public lands to the WGFD. BLM, not the WGFD, is charged with management of the federal lands and only the BLM can manage its lands in compliance with FLPMA's multiple use mandate. By allowing the WGFD to determine how and when oil and gas development will take place on federal lands, the BLM is improperly and potentially illegally attempting to delegate its management responsibilities. Second, BLM has not identified what criterion would be utilized by the WGFD to make population decisions. Third, BLM must explain how it will protect operators' rights if impacted by a WGFD decision. How could an operator potentially challenge a WGFD decision that is implemented by the BLM? The process for this alternative has not been sufficiently developed and must be eliminated.	Alternative B has been amended; please see updated text. The WGFD would not determine how and when natural gas development would take place on federal lands. The WGFD would have no decision-making authority; the BLM would retain those rights. Finally, no valid existing rights would be infringed upon by the implementation of any of these alternatives.
ALT B	WGFD role	In05, In08	30	We are strenuously opposed to the position that all operations in the project area would be halted under Alt. B if the WGFD issues an opinion letter. Forcing operations to halt is inconsistent with existing lease rights and would have a profoundly negative impact on the local and regional economy.	Please see response to In05-28 above.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
ALT B	Wildlife technical team	In10	33	The scope of authority, responsibility and composition of the technical team is unclear. It is also unclear what triggers assembly of the team. How is accelerated rate of decline determined? What burden of proof must the WGFD meet in making their determination and is this subject to review? What is the timeline for preparing a mitigation plan and continuing APD approval?	See revised Alternative B in the Final EIS. The WGFD would no longer be responsible for making a determination. The mitigation plan would be developed on a project-specific basis; therefore, it would not be feasible to state the requirements and the timeline that would be required in this programmatic EIS. More clarification of the technical team has been provided.
ALT C	Acreage calculation	O04	13	Under Alternative C, neither natural gas processing and transmission facilities nor county, state, and federal roads would count against the acreage disturbance cap. Draft EIS at 2-19. This loophole directly contradicts the point of having an acreage disturbance cap. If one assumes that acreage of surface disturbance is correlated with wildlife impact (which is intuitively appealing but has yet to be shown through scientific studies), then an acre of county road and an acre of gas field access road have identical impact. Wildlife does not know and does not care about the administrative purpose for which an impact was constructed; the impact comes from the ecological disturbance and subtraction of habitat, not from administrative responsibility. These impacts should be counted toward the acreage of surface disturbance under this Alternative, just as they are for sage grouse Core Area DDCT calculations.	Alternative C is directed at the development activity of the individual Operators. It is the intent of the alternative that they be held accountable only for their own activities and not the prior, concurrent, or future activities of others. This EIS analyzes the impacts of natural gas development and alternatives and responds to issues raised due to natural gas development, not existing disturbances unrelated to natural gas such as existing county roads.
ALT C	Economic feasibility	In04	39	The surface cap concept in Alternative C, when combined with a specific time requirement is not reasonable or practical in application. Soil, vegetation and reclamation potential data presented in the Draft EIS clearly support this. Please include reclamation standards in the approved project that allow for interim and final reclamation at reasonable times, rather than a set number of years or growing seasons.	Alternative C does not have a specific time requirement for reclamation, nor does the Rawlins RMP.
ALT C	Feasibility	In07	4	Portions of Alternatives C are unworkable. Thresholds have been met in many areas. How does BLM plan on tracking disturbance and reclamation, particularly at locations with multiple leases, some less than 640 acres in extent, and given private/public land mix?	The BLM will track disturbance and reclamation based on reclamation monitoring reports submitted by the Operators.
ALT C	Feasibility	In10	3	The surface cap concept in Alternative C when combined with a specific time requirement (years/seasons) is not reasonable or practical in application. Soil, vegetation and reclamation potential data presented in the Draft EIS clearly support this.	Alternative C does not have a specific time requirement for reclamation, nor does the Rawlins RMP.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
ALT C	High and low density	O04	12	Under Alternative C, the designation of the project into areas of high and low density is problematic, because many areas of low well density have been lumped into the “high density” category making them a sacrifice zone. For this alternative, the boundary lines should be redrawn tightly around lands with 4 well pads per section or more.	The establishment of these zones is based on previous development and high-density areas may have low well density now, but may not in the future.
ALT C	High and low density areas	In05, In08	58	We suggest that BLM develop a criteria under Alt. C whereby the high density and low density areas could shift over time based on new geologic information. As new technology is developed, areas which were previously considered to have low potential may have much higher potential for oil and gas development. By developing criteria by which the BLM could modify the high and low development areas the BLM will ensure it has sufficient flexibility to adequately manage this important natural gas resource.	Allowing for flexibility in the locations for high-density development would defeat the purpose of creating the high- and low-density development areas.
ALT C	Implementa-tion	In01	20	When discussing Alternative C: Surface Disturbance Cap on page 2-18, the BLM should does not clearly identify which party would be obtaining the existing disturbance information and which party would be determining the current acreage for long-term and successful interim reclamation. Also, the BLM should state how the cost of managing a BLM designed disturbance cap and monitoring program will be fairly distributed between operators and the agency. Analysis of costs should be completed for this requirement.	As stated in the description of Alternative C, "The Operators would be required to update their reported disturbance annually in order to certify the accumulated disturbance on their federal lease holdings to date and the amount of interim reclamation that had occurred. Under the alternative, the BLM would perform quality control on the reported data and evaluate the reported interim reclamation and the success of that reclamation. The BLM would then calculate net available surface disturbance under the cap for each section. As new drilling proposals were received, they would be evaluated against the net available surface disturbance within the section where the drilling was proposed. For oil and gas leases smaller than a section, the acreage cap would be adjusted on a pro-rata basis."

Category	Sub-Category	Comment		Comment	Response
		Code	No		
ALT C	Intensity of development	O04	10	Alternative C is an environmentally unacceptable alternative, because both high and low density areas will result in an intensity of development that will destroy the land's capability to support many types of BLM Sensitive Species. See Draft EIS at ES-5. It is notable that the current "high density" area averages 33 acres of surface disturbance per section, which has voided this area of habitat value for sage grouse, elk, and other species. The proposal that a similar level of surface disturbance (30-acre disturbance cap) be permitted in low density areas as well is antithetical to the BLM's multiple-use mandate to allow resource extraction while also providing adequate habitat for native wildlife. Note: We are assuming that the 60-acre cap applies to 40-acre spacing while the 30-acre cap applies to 80-acre spacing; the reverse is described multiple places in the Draft EIS. See Draft EIS at 2-18.	Thank you for your comment.
ALT C	Interim reclamation and rollover credit	In05, In08	55	BLM must clarify the criterion it intends to use to determine when interim reclamation will be adequate for rollover credit. There are three separate interim reclamation standards in Appendix E. As currently presented, we can't determine which BLM plans to adopt. We encourage BLM to develop objective, reasonable criterion that can be utilized to determine when reclamation is sufficient for rollover credit. Without clearly defined objective criteria, BLM's future management of reclamation could be subject to litigation and future challenges.	The rollover criteria that would be used are identified in **Appendix M, Interim Rollover Objective (IRO) For Alternative C.**
ALT C	Reclamation	In05, In08	57	BLM acknowledges the difficulties in achieving successful reclamation within the project area. Given the difficulties, BLM should ensure that interim reclamation standards are sufficiently flexible to allow the operators to demonstrate successful interim reclamation.	Thank you for your comment. Please see the updated **Appendix E, Reclamation Plan**.
ALT C	Reclamation criteria	In05, In08	56	The lack of objective criterion also make it difficult for the operators to plan future operations. Before committing the resources necessary for future operations, operators must be assured that they will be able to proceed with development. If there is insufficient assurance that projects will be allowed to proceed, financial resources will be diverted to other assets.	No valid existing rights would be infringed upon by the selection of any of the alternatives. This has been clarified in the revised document. Projects would be allowed to proceed on a case-by-case basis, with appropriate mitigation measures incorporated as design features into the Proposed Action.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
ALT C	Reclamation standards	O04	11	We also find it objectionable that acres of interim reclamation are subtracted from the acres disturbed. *Id*. Interim reclamation should be required to be restored back to the original site vegetation before these acres are "released" for more surface disturbance to be allowed. Thus, if the original vegetation was Wyoming big sagebrush of canopy height 45 cm and canopy cover 25%, the reclamation should be required to achieve these metrics before the reclamation area is "released." *(see more info in letter)* Rollover of lands should only be provided after the re-establishment of the original vegetation composition and growth form.	Thank you for your comment.
ALT C	Rollover credit	In01	21	When discussing Alternative C: Surface Disturbance Cap on page 2-19, the BLM should analyze a well-defined process for receiving credit for roll over acres. Without said analysis, the conflicting standards referenced in the Appendices create ambiguity.	When the disturbed acreage meets the proposed rollover criteria as defined in **Appendix M**, then Operators would be credited with rollover. The determination of whether the disturbed area meets the rollover objective would be at the discretion of the BLM authorized officer, based on data collected by the Operator and a site visit conducted with the BLM and the Operator.
ALT C	Subcontrac-tors	In05, In08	54	We are concerned regarding BLM's assumption that it would utilize subcontractors hired by the operators to perform quality control and evaluate interim reclamation success. See previous comment regarding funding concerns. Given these uncertainties, BLM should describe how it would implement Alt. C if the operators are unwilling to provide funding for third-party contractors. Does BLM have the resources to monitor surface disturbance caps? In the event the operators are will to fund contractors, how long will such contractors be needed?	Operators are required to monitor reclamation and to - submit this data to the BLM. Third party contractors are generally hired to complete this task. If contractors are not hired, then the Operator is responsible for collecting this information. Once information is submitted to the BLM, the BLM would be responsible for tracking the surface disturbance.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
ALT C	Surface disturbance accounting	In05, In08	53	We appreciate the BLM's attempt to create an Alternative whereby each individual operator would be incentivized to reduce surface disturbance and maximize interim reclamation to the maximum extent possible. Compared to Alternative B in particular, Alternative C allows each oil and gas operator within the CD-C Project Area to control its own destiny. By tracking surface disturbance on a lease-by-lease basis, operators will be, for the most part, only responsible for surface disturbing operations related to their operations and, thus, under their control. The BLM should clarify the language in the first paragraph under Section 2.2.4 to clearly state that the BLM would only count surface disturbance associated with natural gas development against the cap. CD-C Draft EIS, pg. 2-18. Although the BLM includes this language on page 2-19 of the EIS, the BLM does not use consistent language when describing this alternative throughout this section. This lack of clarity could create ambiguity in the future. Obviously only disturbance related to oil and gas operations should count against the proposed cap.	The description of Alternative C makes it clear that only prior surface disturbance committed to long-term use for natural gas development roads or on-pad production facilities and all disturbance that had not been successfully reclaimed would count against the cap.
ALT C	Valid existing rights	In01	2	APC strongly emphasizes with regard to Alternative C that has legal existing lease rights that cannot be voided by claiming in the Draft EIS that a disturbance cap will be or should be imposed on the Project. *See Theodore Roosevelt Conservation Partnership v. Salazar*, 605 F.Supp.2d 263, 284 (D.C. Cir. 2009) (Actual drilling that exceeds projections in the RMP (and NEPA documents) does not foreclose or limit the number of wells that can be drilled). We urge BLM to carefully review the mitigation measures proposed and only impose those measures that are truly necessary to protect sensitive resources and not utilize a fixed development cap.	No valid existing rights would be infringed upon by the selection of any of the alternatives. This has been clarified in the Final EIS.
ALT C	Disturbance calculation	C02	72	Draft EIS p. 2-18 Within the high-density development areas, a 60-acre cap would be placed on the amount of unreclaimed surface disturbance at any one time in a section of public land or federal mineral estate. CLG Comment: BLM cannot prevent a private landowner from plowing his land or mowing for alfalfa. This appears to do exactly that. It would also interfere with state land lessee rights.	The description of Alternative C in **Section 2.2.4** states that "federal, state, county, and local roads and highways, railroads, and disturbances created by ranching operations would not count against the cap."

Category	Sub-Category	Comment		Comment	Response
		Code	No		
ALT C	Disturbance calculation	C02	73	Draft EIS p. 2-18 Only the 16 acres used for roads and production facilities would continue to count against the cap. CLG Comment: The disturbance cap should be limited to public land surface.	The disturbance cap applies to public lands and to federal fluid mineral leases.
ALT C	Valid existing rights	C02	74	Draft EIS p. 2-18 Map 2-1 shows the high-density development and low-density development areas within the project area. Of the 1,697 sections within the project area, 744 sections (about 44 percent) are within a high-density development area..... CLG Comment: The described roll over for reclamation may not conform to lease stipulations or regulations. There is no provision for drought and other factors. It also contradicts law and leasing rules. BLM cannot revise leasing rules.	No valid existing rights would be infringed upon by the selection of any of the alternatives. This has been clarified in the Final EIS.
ALT D	Density loopholes	O04	14	Under Alternative D, in areas where leases are less than one square mile in extent, well pad density should still be capped at one per square mile rather than allowing loopholes for greater density due to small leaseholds. In some circumstances, single leases less than one square mile will abut other leases held by the same company, for a total acreage under lease for that company greater than one square mile. But even where this is not the case, unitization can be required by BLM as part of the ROD approval for this project so that patchwork leaseholds for many different companies can be managed so the surface disturbance presented by well pads never exceeds 1 per square mile. BLM should avail itself of this management capability in the ROD to ensure that well density never exceeds one per square mile in presently undeveloped or lightly developed areas, and the field can be developed as efficiently as possible from both a road and pipeline network standpoint and from a wildlife habitat impact standpoint.	Any decisions made through this EIS would not infringe on any valid existing rights. The BLM would not preclude development on any leaseholds.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
ALT D	Density loopholes	O04	15	BLM should not offer a loophole in currently undeveloped sections to allow more than one well pad per section. See Draft EIS at 2-21. It is technically impossible to "establish that the drilling objective cannot be achieved from a single well pad" unless the objective is to have two pads or the objective is to avoid drilling all wells from a single pad. And neither of these two excuses should be considered valid objectives. BLM should stick to making a simple requirement (one well pad per section) as a Condition of Approval and let the operators use their expertise and ability to figure out how to get the job done.	Thank you for your comment.
ALT D	Disturbance	O04	16	Alternative D has the lowest surface disturbance acreage figure of the action alternatives, and therefore would have the lowest impact among all action alternatives on vegetation (Draft EIS at 4-76), and all the other resources. Balanced against this, the mineral resources within the project area would be fully developed under each action alternative.	Thank you for your comment.
ALT D	Economic feasibility	In04	40	The one well pad concept per 640 acres in Alternative D is technically and economically unreasonable. Existing agreements, safety concerns, well spacing requirements, drainage protection and numerous other flaws exist with this alternative. Allowing for additional pads by request is an uncertain process, and not conducive to long term multiyear development planning and financial commitment.	After evaluation of the potential for the alternatives to reduce the rate of drilling or the number of wells drilled, the BLM concluded that alternative D could reduce the number of wells. The impact analysis of Alternative D in the Final EIS reflects this conclusion.
ALT D	Exemptions	C01	6	Operators should be able to request that an APD be exempted from the general rule when an extraordinary situation exists that could limit full development of the resource.	No valid existing rights would be infringed upon. Text has not been revised.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
ALT D	Feasibility	In05, In08	59	We are opposed to Alternative D. Currently, no operator active in the area is capable of completely developing natural gas resources within a section from a single well pad. An alternative that requires future development be directionally drilled form a single pad within the section is simply not technologically or economically possible at this point in time. As such, Alt. D is not a reasonable alternative. Although the BLM indicates it will consider allowing operators to use more than one pad per section or lease when the "drilling objective cannot be achieved from a single-well pad" the BLM does not define or elaborate on the criterion it will utilize to make this decision. CD-C Draft EIS, pg. 2-21. In order to avoid the potential for future arbitrary and capricious decision-making, the BLM should define and develop criterion it will utilize to determine when directional drilling from a single pad will not be required.	Criteria have not been developed at this point, although language has been added to explain why criteria have not been developed. It is likely than exceptions would be granted based on geological reasons (such as the need to develop CBM as opposed to conventional gas), but developing criteria at this point may lead to the exclusion of other factors not yet known.
ALT D	Feasibility	In06	11	Page 2-12, 2.2.3.2. Alternative D proposes one well pad per 640 acres. Existing agreements, safety concerns, well spacing requirements, drainage protection and numerous other flaws exist with this proposed Alternative. This is unrealistic and not at all economically feasible for development and planning purposes given the uncertainty of the authorization process.	After evaluation of the potential for the alternatives to reduce the rate of drilling or the number of wells drilled, the BLM concluded that Alternative D could reduce the number of wells. The impact analysis of Alternative D in the Final EIS reflects this conclusion.
ALT D	Feasibility	In07	2	Requiring all future natural gas wells to be drilled from multi-well pads as proposed in Alternative D will preclude development of portions of the field. Depending on leasehold, geology, formation, general safety concerns and other site-specific conditions, directional drilling is not appropriate or feasible in every situation.	No valid existing rights will be infringed upon. No unreasonable restrictions will be applied or implemented.
ALT D	Feasibility	In10	4	The one well pad per 640 acres concept in Alt D is technically and economically unreasonable. Existing agreements, safety concerns, well spacing requirements, drainage protection and numerous other flaws exist with this proposed Alternative. Allowing for additional pads by request is not conducive to long term multiyear development planning and financial commitment given uncertainty of the authorization process.	No valid existing rights would be infringed upon by the selection of any of the alternatives. This has been clarified in the Final EIS. In addition, exceptions to the one well pad per 640 acres is included as part of Alternative D. Therefore, if it were determined that an Operator would not be able to develop the resource through the use of only one well pad, then an exception would be granted. After evaluation of the potential for the alternatives to reduce the rate of drilling or the number of wells drilled, the BLM concluded that alternative D could reduce the number of wells. The impact analysis of Alternative D in the Final EIS reflects this conclusion.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
ALT D	Sustainable balance	C01	7	Alternative D appears to be the alternative that is in general compliance with goal 1 of the Carbon County Comprehensive Land Use Plan, "achieve a sustainable balance between energy development agriculture, and the environment."	Thank you for your comment.
BMP	Appendix C	In04	59	Appendix C, page C-1: BMPs are described as general principles for resource protection and COAs are described as being attached to an approved APD to ensure environmental protection, safety, and/or conservation of the mineral resource. However, page C-1 says that BMPs are often expressed in natural gas leaseholders' plans of development, in reclamation plans, or, attached to approved Applications for Permit to Drill, as Conditions of Approval, which are described below. Clarification must be provided as to which of the items listed are BMP's or COAs.	Please see updated Appendix C. COAs are requirements attached to an APD or right-of-way grant or other authorization; BMPs are voluntary measures put forth by the proponent or suggested by the BLM as features of responsible development.
BMP	Appendix C, Clarification	In07	5	Reference is made to Appendix C throughout the Draft EIS without clarifying language that Appendix C contains many measures that are not applicable in every situation. Please add such clarifying language, which does appear on C-2, to the body of the EIS to avoid confusion.	The applicability of COAs as appropriate to site-specific situations is a BLM practice with which the oil and gas industry is familiar. The list is often adapted as needed for site-specific use. The use of COAs has been described more fully in Section 1.7.
BMP	Appendix C, clarification	In09	14	"**Construction Differences. Appendix C** has several areas specifically written for well pad construction but does not address the specific differences inherent in pipeline construction. (Please see the Pipeline Reclamation Plan for proposed insight.) "	COAs are provided in individual APDs and ROW grants and are not subject to revision in this document.
BMP	Appendix C, clarity	In04	60	Appendix C, Page C-8, Operations, Item 25, says that Upon APD expiration, it is the responsibility... The beginning of this COA should be revised to read Upon APD expiration, if an extension is not requested or cannot be obtained, it is the responsibility... to remind the operator and the BLM that an extension can be obtained.	Outside the scope of this document; COAs will not be modified at the EIS level.
BMP	Appendix C, clarity	In04	61	Appendix C, Page C-9, Construction, Item 1, states that All facilities on location that have the potential to leak/spill oil, glycol, methanol, produced water, condensate, or other fluids... shall be within secondary containment, impervious to those fluids... and able to contain a minimum of 110% of the volume of the largest storage vessel. The phrase impervious to those fluids should have a specific reference. The term largest storage vessel applies to tanks, but should not apply to pass-through process vessels such as separators.	Please see response to In04-60 above.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
BMP	Appendix C, COAs	In07	20	Appendix C, Specific unnecessary COAs include (pages C-14 to C-17), 2a, 2b, 2c, 5c, and 14.	COAs are provided in individual APDs and right-of-way grants and are not subject to revision in this document.
BMP	Appendix C, frozen soils	In09	15	"**Frozen Construction.** Item 6, page C9, references frozen soils and prohibits their use during well pad construction. In prior RFO decision documents this language has resulted in a general prohibition of any construction with frozen material [and thus] included in pipeline right of way grants. This prohibition was not developed with proper consideration of its impact on pipeline construction [which] results in better reclamation when done in frozen conditions. Williams recommends, therefore, the prohibition on construction in frozen material is much too general and should be amended to specifically address situations where frozen conditions are acceptable and/or preferred based on the type of construction."	Please see response to In07-20 above.
BMP	Appendix C, Mitigation	In04	62	Appendix C, Page C-11, Construction, Item 21, states... the project proponent will install housing and/or muffler(s) around equipment that exceeds 55 dBA. This requirement is too broad and does not take into account that virtually all construction equipment will exceed 55 dBA and that construction equipment is short term in duration and only occurs during daylight hours. While mufflers can be installed to lessen noise from construction equipment, placing housing around it is not feasible or safe.	Outside the scope of this document; COAs will not be modified at the EIS level.
BMP	Appendix C, Mitigation	In04	63	Appendix C, page C-13, Pits, Item 6 contains the phrase “Approved netting (mesh diameter no larger than one inch) is required over any pit that contains or is identified as containing hydrocarbons or hazardous substances. Netting over evaporation ponds or other pits that could contain hydrocarbon substances or hazardous substances have not been found to be effective because 1) they are difficult to install and remain effective and heavy snow load can cause the netting to sag and compromise the integrity of the mesh material. It would be much better to allow alternative means to netting such as strobe lights, bird alarms, flagging, or other mechanisms to discourage use by wildlife and livestock.	Please see response to In04-62 above.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
BMP	Appendix C, recommend-dation	In09	13	"**Construction Holes. Appendix C**, page C-27, item L, requires covering all construction holes left open overnight. This requirement should be removed and alternative management practices should be made available. While a cover... is intended to prevent access by wildlife, this is not a foolproof method. The cover can make the hole or trench an inescapable trap... Alternatives, such as allowing soft plugs with sloped sides, would allow an escape route for any wildlife that may enter the hole or trench."	COAs are provided in individual APDs and right-of-way grants and are not subject to revision in this document.
BMP	BMP assessment	S04	16	The ROD should require monitoring of the success or failure of BMPs to control erosion. BMPs needing replacement or maintenance would be addressed. We recommend using the performance triggers outlined in the Atlantic Rim Aquatic Workgroup document.	The installation, monitoring, and replacement of BMPs for the control of stormwater by the Operators is required by the Wyoming Department of Environmental Quality and is not the responsibility of the BLM. BMPs that are required by the BLM on locations on a site-specific basis are inspected by BLM surface compliance technicians and Operators are required to install, monitor, and maintain these BMPs based on H212 site-specific inspections.
BMP	Mitigation	P10	1	• Require direction drilling throughout the project area and designate a maximum acreage for drilling pads. • Cluster drilling areas to lessen overall surface impact. • Require the best technology throughout. • Require cleanest technology for non-mobile engines, i.e. drill rigs and frack/completion operations • Examine fracking/completions operations and pinpoint best areas to reduce VOC and NOx emissions, i.e. fleet idling. • Designate minimum gas well standards. • Require all existing facilities to be brought to best standards before permitting new wells. • Do not allow venting and flaring.	Thank you for your comment. BMPs and COAs are considered on a case-by-case basis.
BMP	Mitigation	P10	5	• Establish an aggressive timeline for replanting of native plants, and pad renovation • Plant in a natural pattern	Thank you for your comment.
BMP	Mitigation	In09	10	"Rip Rap. Appendix A, page A-3, states rip rap and double ditching (taking 1' off the top in the stream bed) should be used for bank stabilization on ephemeral streams. Williams recommends neither rip rap nor double ditching is necessary for bank stabilization in this environment.	The cited reference is to a comment made during scoping for this project. Use of rip rap would only be indicated on a site-specific basis.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
BMP	Surface pipelines	C02	19	The Proposed Action should consider surface pipelines where the nature of the gas transported allows. See id. at 2-4. Buried pipelines increase surface disturbance, leave long term scars on the landscape, and may remain there for a number of years before causing more surface disturbance upon removal.	The Proposed Action is the description of the project provided to the BLM by the Operators (**Appendix B**). This is not a BLM proposal; therefore, whether to propose surface or buried pipelines in the Proposed Action is at the discretion of the Operators.
BMP	Surface pipelines	C02	20	"It is also possible that buried pipelines could be prohibited or have seasonal restrictions on their construction when within occupied sage-grouse leks, brood-rearing habitat, and/or winter concentration core areas. See, e.g., BLM IM WY-2012-019, at 4-6 (Feb. 10, 2012). The Wyoming Sage Grouse Resource Management Plan (RMP) Amendments are currently in process, and this project must be aware of and consider any changes to the Rawlins RMP in regards to sage grouse management."	Please see **Section 2.2.7.9** of the Final EIS for a description of Greater Sage-Grouse management in the CD-C project area. Management of Greater Sage-Grouse under all alternatives will be consistent with the BLM Approved Resource Management Plan Amendments for Greater Sage-Grouse, and the Wyoming Greater Sage-Grouse Conservation Strategy.
CH 1	Oil and other hydro-carbons	In05, In08	6	BLM must ensure itself sufficient flexibility to authorize the development of natural gas, as well as, oil resources within the project area. Throughout the Draft EIS, the BLM does not specifically discuss the potential development of other hydrocarbons including oil and condensates. In particular BLM appears to focus too much emphasis on natural gas from the Almond member of the Mesaverde formation. Many formations within the project area contain potential for hydrocarbon development.	The development of this EIS was based on the Proposed Action and the Project Description (**Appendix B)** that was submitted by the Operators. No mention of oil development or the use of horizontal drilling was made in the project description. The Proposed Action and alternatives were developed based on the presumption that the Operators were intending to develop natural gas, not oil. Therefore, horizontal drilling and the development of oil is not analyzed in this EIS. If Operators intend to develop oil, then applications for such would be analyzed under a separate NEPA document to address the different impacts associated with the development of oil.
CH 1	Valid existing rights	In10	7	It is clear that the BLM is infringing upon Yates existing lease rights via a number of stipulations and resource management decisions. Yates' leases issued within the CD-C project area grant Yates the right to remove and dispose of all the oil and gas in the lands described subject to laws, regulations, orders, terms, conditions, and stipulations consistent with lease rights granted or specific provisions of the lease. Stipulations to protect the Muddy Creek and Bitter Creek corridors (setbacks >500 ft. from water), wetland communities (setbacks >500 ft. from water), livestock grazing, and pronghorn/mule deer crucial winter range restrict or effectively prohibit oil and gas operations on leased lands within the CD-C project area by preventing use of lands necessary to produce all of the oil and gas in the subject lands.	No valid existing rights would be infringed upon through the selection of any of the alternatives.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
CH 1	Valid existing rights	In10	8	As the lease is issued "granting the exclusive right to drill for, mine, extract, remove and dispose" these minerals, preventing offset drainage and protection of correlative rights is a fundamental right established in the lease. Infringement upon this valid existing lease right raises concerns with offset drainage and protection of correlative rights if offsetting acreage is in a better position to drain the subject lease due to lease restrictions. This is a strong possibility if the stipulations described above are implemented. The BLM must not adopt lease restrictions that infringe upon this right. Yates urges the BLM to clearly state in the Final EIS that restrictions proposed in the Preferred Alternative will not apply to lands already under oil and gas lease and will not infringe upon valid existing lease rights. Moreover, it must be made clear that the BLM has no authority to impose restrictions through Conditions of Approval (COA) on applications for permit to drill (APD) if they would abrogate the valid existing lease rights. Once a lease has been issued, stipulations may not be legally modified absent voluntary agreement by the lessee. Therefore, in accordance with 43 CFR 3101 and federal case law, we recommend that BLM clearly disclose its limited authority to add conditions of approval to a drilling permit (i.e. conditions must remain consistent with the terms of the issued lease). These principles are particularly important given the fact that protections identified in the CD-C Draft EIS could very much impose significant limitations on existing leases that were not anticipated at the time the leases were acquired from the federal government in good faith. Such qualifiers are consistent with current rules and policies of the BLM and must be clearly disclosed in the planning documents. An acceptable example of appropriate language is included in the Rawlins RMP adopted in 2008, page 20	No valid existing rights would be infringed upon through the selection of any of the alternatives.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
CH1	All hydro-carbons	C04	8	We ask that the BLM ensure the CD-C EIS retains the ability for the operators to develop not only natural gas, but also oil. The Draft EIS gives short change to the potential to develop oil in the project area. Development of hydrocarbons other than natural gas is a high potential in many of the formations within the project area.	The original project proposal submitted by the Operators is included as **Appendix B, Operators' Project Description**. This proposal only refers to the development of natural gas. This EIS has therefore been developed in response to the action proposed by the Operators, which only included natural gas. If the BLM were to include the development of oil at this point, it would require the preparation of a supplemental EIS.
CH1	Editorial	C01	28	Table 1-3: Comments Carbon County: Delete: Issues construction and conditional use permits for all new structures, Replace with: Requires construction/building permits and conditional use permits to insure all structures and uses comply with the health, safety and welfare standards of the Carbon County Zoning Resolution and goals and policies of the Comprehensive Land Use Plan.	The text in the Final EIS has been revised as requested.
CH1	Editorial	C01	29	Table 1-3: Delete: Administers zoning changes where applicable. Replace with; Reviews zone change applications to ensure that the proposed land use is consistent with the Carbon County Comprehensive Land Use Plan and zone change criteria listed in the Zoning Resolution.	The text in the Final EIS has been revised as requested.
CH1	Editorial	C01	30	Table 1-3: Add: Carbon County Weed & Pest District and move "provides control of noxious weed." (Same as Sweetwater County entity.)	The text in the Final EIS has been revised as requested.
CH1	Editorial	C01	31	Table 1-3: Add: under Carbon County: Local Emergency Planning Committee: (same as Sweetwater County entity)	The text in the Final EIS has been revised as requested.
CH1	Editorial	C02	1	"The Energy Policy Act of 2005... should be included in the list of applicable laws."	Thank you for your comment.
CH1	Land Use plans	C02	2	"The Draft EIS...omits the land use plans of the SWCCD and LSRCD. These plans have been discussed in past oil and gas development projects and should be included in this Draft EIS."	These plans are now described in **Section 4.15.3.3**.
CH1	Previous development	In05, In08	9	BLM has studied the impacts of numerous O&G developments in the current CD-C area and in surrounding areas and must acknowledge this development when analyzing potential impacts and selecting a Preferred Alternative in the Final EIS.	Thank you for your comment. The BLM has taken into account all the existing development and associated impacts.
CH1	Purpose & Need	P19,P 27, P28	1	"Domestic need for natural gas has diminished. Nationally, a surplus exists. Projected needs when the proponents applied in 2005 no longer pertain."	Domestic demand for natural gas continues unabated; increased reserves have resulted in lower prices.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
CH1	Reasonably foreseeable development	In05, In08	13	BLM should explain that the RFD Scenario is only a tool utilized to estimate the potential impacts of O&G development.	As stated in **Section 1.8**, the RFD in the RMP was used "for analysis purposes only. The estimates should not be construed as a cap or limit on the number of wells that could be drilled, or on the amount of surface disturbance resulting from the development of oil and gas resources within the resource area."
CH1	Regulatory Setting	In05, In08	11	Page1-7. BLM identifies regulations and manuals utilized to implement NEPA. Missing from the list is the BLM's own NEPA regulations at 43 CFR, part 46. 73 FR61314 (Oct 15, 2008). BLM should add these regulations to its list and ensure it has complied with them.	**Section 1.6** has been modified to include reference to Department of Interior NEPA regulations.
CH1	RMP confor-mance	In05, In08	12	Alternative B may not conform to the existing Rawlins RMP. It is inappropriate for the BLM to analyze, develop or even consider an alternative that does not conform to the existing land use plan. Because the BLM has not scoped the EIS as a potential amendment to the RMP, we strenuously urges the BLM to eliminate any alternatives, or portions of alternatives that do not comply with the RMP.	The revised text describing Alternative B in the Final EIS notes that "Because several of these enhanced resource protections for the Muddy Creek watershed go beyond the scope of the current RMP, the selection of this alternative would require an RMP amendment to ensure those enhanced protection measures are in conformance with the RFO RMP."
CH1	RMP scope	O12/ O13	4	The 2008 RMP estimated that an additional 8822 wells and 57,819 acres of additional disturbance would occur. The Draft EIS has 8,950 wells and 47,200 acres of disturbance in one project area. This does not appear to be in line with the scope of the RMP. The RMP does not set a limit on the amount of drilling, but the parties that agreed to the plan did so in good faith that the BLM would be able to consider multiple resources and not over commit to industrial development within the FO area.	The number of wells analyzed in the RMP is only the reasonably foreseeable development scenario, and does not function as a cap on potential development in the field office.
CH1	Table 1-3	C03	11	Sweetwater County Permits: Sweetwater County Oil & Gas Construction/Use Permits are required for all oil and gas wells proposed within the leased area. Other County permits such as Construction, Use, Conditional Use, and Zone Changes, may be required for other facilities such as compressors, processing/separation facilities and production water disposal facilities. For more information on zoning permits, please contact Mr. Eric Bingham, Land Use Director, at (307) 872-3916.	**Table 1-3** has been modified to indicate that oil and gas wells are included among structures requiring a Construction/Use Permit in Sweetwater County.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
CH1	Table 1-3	C03	12	Sweetwater County Roads: Any crossing, access to, or utilization of a Sweetwater County road right-of-way requires an access permit or license from Sweetwater County's Engineering Department. Project developers are encouraged to contact the Sweetwater County Engineer to obtain necessary roadway permits prior to lease development.	**Table 1-3** has been modified to show that Sweetwater County issues County Road permits and licenses including road access and road crossings.
CH1	Table 1-3	C03	13	To ensure that public roads, cattle guards and bridges are maintained in a safe condition and are not damaged by heavy construction traffic, the Sweetwater County Engineering Department requests that, before contractors move heavy equipment over County roads, they contact Mr. John Radosevich, Public Works Director, at (307) 872-3921.	Thank you for your comment.
CH1	Table 1-3	C03	14	Where oil and gas developments cause significant increases in traffic or impacts on County roads, developers are encouraged to work with the Sweetwater County Engineering Department to evaluate and to implement any identified roadway construction, maintenance or safety improvements that may be required. In some cases, at the discretion of Sweetwater County, the County may require a Road Use and Maintenance agreement to address County road use and responsibilities for road maintenance. Dust control is of special concern.	Thank you for your comment.
CR	Appendix J, Class III Surveys	In05, In08	117	This comment is almost identical to comment #95.	No valid existing rights would be infringed upon by the selection of any of the alternatives. This has been clarified in the Final EIS.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
CR	Class III inventory	In05, In08	98	BLM states that a Class III cultural resource inventory would be required for any area of disturbance associated with an APD or other proposed activity. CD-C Draft EIS, pg. 4-139. The BLM should revise its requirements that a Class III cultural survey always be required on both private and federal lands. The BLM's practice of refusing to approve projects if private surface owners object to surveys on their private surface is not consistent with existing laws and regulations. (several paragraphs of supporting citations, ending with, "Given the fact the Solicitor's office has expressly rejected the position that private surveys are always required, the BLM must modify the text in the CD-C Draft EIS."	If a project requires the use of federally owned surface lands and privately owned surface lands, two authorities require federal agencies to apply the same NHPA Section 106 compliance standards to private lands as they do federal lands. The regulations at 36 CFR Part 800.4(b) require the federal agency to "take the steps necessary to identify historic properties within the area of potential affect." It is implicit throughout the statute and the regulations that federal and nonfederal lands are included because the regulatory definition of "area of potential effect" is the "geographic area or areas within which an undertaking may directly or indirectly cause changes in the character or use of historic properties." (36 CFR, Part 800.16[d]). The regulations do not distinguish between federal and nonfederal lands. Executive Order 11593, entitled, "Protection and Enhancement of the Cultural Environment" is more explicit. It states that all federal agencies: "…in consultation with the Advisory Council on Historic Preservation, institute procedures to assure that federal plans and programs contribute to the preservation and enhancement of non-federally owned sites, structures, objects of historical, architectural, or archaeological significance." BLM's responsibility for inventory, evaluation and protection of cultural properties on lands outside BLM's administrative jurisdiction is limited according to the degree to which the Field Manager's decisions determine or control the location of surface disturbing activities on those lands. Before BLM can authorize any project that may adversely affect significant cultural resources, the BLM has the legal responsibility to take into account the effects of its actions on these resources. For BLM to fully consider effects of its actions, it also has the responsibility to gather the information necessary to determine what cultural resources may be affected, evaluate the resources for eligibility for inclusion in the National Register of Historic Places, and mitigate adverse effects to historic properties where possible. If cultural resource data are lacking from private lands so that the BLM Authorized Officer cannot make an informed decision, BLM cannot allow the undertaking to proceed.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
CR	Impact analysis	In05, In08	70	The BLM notes that there have been a significant number of cultural resources discovered within the Project Area. CD-C Draft EIS, pg. 3-141. The BLM should more clearly acknowledge that these discoveries resulted primarily from oil and gas exploration as survey for roads, pipelines, power lines, seismic projects, and block surveys for well locations were conducted. It is only as a result of oil and gas development that these discoveries have been made, mitigated, and the overall understanding of cultural resources in the area increased. Given existing protection of historic resources under the National Historic Preservation Act and the Archeological Resources Protection Act, oil and gas development more often leads to the discovery and protection of cultural resources rather than their inadvertent destruction. The BLM should make the public aware of this information.	The text of **Section 3.14.2, Summary of Extant Cultural Resources** has been revised to state "Many of these projects have been linear Class III cultural resource inventories for roads, pipelines, well pads, power lines, and seismic projects." **Section 4.14.3.1, Direct and Indirect Impacts,** states that, "Data derived through mitigation could provide beneficial information on prehistoric and historic use in the CD-C project area, as well as contribute to the regional database for cultural resources."
CR	Impact analysis	O02	1	"While you do note the different acreage totals to be impacted by the various alternatives, you seem to have done no extensive analysis of how each alternative presented would actually affect the cultural and historical resources in the project area [and assume that adverse effects will be sufficiently addressed through Section 106]."	Using BMPs, sites are generally avoided, impacts to sites are minimized, and then mitigated. All adverse effects will be addressed through Section 106; this is not an assumption.
CR	Impact analysis	O02	4	"...we find no evidence that NRHP-eligible landscapes [settings for the historic Overland and Cherokee Trails, Lincoln Highway, freight roads, and rail beds] were considered....the initial focus seems to have been on 'historic sites' only. The presence of historic or cultural landscapes, and also how they may be impacted by the often more extensive ancillary facilities... [pipelines, power lines, etc.], can often necessitate a much larger APE... [with] natural boundaries that create a logically defined space.]"	As stated in **Section 4.14.1**, paragraph 3, the BLM has established a 2-mile analysis area around the trails for consideration of the elements of setting. **Section 4.14.6** references mitigation measures in Appendix C that would affect Historic Properties for which setting is an aspect of integrity (visual, auditory, atmospheric) and lists additional mitigation measures that would be implemented to minimize effects to those elements of a setting. Surveys and analysis would be conducted on a case-by-case basis when APDs are submitted to the BLM.
CR	Impact analysis	O02	5	"As ground-disturbing, large-scale energy development consumes more and more of Wyoming's historic open spaces, the necessity to fully evaluate a project area for the existence of potential landscapes becomes ever more important...we encourage you to take a larger view of these historic routes, recognizing that whenever any segment of them is degraded, the entire resource has suffered a blow."	The analysis in Chapter 3 of the Draft EIS indicates that extensive alteration has occurred in the project area due to a variety of natural and human causes. Potential increases in those changes that might be produced by additional oil and gas development would be minimized and mitigated by BLM's requirements. Contributing segments on public lands would be protected.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
CR	Impact analysis	O02	6	"...some impacts to... our traditional cultural resources would be more effectively... addressed directly through NEPA [Section 106 deals only with NRHP-eligible properties]... Alternative B pays extensive... attention to “resource protection,” [but] these protections never seem to have been considered as they might or should apply to the equally important historic and cultural resources [e.g. wide-open vistas, unobstructed views and the ability to transport visitors back in time]."	The BLM has protections for historic trails and their settings that would apply under all alternatives, including Alternative B. Please refer to the RMP and **Appendix C** of the EIS for this information.
CR	Mitigation	O02	10	"… it is especially important that the field operators understand their obligations under both NHPA and the Archaeological Resources Protection Act (ARPA). We hope you will consider adding such requirements to your NEPA analysis and any listing of best management practices."	Thank you for your comment. The field operators are informed of their obligations under these and other federal laws. These requirements are already included as standard COAs in **Appendix C**, Operations, Items 3, 6, 7, and 8.
CR	Monitoring	O02	11	"… we want to emphasize the importance of developing a comprehensive monitoring and cultural resource discovery plan for this project."	Thank you for your comment. All locations are thoroughly inventoried and investigated prior to any development being authorized. The standard protections under Section 106 of the NHPA provide for monitoring and discovery and are outlined in **Appendix C**, Operations, Items 3, 6, 7, and 8.
CR	Protections	C03	16	Protection of important Natural Features (cultural, historical, recreational, and environmental) Sweetwater County encourages the BLM, BP and other project proponents to apply standard inventory and mitigation protocols to provide reasonable protection to any important natural, cultural and historic features that may be identified within the project area.	Inventory and mitigation protocols would be standard attachments to all APDs within the CD-C project area.
CR	Significance criteria	In05, In08	97	When describing potential significance criteria, the BLM utilizes inconsistent language. It identifies a series of four potential significance criteria, identified as Criteria 1 through 4, but the text later refers to Criterion A, B, C, and D. The BLM should revise this language to ensure that members of the public clearly understand the BLM's significance criteria. CD-C Draft EIS, pgs. 4-138 -139.	The references to significance criteria have been corrected to match the designation of Criteria A through D as defined in 36 CFR 60.4.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
CR	Trails	In05, In08	96	BLM states that it utilizes a two-mile analysis area around historic trails for consideration of elements and setting. CD-C, Draft EIS, pg. 4-137. Given the fact that the majority of the CD-C Project Area is within the checkerboard, we encourage the BLM to reconsider its two-mile analyses area. Given the presence of private lands within the checkerboard, the BLM can never hope to control, modify, or mitigate impacts on private lands within this analysis area.	A 2-mile analysis area around historic trails is not an attempt on the part of the BLM to control, modify, or mitigate impacts on private lands within the project area. When projects are proposed that may impact a historic trail, the BLM archaeologist would use a 2-mile buffer to determine what the impacts would be, based on land use and other disturbance within the 2-mile buffer.
CR	Trails designations	C02	50	The BLM has designated a quarter-mile buffer surrounding the contributing segments of the Overland and Cherokee Trails as highly sensitive without first determining whether the trails are eligible for protection under the National Park Service (NPS) guidelines. See id. at 4-137. A trail must have visible physical features to qualify for protection under the National Register of Historic Places (NRHP). NPS, National Register Bulletin, #15, Sec. VIII (last amended 2002). Before determining that an area is highly sensitive and requires particular mitigation measures, it must first be determined whether the historic trails are even visible in the areas where project will be located. Cherokee Trail is no longer visible in a number of areas and any remnants of the trail have been erased; therefore, it would not qualify for protection under the NRHP. Further, many of these trails may be expansionary roads that either do not meet the required integrity requirements or have no remnants of their historic origin.	During the scoping period for the CD-C EIS, data gaps were identified in regard to the location of historic trails within the checkerboard area. Locational information for historic trails is essential for accurate management of those trails. One aspect of integrity that conveys the significance of historic trails is the associated setting, defined in 36CFR 60.4 as “The physical environment of a historic property.” The 2-mile analysis area was used to assist the BLM in filling in those data gaps, conducting an accurate assessment of the historic trails’ condition for the NEPA analysis, and making an informed decision prior to permitting undertakings that may have an effect on the historic trails including their associated settings.
CR	Tribes	O02	9	"....we encourage you to make extensive and effective outreach to any potentially affected tribes as early as possible and to offer them the opportunity to conduct extensive on-the-ground surveys to identify landscape-wide cultural sites of importance... prehistoric and cultural features identified by SHPOs [often] do not come close to being as inclusive or extensive as the sites and landscapes identified by THPOs and tribal elders."	Thank you for your comment. The BLM makes every effort to consult and coordinate with potentially affected tribes for their input and knowledge.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
CR/VRM	Historic trails	O04	61	To date, the BLM, state agencies, and private checkerboard land and mineral owners have failed utterly to manage oil and gas development to prevent major impacts to the historic settings of the Overland and Cherokee Trails. Most egregious is the permitting of roads, pipelines, and well pads in the immediate viewshed beside these trails, with the net effect that visitors seeking to enjoy these trails in their historic and natural setting are instead presented with trail segments through heavily industrialized oil and gas fields in places. BLM has designated a ¼-mile NSO buffer for the Overland Trail (Draft EIS at ES-22), which is woefully inadequate. Moving forward, BLM should prevent these types of impacts by applying a 3-mile buffer (at minimum) where surface occupancy and disturbance is not permitted as a Condition of Approval, and developments between 3 and 5 miles from trails are permitted on a Controlled Surface Use basis and only to the extent that they do not present visual intrusions that can be seen from these historic trails. BLM only considered a 2-mile analysis area around historic trails for the impact analysis on setting. Draft EIS at ES-22. This is an inadequate area given that drilling rigs can be seen from a much greater distance on flat country.	The protections afforded were developed as part of the RMP process and are found in Appendix 5 to the Rawlins RMP beginning on page A5-8, Standard Measures to Reduce Visual Contrast. However, portions of these trails do cross an extensive area of the checkerboard and the BLM cannot regulate activity on private and state land within the checkerboard.
General	Adaptive manage-ment	C02	22	The Draft EIS does provide performance goals, soil data, and monitoring, however, it fails to recognize that it must adopt and follow the DOI Adaptive Management Guidelines. The Draft EIS also fails to consistently provide collaboration and coordination with stakeholders, such as state and local governments, landowners, and permittees, throughout all resource management decisions...Under Alternative B, it is the WGFD and a technical team...making most of the management decisions without any coordination with stakeholders or local governments. See e.g. CD-C Draft EIS at 2-9, 2-11, 2-13.	Please see updated text for clarification on the role of the CD-C consultation and coordination group.
GEO	Impact analysis	C02	76	Draft EIS p. 2-25 Table 2.4-2 Paleontology - Intermediate Impact CLG Comment: ARPA and NHPA prohibit adverse impacts unless disturbance is found to not affect a significant resource. All alternatives should be low impact. It does not qualify as an adequate discussion of impact. The Table shows that alternatives are essentially the same or that there is an insufficient range of alternatives.	**Tables 2.4-2 and ES-2** have been modified to indicate that although impacts would vary according to the amount of disturbance, they would be low under the Proposed Action and all alternatives.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
GEO	Impact analysis	In05, In08	76	The BLM very appropriately recognizes that oil and gas development within the CD-C Project Area may actually lead to beneficial discoveries of previously unknown paleontological resources. CD-C Draft EIS, pg. 4-12. Devon and other oil and gas operators conducting operations in the Project Area routinely have paleontological reports and surveys prepared prior to operations. These often lead to beneficial discoveries that can then be mitigated and better studied.	Thank you for your comment.
GEO	Site clearance	O04	59	The Green River, Lance, and Wasatch formations are rated Probable Fossil Yield Class 5, having “very high” potential for yielding scientifically important fossils. Draft EIS at 3-16. The Lance formation is known for its potential for dinosaur fossils. Draft EIS at 3-16. The Wasatch formation is known for Eocene mammal fossils (*id.*), while the Green River formation is known for fossil fishes and birds. Draft EIS at 3-18. In addition, the Fort Union formation is PFY Class 3 (moderate), but the importance of fossil finds is quite high as this formation contains fossils from the dawn of the age of mammals (J. Lillegraven, *pers. comm.*). BLM should require site clearance by a trained paleontologist of areas proposed for surface-disturbing activities in all areas of PFY Class 5 and also in the Paleocene Fort Union formation area.	As stated in **Section 4.2.2.2**, "IM 2009-011 calls for the BLM to assess the possible effects on paleontological resources of all proposed surface-disturbing activities on public lands or split-estate lands. If the assessment indicates '(a) the presence or high probability of occurrence of vertebrate fossils or uncommon nonvertebrate fossils (PFYC Class 4 or 5), or that the probability is unknown (Class 3)...and (b) a reasonable probability that those resources will be adversely affected by the Proposed Action,' then measures such as a field survey, onsite monitoring, special stipulations, avoidance, or other mitigation may be required… The preferred mitigation technique is to change the project location based on the results of the field survey."
GN	Cumulative RFD	C01	27	Map 5.0-1: Add the Zephyr transmission line and possibly the Whirlwind Project to the "past, present and reasonably foreseeable future actions."	The Zephyr Power Transmission Project and Whirlwind are not currently identified as reasonably foreseeable future actions by the BLM.
GN	Developmen t	O04	2	The development of this project will be acceptable from a conservation standpoint as long as it minimizes the additional footprint of oil and gas development through the implementation of directional drilling and well clustering as well as other methods, and maintains presently undeveloped lands of critical importance for wildlife habitat (such as Chain Lakes and sage grouse core areas) to the maximum extent possible.	Thank you for your comment.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
GN	Editorial	C02	39	The Draft EIS has conflicting average precipitation numbers for the project area. On page 32, it states that the "project area is dominated by semiarid desert that receives an average of 7.1 inches of annual precipitation, ranging from 3.8 inches to 13.6 inches." Then on pages 3-18 through 3-19, it states that the "project area is dominated by the 10 to 14 inch precipitation zone..." The second quoted language...is outdated. The Draft EIS should use the USDA/NRCS precipitation zone map... or the RAWS time series precipitation graphs from the Western Regional Climate Center Cow Creek Wyoming station.... The average of 7.1 inches or lower of annual precipitation for the project area is more consistent with the USDA NRCS's map and the graphs created by the Western Regional Climate Center. See http://www.wcc.nrcs.usda.gov/ climate/prism.html, and http://www.raws.dri.edu/cgi-bin/rawMAIN.pl?wyWCOW. It is also consistent with BLM's range gages yearly precipitation averages in Appendix F. See CD-C Draft EIS at F-1 (Average for all gages within and adjacent to the project area is 7.54 inches.).	Specific references to precipitation have been standardized to data available from the Western Regional Climate Center (WRCC), but the wide variation in precipitation throughout the 1.1-million-acre project area is often noted.
GN	Editorial	S02	1	Page 2-17, last bullet, describes control of fugitive dust. The WDA requests that the text be changed to read: "Uniform application of dust-abatement procedures during construction and drilling operations year-round and seasonally, as needed, on well site, pipelines, and collector and well access roads."	The description of the Preferred Alternative states, "A fugitive dust control plan (**Appendix P**) would be adhered to by the Operators in conjunction with the BLM and updated on an annual basis, and dust control measures would be applied during all phases of the well's life cycle in specific areas and during specific times as indicated in the dust control plan and the COAs for the APD.
GN	Editorial	S02	2	Page 3-83, second paragraph: Change *western Wyoming* to *south-central Wyoming*.	The text referenced in this comment uses *western* Wyoming intentionally to distinguish that broader area from the south-central area of Wyoming in which the CD-C project is located.
GN	Editorial	S02	5	Page 3-125, third paragraph: The WDA asks that the word *unfortunate* be removed.	The text has been changed as requested.
GN	Enforcement of ROD	C03	22	Enforcement: Sweetwater County strongly encourages the BLM to commit the necessary monetary and staff resources to provide the necessary enforcement to ensure development is implemented in a manner that complies with the final ROD.	Thank you for your comment.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
GN	Lease rights	In05, In08	74	CD-C is an infill project. Decision has already been made to develop and it has been authorized. BLM's options are limited and they cannot prohibit all O&G development on those existing leases. Once BLM issues a lease without NSO stipulations and in the absence of a nondiscretionary statuary prohibition, they cannot completely deny development. Nothing in the Draft EIS or ROD can modify existing lease rights through COAs or other means. (citations)	No valid existing rights would be affected through the selection of any of the alternatives. Site-specific development in the CD-C project area has not yet been authorized, however, and the BLM has the responsibility to enforce restrictions on any development proposals that would cause unnecessary and/or undue degradation.
GN	Multiple use	C01	4	Maintaining multiple use of public lands is important to preserve the customs and culture that forms the basis of the local economy. The economy of Carbon County is directly tied to the use of public lands, therefore, the continued availability of these lands to sustain economic growth, including but not necessarily limited to, agriculture, industry, and recreation is vital to a strong and diversified economic future of the County and its residents.	Thank you for your comment.
GN	NEPA	In05	3	NEPA does not impose any requirement on agencies to reach a particular decision and does not require agencies *to elevate environmental concerns over other valid concerns*. BLM must recall that it is not required to eliminate all potential significant impacts to the environment; it is merely required to analyze and disclose such impacts to the public.	Thank you for your comment.
GN	Preferred Alternative	C04	1	The absence of a Preferred Alternative hampers the public's ability to comment effectively on the CD-C Draft EIS. We are not asking the BLM to release a supplemental Draft EIS with a Preferred Alternative.	CEQ regulations at 40 CFR 1502.14(e) direct that a Preferred Alternative be identified in the draft statement if one exists. As stated in the Draft EIS in **Section 2.1**, ”The BLM does not have a Preferred Alternative for the CD-C Natural Gas Development Project at this time. The BLM believes that the Proposed Action and the action alternatives all have elements that would address the project purpose and need and will review public comment on the Draft EIS before determining a Preferred Alternative. A Preferred Alternative will be designated in the Final EIS.”

Category	Sub-Category	Comment		Comment	Response
		Code	No		
GN	Schedule	C01	2	The Carbon County Board of County Commissioners strongly favors expedited approval by the BLM of the Record of Decision (ROD). This project will provide significant tax and employment benefits for the County, the State, and the Nation. this project has been under analysis by the BLM for the past seven years and the Board would encourage development of this project as quickly as feasible, taking into consideration the goals and policies of the Carbon County Comprehensive Land Use Plan (CCCLUP).	Thank you for your comment.
GN	Schedule	In05, In08	119	We appreciate the BLM's tireless efforts on this project. Given the fact the BLM has been analyzing continued development in the CD-C Project area for over seven years Devon encourages the BLM to finalize the Final EIS and ROD for this project as soon as possible.	Thank you for your comment.
GN	Spacing	In05, In08	75	In the CD-C Draft EIS the BLM suggests that spacing units reflect the judgment of operators with only the concurrence of the Wyoming Oil and Gas Conservation Commission ("WOGCC"). CD-C Draft EIS, pg. 4-8, para. 2. The BLM should correct this incorrect statement in the Final EIS. Spacing unit determinations are made by the WOGCC based on expert testimony of landmen, geologists, and engineers. It is a highly scientific process and one in which the BLM itself is authorized to participate. To suggest that spacing determinations are made at the whim of operators is not accurate or consistent with the responsibilities of the WOGCC.	This statement has been revised to read as follows: "Generally, spacing units reflect the judgment of the Operators, based on the opinions of landmen, geologists, and engineers, with the concurrence of WOGCC, and on federal minerals, with input from the BLM, as to the number of wells that would be required to efficiently develop and recover the natural gas resource in an area.″

Category	Sub-Category	Comment		Comment	Response
		Code	No		
GN	Surface disturbance	O04	4	It is disingenuous to report the acreage of surface disturbance for each alternative as the long-term surface disturbance or the surface disturbance from the infill project only, when the combined initial surface disturbance is a much more meaningful metric. *See* Draft EIS at Table ES-1. In these landscapes, with short growing seasons and small amounts of annual precipitation, lands initially disturbed and subject to interim reclamation can take a century to recover back to their original habitat cover. The fact that at least 1.2% of the Project area is currently infested with halogeton (Draft EIS at ES-17), which invades following surface disturbance, underscores this problem (halogeton is rated by BLM as "an ecological and economic threat," Draft EIS at 3-83). And the ecological footprint of the proposed new drilling must be combined with the impacts already on the ground to appropriately measure the scale of impact for the project. With these factors in mind, the disturbance acreages of the respective action alternatives range from 9-11.4% combined surface disturbance, a very heavy level of impact.	Please refer to **Tables 2.4-1 and 4.0-1**, which provides a summary of existing and proposed new disturbance by alternative.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
GN	Sweetwater County Comprehen-sive Plan	C03	1	The Sweetwater County Board of County Commissioners (Board)... strongly encourages the BLM to expedite the approval of Continental Divide-Creston Natural Gas Development Project while ensuring that the following Sweetwater County Comprehensive Plan -2002 goals and objectives are addressed in the BLM's EIS review process: • Encourage and support environmentally responsible resource exploration/development within the region. • Evaluate natural resource development proposals for their effects on air, water and environmental quality. • Encourage a balance between resource development and environmental protection. • Identify and protect the County's natural environment and resources. • Identify and protect the County' s unique cultural, recreational, environmental and historical resources. • Encourage/support public land uses consistent with orderly development and efficient use of renewable and non-renewable resources. • Locate worker housing within existing communities where services are/can be provided, where feasible. • Support and participate in federal and state land use planning activities	Thank you for your comment.
GN	Valid existing rights	In05, In08	5	The ROD cannot defeat valid and existing rights through COAs or other means. BLM must recall that it cannot impose new, unreasonable mitigation requirements on existing leases. Courts have recognized that once the BLM has issued an oil and gas lease, the BLM cannot later impose unreasonable mitigation measures that take away those rights.	No valid existing rights would be infringed upon by the selection of any of the alternatives. This has been clarified in the Final EIS.
GN, VEG	Timeframes	In04	44	Page 4-71, 4.6.1 Introduction: Please explain exactly the time frames associated with short and long term AND utilize these terms consistently throughout document.	Short-term and long-term have differing meanings for different resources and/or in different contexts. However, to clarify the meanings of short-term and long-term in this instance, definitions have been added.
H&S	Opinion	P17	2	I find many of the 'wildlife stips' ridiculous and it leads to everyone packing people into a compressed timeframe and not a level based work schedule. I believe it leads to greater safety concerns as well due to hurry-up issues.	Thank you for your comment.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
HAZ	Produced water	C01	9	Pages ES - 25 & ES-26: Waste and Hazardous Materials: Carbon County is concerned with the increased quantity and need for treatment and disposal of produced water. Currently authorized and approved projects are already exerting stress on the permitted and authorized disposal facilities near the project area. Alternative D may serve to extend the life of existing facilities and minimize the need for new facilities.	Please see the revised text in **Section 4.21.2.1**, which describes current and projected produced-water disposal facilities.
INV	Baseline data	S02	3	Page 3-83, fifth paragraph: WDA urges BLM to provide scientific evidence regarding livestock use and feed grounds as sites for halogeton infestation.	Thank you for your comment.
INV	Editorial	In01	19	When discussing non-native, invasive plant species on ES-18, leafy spurge is not discussed as being one of the principal invasive weed species known in the area. Yet, the Draft EIS later identifies and references to leafy spurge as a principal invasive weed species in the area. The BLM should revise the EIS to either include leafy spurge or exclude leafy spurge for accuracy and consistency.	Leafy spurge has been removed from the text.
INV	Impact analysis	O03	4	While the presence of non-native, invasive species was recognized, acreage was not tallied for the Proposed Action or alternatives. Neither was a procedure outlined to mitigate the impacts. Attention must be paid to the quality of remaining habitat, which non-native, invasive species can drastically impact.	An inventory of invasive species infestations in the project area is outside the scope of the CD-C EIS. Avoidance and mitigation strategies are part of this EIS and part of the BLM's ongoing management of public lands.
INV	Impact analysis	In04	46	Page 4-77, 4.7.3 Direct and Indirect impacts : Please acknowledge that all activities that alter disturbance regime e.g. recreation and livestock operations also impact native plants and provide opportunities for non-native plants and promote their spread within the RFO.	As the text indicates, disturbance creates the opportunity for invasive species to compete with native vegetation.
INV	Impact analysis	In04	47	Page 4-77, 4.7.3 Direct and Indirect impacts, fourth paragraph: *Without proper management and control, invasive plant species may cause widespread infestations*. Invasive plants cannot cause widespread infestations of themselves. This sentence should be reworded.	The sentence has been reworded in the Final EIS.
INV	Impact analysis	In04	48	Page 4-77, 4.7.3 Direct and Indirect impacts, fifth paragraph: Halogeton has increased and spread throughout the west, even in areas without oil and gas development. In the absence of peer-reviewed scientific literature to back up the assertion that the continued establishment and spread of Halogeton is only due to energy-related activities we suggest BLM delete that part of the sentence.	The phrase "due to energy-related activities" has been removed.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
INV	Impact analysis	In04	49	Page 4-81,top of page: The power washing bullet presents some issues: Who will set up and maintain the wash stations? Who determines which zones require washing? What is considered a field vehicle? Power washing in the winter may present a safety issue due to ice buildup. Also it seems unreasonable to require washing by operators and not of others; recreational users and livestock operations can also spread weeds.	Recreationists and others will not have the same volume of traffic as Operators and will not be traveling between as many areas. The Operators would be responsible for setting up and maintaining the power washing vehicle stations. All vehicles that access the project area for the purpose of natural gas development would be considered field vehicles.
INV	Impact analysis	C02	42	Further, Operators should reestablish a competitive grass/forb cover immediately after disturbance, not “as soon as feasible.” CD-C Draft EIS at 4-80. In order to prevent the establishment of invasive weeds at disturbance sites and to increase the chance for the return of native plant species, it is imperative that reclamation occurs as soon as the disturbing activity is completed.	The phrase has been removed. Reclamation on public lands in the CD-C project area will proceed according to the guidance provided in Appendix 36 of the Rawlins RMP.
INV	Mitigation	O14	3	"We recommend periodic inspection of roadways for... weeds even if this employs the use of local residents for weed patrol. With our partners, we would be happy to help organize these…good stewardship suggests... vigilance and mitigation to catch new invasive species while they are easily eliminated, instead of noting their existence after control is impossible..."	Thank you for your comment and your willingness to assist with such a difficult and challenging task. Your offer has been passed along to our weed specialist.
INV	Mitigation	O14	4	"BLM must mitigate threats [from noxious and invasive plants] in the CD-C project area by avoiding impacts as possible (reduce road construction). minimizing impacts (weed control), and considering off-site mitigation. Species of particular concern include Halogeton (*Halogeton glomeratus*), Russian Thistle (*Salsola kali*), and Black Henbane (*Hyocyamus niger*).	Thank you for your comment. The BLM works cooperatively with many partners to reduce the presence of any and all weeds.
INV	Mitigation	O01	17	Recommendations: - Wash vehicles daily to reduce spreading unwanted seeds - Reclaim sites with native plant species	Thank you for your comment. As part of mitigation measures, power washing of all field vehicles is being promulgated as part of Alternative B. In addition, all disturbances must be reclaimed with native vegetation as required by the RMP.
INV	Plant identification	In04	42	Page 3-83, fourth paragraph: *Chenopodium berlanderi* is a native plant, not an invasive weed. Likewise the reference to *wild mustards* is vague. The term should be replaced with exactly the plants of concern.	*Chenopodium berlanderi* has been deleted. The term *wild mustards* has been deleted.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
INV	Reclamation costs	In05, In08	82	Costs for reclamation are provided for various locations and vary between 20 and 43K per acre. This information is not directly comparable to the project area. Reclamation costs are running from 12 to 18K per acre in the project area. Nevertheless, we agree with BLM's statement that operators should minimize initial surface disturbance whenever possible and seek to establish interim reclamation asap.	It is recognized that reclamation costs may vary greatly throughout the project area. The published and detailed study mentioned in the text was used to illustrate the potential difference of total costs between properly or improperly reclaiming a site.
NO	COAs	In04	5	The requirement on page 2-12, second bullet: "*Use of noise-reduction technology so that noise would not exceed 49 decibels measured at 30 feet from the source at all drilling, production and compressor sites.*" is arbitrary and unjustifiable.	Alternative B no longer includes a noise restriction for Sage-Grouse. However, the Approved Resource Management Plan Amendment (ARMPA) for Sage-Grouse Management includes the following management decision (SSS 12): "New project noise levels, either individual or cumulative, should not exceed 10 dBA (as measured by L50) above baseline noise at the perimeter of the lek from 6:00 pm to 8:00 am during the breading season (April 1–May 15). Specific noise protocols for measurement and implementation will be developed as additional research and information emerges."
NO	COAs	In07	10	Page 4-11 2, Sage-grouse, first bullet series, second bullet and page 4-208, 4.17.3.3, Alternative B, paragraph 1, line 4. Requiring noise levels to be less than 49 decibels at 30 ft. from source is not achievable for construction, drilling, and completion operations. Limiting noise at a 30' distance from a source is unnecessary when a specific sensitive site, such as a lek, may not be in the neighborhood.	Please see response to In04-5 above.
NO	Editorial	In07	16	Page 4-208, 4.17.3.2, Alternative A, paragraph 2. The additional 7 days indicated for directional well development is inconsistent with Table 4.1 5-1.	The statement has been removed from the Final EIS.
NO	Editorial	In07	17	Page 4-209, 4.17.5, Unavoidable Impacts, paragraph 1, lines 4 & 5. It appears the durations for directional wells and conventional wells are stated incorrectly and may need to be interchanged.	The reference to drilling times for conventional and directional wells has been removed due to the great changes in this parameter that have occurred in the last 10 years.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
NO	Impact analysis	In04	58	Page 4-204, 4.17.1, fourth paragraph: Emerging research relative to the impact of noise on wildlife, specifically Greater Sage-Grouse and mountain plover, indicates this level of noise or the 49-dBA level (10 dBA over background) commonly found in BLM documents may not be sufficiently protective (Blickley and Patricelli undated, Blickley and Patricelli 2010). We object that BLM has relied upon research that has not been fully evaluated for accuracy or validity to set the noise requirements in this Draft EIS. The referenced study failed to follow proper research protocols, as well as accepted standards of practice or standard accepted procedures used by acoustical engineers and specified by the ASA and ANSI.	Thank you for your comment. The BLM has used research that was available for this analysis. Text has not been revised.
NO	Impact analysis	C02	54	The discussion on possible noise limitations is very open-ended and does not allow for discussion or analysis on possible impacts from such limitations. CD-C Draft EIS at 2-12. The Draft EIS does provide noise standards (noise would not exceed 49 decibels measured at 30 feet from the source) within sage-grouse habitat under the Enhance Resource Protections section. Id. at 213. The first discussion on noise limitations needs to incorporate this language or similar language, such as in Chapter 4 (CD-C Draft EIS at 4-205), in order to provide an actual standard for analysis purposes.	Alternative B no longer includes a noise restriction for Sage-Grouse. However, the Approved Resource Management Plan Amendment (ARMPA) for Sage-Grouse Management includes the following management decision (SSS 12): “New project noise levels, either individual or cumulative, should not exceed 10 dBA (as measured by L50) above baseline noise at the perimeter of the lek from 6:00 pm to 8:00 am during the breading season (April 1–May 15). Specific noise protocols for measurement and implementation will be developed as additional research and information emerges.”
NO	Mitigation	P10	6	Establish guidelines for light and noise pollution, including installing shielding on light sources.	Thank you for your comment.
NO	Mitigation	S04	6	We think the noise stipulation that would not allow noise to exceed 49 decibels measured at 30 feet from the source at drilling, production and compressor sites overreaches the sage grouse guidance and should be eliminated.	Please see response to comment C02-54 above.
NO	Wildlife impacts	In06	9	Page 4-204, 4.17, *Emerging research relative to the impact of noise on wildlife … indicates this level of noise or the 49-dBA level (10 dBA over background) … may not be sufficiently protective (Blickley and Patricelli undated, Blickley and Patricelli 2010)*. This study has technical flaws which should prevent BLM from using this paper as a reputable resource.	Thank you for your comment. The BLM has used research that was available for this analysis. Text has not been revised.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
OG	Alternatives	In05, In08	7	BLM impermissibly assumes that the same level of O&G development will occur under all four of the action alternatives. Under no circumstances will the same number of wells be developed under Alternatives B, C, and D as will be developed under the Proposed Action. The uncertainty inherent in Alternatives B, C, and D will necessarily limit the number of wells that could be developed in the project area. Alternative B and D will substantially increase costs; rendering the development of natural gas resources uneconomic.	Based on several comments on the Draft EIS, the RFO reviewed the likely effect of the requirements of the CD-C alternatives on drilling rates and total number of wells drilled in the project area. The review concluded: (1) Existing seasonal activity constraints already affect decisions about directional drilling under the Proposed Action as much as they would under the alternatives; (2) The alternatives encourage greater use of directional drilling, a technology that operators are already adopting on their own; (3) While some of the alternative requirements are likely to increase costs, the cost increases would likely be such that they are within the normal realm of operational cost increases (such as those that arise from the switch to directional drilling) or of natural gas price changes; (4) Requirements that emphasize improved reclamation are based on the premise that the project's 15-year development period provides sufficient time to achieve reclamation goals; and (5) Alternative D, Directional Drilling, is likely to result in a decline in drilling rates and well numbers. This conclusion is reflected in the Final EIS and its impact analysis.
OG	Impact Analysis	In04	2	Mandatory multi-well pads or a maximum acreage limitation may have significant effects on recoverability of natural gas, on access, and on safety. The Draft EIS does not provide enough information about how proposed surface use constraints will affect development time and output over the life of the project and about how seasonal limitations may affect the ability of operators to develop multi-well pads that will require longer periods of time to construct.	Please see the response to In05-7 above.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
OG	Impact Analysis	C02	6	"This is even more the case since the social and economic analysis was confined to the Proposed Action and not adjusted to the other alternatives. The Draft EIS incorrectly states the same number of wells will be drilled... This is untrue, since Alternative C imposes a surface disturbance limit that will delay or preclude production."	Based on several comments on the Draft EIS, the RFO reviewed the likely effect of the requirements of the CD-C alternatives on drilling rates and total number of wells drilled in the project area. The review concluded: (1) Existing seasonal activity constraints already affect decisions about directional drilling under the Proposed Action as much as they would under the alternatives; (2) The alternatives encourage greater use of directional drilling, a technology that operators are already adopting on their own; (3) While some of the alternative requirements are likely to increase costs, the cost increases would likely be such that they are within the normal realm of operational cost increases (such as those that arise from the switch to directional drilling) or of natural gas price changes; (4) Requirements that emphasize improved reclamation are based on the premise that the project's 15-year development period provides sufficient time to achieve reclamation goals; and (5) Alternative D, Directional Drilling, is likely to result in a decline in drilling rates and well numbers. This conclusion is reflected in the Final EIS and its impact analysis.
OG	Impact Analysis	C02	7	"This assumption also means that if true, then the other alternatives would not have less environmental impact. The Draft EIS assumes Alternatives A-C are necessary to reduce impacts. This can only occur in a gas field if there is less drilling which means less income. Hence again the assumptions made in the Draft EIS are incorrect and make the resulting analysis equally, if not more, incorrect."	Please see the response to C02-6 above.
OG	Impact Analysis	C02	9	The Coalition has always maintained that the Mineral Leasing Act requires development to occur in a manner that would provide the best recovery of the resource and thus revenue to the U.S. Treasury. Considering alternatives that may well lead to reduced gas production is not consistent with this direction. It also will lead to the unfair administration of the field, since existing wells will preclude future wells thus denying the lessees their rights to produce.	Thank you for your comment.
OG	Impact Analysis	C04	2	The socioeconomic analysis is flawed as it concludes that the socio-economic impact will be the same no matter what alternative is selected, failing to take into account the effect of resource use restrictions and seasonal limitations applied in the alternatives.	Please see the response to C02-6 above.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
OG	Impact Analysis	C04	3	The socio-economic impact analysis concludes that the same number of jobs and the same revenue will be generated in Alternative B as the Proposed Action, which does not contain the same seasonal restrictions. We ask that the BLM fix the socio-economic analysis to ensure that an accurate picture of the socio-economic impact is portrayed.	The socioeconomic analysis was based on well number estimates for each alternative produced by the BLM. Based on several comments on the Draft EIS, the RFO reviewed the likely effect of the requirements of the CD-C alternatives on drilling rates and total number of wells drilled in the project area. The review concluded: (1) Existing seasonal activity constraints already affect decisions about directional drilling under the Proposed Action as much as they would under the alternatives; (2) The alternatives encourage greater use of directional drilling, a technology that operators are already adopting on their own; (3) While some of the alternative requirements are likely to increase costs, the cost increases would likely be such that they are within the normal realm of operational cost increases (such as those that arise from the switch to directional drilling) or of natural gas price changes; (4) Requirements that emphasize improved reclamation are based on the premise that the project's 15-year development period provides sufficient time to achieve reclamation goals; and (5) Alternative D, Directional Drilling, is likely to result in a decline in drilling rates and well numbers. This conclusion is reflected in the Final EIS and its impact analysis.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
OG	Impact Analysis	S01	3	The BLM did not adequately consider the impact of seasonal stipulations and surface controls across alternatives. The socioeconomic analysis developed to support the CD-C EIS should be expanded. It does not seem plausible that the Proposed Action and the alternatives would have similar well numbers and the same pace of development. The combination of limiting factors in each of the alternatives will have differing impacts on the pace of well development.	The socioeconomic analysis was based on well number estimates for each alternative produced by the BLM. Based on several comments on the Draft EIS, the RFO reviewed the likely effect of the requirements of the CD-C alternatives on drilling rates and total number of wells drilled in the project area. The review concluded: (1) Existing seasonal activity constraints already affect decisions about directional drilling under the Proposed Action as much as they would under the alternatives; (2) The alternatives encourage greater use of directional drilling, a technology that operators are already adopting on their own; (3) While some of the alternative requirements are likely to increase costs, the cost increases would likely be such that they are within the normal realm of operational cost increases (such as those that arise from the switch to directional drilling) or of natural gas price changes; (4) Requirements that emphasize improved reclamation are based on the premise that the project's 15-year development period provides sufficient time to achieve reclamation goals; and (5) Alternative D, Directional Drilling, is likely to result in a decline in drilling rates and well numbers. This conclusion is reflected in the Final EIS and its impact analysis.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
OG	Impact Analysis	C03	4	Sweetwater County requests that the BLM provides a more complete and clear analysis regarding the effects that the environmental policies within each alternative will have on production, employment, tax revenue and other economic factors. Of particular concern are the potential negative economic effects that the environmental restrictions of seasonal limitations and surface disturbance caps may have on a producer' s ability to accomplish Project drilling objectives within the time frame specified in the Draft EIS. Sweetwater County understands seasonal restrictions and surface disturbance caps benefit wildlife and the overall management of the range but these restrictions, if not applied in a balanced manner, may severely reduce the ability of companies to develop their leases, which could result in an economic loss to the local governments and the State of Wyoming. To prevent this economic loss from occurring, Sweetwater County encourages the BLM to re-analyze the socioeconomic impacts related to environmental restrictions and work closely with BP and other operators to reconsider how these restriction may be applied in a manner that maximizes drilling and economic opportunity while sustaining wildlife, grazing and the overall viability of the range resources.	Based on several comments on the Draft EIS, the RFO reviewed the likely effect of the requirements of the CD-C alternatives on drilling rates and total number of wells drilled in the project area. The review concluded: (1) Existing seasonal activity constraints already affect decisions about directional drilling under the Proposed Action as much as they would under the alternatives; (2) The alternatives encourage greater use of directional drilling, a technology that operators are already adopting on their own; (3) While some of the alternative requirements are likely to increase costs, the cost increases would likely be such that they are within the normal realm of operational cost increases (such as those that arise from the switch to directional drilling) or of natural gas price changes; (4) Requirements that emphasize improved reclamation are based on the premise that the project's 15-year development period provides sufficient time to achieve reclamation goals; and (5) Alternative D, Directional Drilling, is likely to result in a decline in drilling rates and well numbers. This conclusion is reflected in the Final EIS and its impact analysis.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
OG	Impact Analysis	C03	7	Surface Use Limitations: The BLM should retain discretion to permit development that is appropriate for existing surface features, reservoir characteristics and other factors. The Draft EIS does not provide enough information about how the proposed surface use constraints and seasonal limitations will affect development time and output over the life of the project or the ability of operators to utilize multi-well pads that could potentially reduce the overall footprint of the project.	Based on several comments on the Draft EIS, the RFO reviewed the likely effect of the requirements of the CD-C alternatives on drilling rates and total number of wells drilled in the project area. The review concluded: (1) Existing seasonal activity constraints already affect decisions about directional drilling under the Proposed Action as much as they would under the alternatives; (2) The alternatives encourage greater use of directional drilling, a technology that operators are already adopting on their own; (3) While some of the alternative requirements are likely to increase costs, the cost increases would likely be such that they are within the normal realm of operational cost increases (such as those that arise from the switch to directional drilling) or of natural gas price changes; (4) Requirements that emphasize improved reclamation are based on the premise that the project's 15-year development period provides sufficient time to achieve reclamation goals; and (5) Alternative D, Directional Drilling, is likely to result in a decline in drilling rates and well numbers. This conclusion is reflected in the Final EIS and its impact analysis.
OG	Level of development	In05, In08	8	BLM assumes that the same level of development will occur under all four of the action alternatives. Under no circumstances will the same number of wells be developed under Alts. B, C, and D as will be developed under the Proposed Action. Alt. B will substantially increase costs associated with the numerous mitigation measures imposed and the substantially increased costs associated with the directional drilling in Alt. D will render the development of natural gas resources from the project area uneconomic. Operators will be unable to develop in the area and the immense economic benefits associated with the project will not occur.	Please see the response to C03-7 above.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
OG	Sage-Grouse	In04	1	The Operators believe that the Draft EIS analysis does not realistically portray the results of seasonal limitations, mandatory pad well development, air quality limitations, and other surface use limitations on the timeliness of well development and production. The combination of limiting factors in each of the alternatives will have impacts on the pace of well development so that production, employment, and tax revenue would be reduced or slowed.	Based on several comments on the Draft EIS, the RFO reviewed the likely effect of the requirements of the CD-C alternatives on drilling rates and total number of wells drilled in the project area. The review concluded: (1) Existing seasonal activity constraints already affect decisions about directional drilling under the Proposed Action as much as they would under the alternatives; (2) The alternatives encourage greater use of directional drilling, a technology that operators are already adopting on their own; (3) While some of the alternative requirements are likely to increase costs, the cost increases would likely be such that they are within the normal realm of operational cost increases (such as those that arise from the switch to directional drilling) or of natural gas price changes; (4) Requirements that emphasize improved reclamation are based on the premise that the project's 15-year development period provides sufficient time to achieve reclamation goals; and (5) Alternative D, Directional Drilling, is likely to result in a decline in drilling rates and well numbers. This conclusion is reflected in the Final EIS and its impact analysis.
OG	Target resources	In05, In08	73	We believe the BLM places far too much emphasis on oil and gas development from the Lance formation and the Mesaverde group. Although oil and gas development in the CD-C Project Area has primarily focused on the Mesaverde group and the Almond formation, these are not the only formations with hydrocarbon potential. As oil and gas development technology continues to improve, operators within the CD-C Project Area will target other formations. The BLM incorrectly assumes that all future oil and gas development within the CD-C Project Area will take place using vertical or directional deviated vertical drilling technologies. Oil and gas operators in the CD-C Project Area, and other portions of Wyoming, are utilizing horizontal development techniques with increased frequency. The BLM should carefully analyze the potential for horizontal development within the CD-C Project Area and ensure that the agency has sufficient flexibility to authorize horizontal development in the future within the CD-C Project Area.	The emphasis on gas development from the Lance and Mesaverde groups was derived from information the BLM received in the Project Description (**Appendix B**) that was submitted by the Proponents. If there are issues with the Project Description, then these need to be addressed by the Proponents.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
OG	Target resources	In05, In08	102	As discussed earlier, the BLM focuses far too much emphasis on oil and gas development in the Mesaverde and the Almond formations. Many operators are analyzing and even testing oil and gas production from other formations within the Project Area. The BLM must ensure that it has sufficient flexibility to authorize oil and gas development from many formations using many development techniques, and should not constrain itself to only so-called traditional vertical development.	The focus on the Mesaverde and Almond formations is part of the Project Description (**Appendix B**) as received from the Operators. In addition, the Project Description focused on the development of natural gas resources and did not include the development of oil nor of the use of horizontal drilling. This EIS analyzes the development of natural gas.
PA	Appendix B, abandon-ment	In09	12	"**Abandonment.** Appendix B, page B-23, discusses abandonment of well pads [but] no reference is made to the possible abandonment of pipelines. Although few pipelines are officially abandoned at this time, this practice may become common as the field changes... How the RFO manages pipeline abandonment may have a significant impact on reclamation following construction and following abandonment. Williams recommends, therefore, that pipeline abandonment be addressed in this document."	**Appendix B** is the Operators' Project Description and can only be changed by the Operators.
PA	Appendix B, clarification	In09	11	"**Average Pipeline Length. Appendix B**, page B-6, line 1.2, Bullet 5, assumes average pipeline length will be .25 mile [which] is inaccurate when compared to actual field results. Construction of larger well pads results in construction of larger diameter pipe. This increases the average pipeline length beyond .25 mile. Since 2010, Williams' average combined pipeline length of both 4" and 6" pipe is .53 mile. The average pipeline length for 6" pipe alone is slightly less than 1 mile."	Thank you for your comment. Because the figures on average length and average disturbance are from the **Operators' Project Description (Appendix B)**, they are used in the EIS.
PA	Appendix B, editorial	O01	3	The project overview on p B-3 references the Great Divide RMP and should reference the Rawlins RMP of Dec. 2008.	At the time the **Operators' Project Description** was written (August 2006), the Rawlins RMP had not yet been completed.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
PA	Appendix B, Interim rollover credit	In05, In08	107	BLM must explain how it intends to utilize the proposed interim roll-over objectives for the Continental Divide/Creston Natural Gas Project Environmental Impact Statement and ROD dated February 25,2011, developed by the State of Wyoming and several oil and gas operators ("Working Group Reclamation Plan"). The proposed reclamation document is currently included in part of Appendix E, but the text of the Draft EIS itself makes no mention on how, or if, the BLM will utilize this criterion. Similarly, the BLM must explain how, or if, it intends to use the document entitled BLM Roll-Over Criteria, Continental Divide/Creston Environmental Impact Statement ("BLM Reclamation Plan") also included in Appendix E. These two documents have very different components and standards and it is unclear how each document will be utilized. The reclamation guidance developed by the Working Group was intended to define meaningful and objective criterion to determine when and if reclamation was tending toward success. The BLM reclamation plan, however, appears to be generally vague, ambiguous, and potentially arbitrary and capricious. The BLM's Reclamation Plan does not provide clear criteria that will be utilized to determine when reclamation has been successful. The BLM's proposed "I know it when I see it" standard does not provide Devon the regulatory assurance it needs to develop successful on-site reclamation plans. Devon encourages the BLM to carefully review the Working Group Reclamation Plan and adopt portions of said plan as the reclamation rule or criteria for the CD-C Project.	As revised in the Final EIS, the description of Alternative C now make clear that the "standards to be met for successful interim reclamation of surface disturbance on public lands are described in Appendix M: Interim Rollover Objective (IRO) for Alternative C, which includes two documents that apply to interim reclamation and the concept of rollover: the Proposed IRO for the CD-C Natural Gas Project and the CD-C Rollover Criteria.″
PA	Beneficial use of produced water	C01	23	Appendix B, Plan of Development: The NEPA alternatives analysis should include the treatment and beneficial use of produced water to off-set the loss of livestock grazing values and wildlife habitat	That potential was not included in the **Operators' Project Description (Appendix B)**.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
PA	Clarification	In09	2	"Additional Facilities. In the Proposed Action alternative item 2.2.1,...page 2-1, the EIS discusses the number of proposed wells and possible additional facilities. At the bottom of paragraph one, page 2-2, the CD-C EIS mentions that gas will be transported by sub-surface pipelines. While this statement is accurate, it implies [that] the only pipelines to be considered by the CD-C EIS are those already in place. Williams recommends specifically including gathering and transportation pipelines in the list of facilities at the beginning of the paragraph (rather than just the word "gas" in the list of additional facilities) that will be constructed in other sections of the Proposed Action. (See notes on Appendix B for further description in the plan of development.)	The text was not changed. As written, the description, which comes from the **Operators' Project Description (Appendix B)** seems to clearly convey how pipelines will be used without implying that only existing pipelines would be used.
PA	Clarification	In09	3	"**Construction Activities.** Line 2.2.1.1 makes no mention of pipeline construction associated with well pads and roads. Because additional pipeline disturbance will accompany each well pad, pipelines should be included in this statement even if the pipelines are to be constructed by a third-party pipeline company rather than the director operator of the well. The EIS also estimates average pipeline length associated with each well pad will be .25 miles [which] would result in an average additional disturbance of 1.52 acres per well pad. As later addressed in this document, the .25 mile average pipeline length is incorrect."	**Section 2.2.7.4, Pipeline Facilities**, describes the role of pipelines in natural gas development. The figures on average length and average disturbance are from the **Operators' Project Description (Appendix B)**.
PA	Clarification	In09	4	"**Construction Activities Listed.** Table 2.4 shows estimated disturbance but limits its reference to 'related O&G facilities' {and] makes no mention of what those facilities may be. Williams recommends this table include express reference to pipelines. "	**Table 2.4** has been modified to clarify the constituents of Related O&G facilities.
PA	Clarification	In09	5	"**Pipeline Definitions**. Section 2.2.1.4, Pipelines, should include additional clarification of the differences between gathering pipelines and transmission pipelines [and] that operators will use existing transmission lines also should be included (see In09-4)."	The section, now numbered **2.2.7.4**, has been revised to clarify the distinction between transmission lines and gathering lines.
PA	Clarification	In09	6	"**Pipeline Location.** Line 2.2.1.4... should state 'pipelines will follow access roads ***where practical***.' In many instances, it is more practical and will result in less surface disturbance if pipelines are allowed to diverge from existing access roads."	The text was not changed. The statement, "pipelines will follow access roads where possible" has the same meaning as the suggested replacement language.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
PA	Clarification of drilling methods	O01	2	There appear to be discrepancies between BLM's public claims regarding minimization of impacts and the actual alternatives discussed. The BLM Fact Sheet for this project claims that the operators have made a commitment to consolidate wells on well pads to disturb less land and reduce development costs. We commend the operators for this decision and support utilizing each well pad to its fullest extent possible, including directional drilling. Looking at Appendix B - Plan of Development, indicates that most of the new wells will be drilled either conventionally with a single well bore from one pad or with many wells from one well pad. Elsewhere the Draft EIS states that an estimated 42% of wells would be located on multiple-well pads. These noncommittal and conflicting claims fail to provide clear, enforceable explanations of the commitment claimed by operators in the BLM Fact Sheet. Clarification is needed.	The Fact Sheet available on the CD-C web site at http://www.blm.gov/pgdata/etc/medialib/blm/wy/information/NEPA/rfodocs/cd_creston.Par.78701.File.dat/CD-C-Facts.pdf does not describe a commitment by the Operators to consolidate wells and they have not made such a commitment. As the **Operators' Project Description (Appendix B)** states, "This proposal assumes that the gas wells may be drilled conventionally, i.e., with a vertical well bore on a single pad, or with multiple directional well bores from a single pad." Individual operators make their own plans for drilling, or not drilling, multiple wells from a single well pad. The Project Description also contains aggregate and individual assumptions about disturbance (Table 1) that allow an inference that 42 percent of the wells would be drilled directionally. No commitment was made.
PA	Coalbed methane	O04	64	The EIS appears not to analyze the disposition of coalbed methane produced water under this project (Draft EIS at 2-5), although up to 500 of the approved wells would be coalbed methane wells (Draft EIS at 2-1). Coalbed methane wastewater disposal needs to be addressed, and BLM should require underground injection of such produced water into formations of equal or lower quality that have no hydrological connection to surface waters. BLM states that in any case additional NEPA analysis would occur if coalbed methane wells were pursued under this project. Draft EIS at 4-21. If the BLM has no intention of analyzing the produced water disposal issues for coalbed methane, then all coalbed methane drilling approvals should be stricken from this Project.	The disposition of CBM-produced water is not analyzed in this document. If and when the BLM receives an application for CBM development and disposal of CBM-produced water, then it will be analyzed. This has been clarified in the Final EIS.
PA	Directional drilling	In05	18	BLM should also recognize that the estimate of directional drilling that will occur within the project area is likely very conservative. When the POD was originally submitted in 2005, directional drilling was a relatively new practice within the project area. Since that time, it has become more common, more effective, and more economical. It is highly likely that far more than 42% of the wells within the project area will be directionally drilled if the BLM were to select the PA as the Preferred Alternative in the Final EIS and ROD.	The estimate of directional drilling in the Proposed Action is based on information included in the **Operators' Project Description (Appendix B)**. Because this estimate is based on the Proposed Action, the BLM cannot change this assumption.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
PA	Directional drilling	F03	8	Page 2-6. Section 2.2.2. The Draft EIS makes an assumption that 42 percent of the wells will be directionally drilled. We could not find any operator commitment to this effect. We recommend the Final EIS clearly identify what the Proposed Action is under each alternative, and identify any commitment made by the operators that would modify them.	As described in **Section 2.2.2, Alternative A**, the 42 percent of the wells that would be drilled as part of the Proposed Action is implicit in their numbers but the proposal contains no commitment on the part of individual Operators or the group as a whole to implement that amount of directional drilling.
PA	Drilling methods	C02	18	The Draft EIS needs to clarify the differences between conventional drilling and coalbed natural gas drilling. See CD-C Draft EIS at 2-2 and 2-3. The specific operations related to drilling coalbed natural gas wells must be addressed, as well as differences between the two types of wells as it relates to the location and timing of drilling and the production facilities. The Coalition understands that the differences are quite significant and these differences should be fully analyzed and disclosed.	For the purposes of this EIS, what matters are the similarities between the two methods of developing fluid mineral resources: the surface disturbance, the drilling and production activity, and the transportation of gas and liquids. The greatest dissimilarity--the production of large quantities of produced water by CBM production-- is explicitly removed from consideration in the EIS. Any proposal for surface discharge of produced water would be analyzed in a separate NEPA document.
PA	Editorial	In05, In08	19	Page 2-5, 2.2.1.7: BLM incorrectly states that it imposes additional COAs and other mitigation measures through NEPA. Although the BLM often utilizes the NEPA process to determine appropriate COAs, such COAs are not imposed using authority conferred by NEPA. Instead, COAs are applied using BLM's authority under FLPMA, the Mineral Leasing Act of 1920, and other laws. BLM should correct this misleading statement.	The source of the cited language was the **Operators' Project Description (Appendix B**). The phrase "implemented through NEPA" has been removed from the text.
PA	Horizontal drilling	In05	17	BLM does not mention the possibility that horizontal development could be utilized within the area. BLM should not eliminate the possibility that future development in the project area may utilize horizontal development techniques. Impacts are nearly identical to that of vertically or directionally developed wells. BLM should specifically analyze the potential impacts of horizontal drilling techniques within the project area and disclose these potential impacts to the public in the Final EIS.	The development of this EIS was based on the Proposed Action and the **Operators' Project Description (Appendix B)** that was submitted by the Operators. No mention of oil development or the use of horizontal drilling was made in the project description. The Proposed Action and alternatives were developed based on the presumption that the Operators were intending to develop natural gas, not oil. Therefore, horizontal drilling and the development of oil is not analyzed in this EIS. If Operators intend to develop oil, then applications for such would be analyzed under a separate NEPA document to address the different impacts associated with the development of oil.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
PA	Horizontal drilling	In05, In08	104	BLM should develop and include specific language in the plan of development noting that oil and gas operators may pursue horizontal drilling and development techniques within in the CD-C Project Area. As currently drafted, the plan of development assumes that operators will utilize directional or vertical drilling techniques exclusively. As oil and gas development technology continues to improve, operators may utilize other drilling and development techniques, including horizontal development. Horizontal drilling techniques are virtually identical to conventional or directional, sometimes deviated, drilling techniques, except that surface pads may be slightly larger and drilling completion timelines slightly longer than those included within the CD-C Draft EIS. (more information on horizontal drilling in letter.)	The development of this EIS was based on the Proposed Action and the **Operators' Project Description (Appendix B)** that was submitted by the Operators. No mention of oil development or the use of horizontal drilling was made in the project description. The Proposed Action and alternatives were developed based on the presumption that the Operators were intending to develop natural gas, not oil. Therefore, horizontal drilling and the development of oil is not analyzed in this EIS. If Operators intend to develop oil, then applications for such would be analyzed under a separate NEPA document to address the different impacts associated with the development of oil.
PA	Water quantities	C01	10	Section 2.2.1.2 Drilling and Completion: Drilling and Completion activities require 24,000-42,000 barrels (bbls) of water per well. Please express water quantity in barrels, gallons and acre feet and include an estimated cumulative ground water demand for the project area.	The requested information is found in **Section 4.4.4.1** of the Draft and Final EIS. The total water demand for the project (up to 48,720 ac-ft) has been added to the text in **Section 2.2.7.2** of the Final EIS.
PA	Well numbers	O03	1	The Proposed Action projections need to be analyzed and the number of proposed wells needs to be reviewed to determine if the target resource can be fully developed or if additional wells will be needed. BLM should analyze the assumption that drilling will occur at well densities of up to one well per 40 acres (page 1-3). The potential total number of wells, assuming 1697 sections in the project area, is actually 13,406.	The Proposed Action represents the Operators' best estimate as of August 2006 (the date of their Project Description) with regard to the CD-C project area's overall potential, with presumed variation in different parts of the area. It does not assume uniform drilling throughout the project area.
RCL	Appendix C / Appendix E clarification	In07	19	Appendix C, pages C-14 to C-15. Many of the Reclamation Plan requirements identified are unnecessary. It is recommended that the reclamation specifications identified in Appendix E be followed and that, as identified in the High Desert District Letter (in Appendix E), emphasis be placed on success full reclamation not reclamation planning.	Please see the updated **Reclamation Plan (Appendix E)**. Specific criteria for interim reclamation are identified.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
RCL	Appendix E	In01	24	The reclamation guidance introduction on page E-3 refers to guidance and requirements documents such as, Appendix 36 to the Rawlins RMP, High Desert District Policy for Reclamation of Disturbed Lands, and Wyoming BLM State Reclamation Policy. These guidance and requirements documents are not consistent with each other in terms of objectives and standards which results in unclear guidance as to the goals and objectives for the CD-C project area. APC suggests that the BLM clarify the guidance that is to be used.	Please see the updated document. **Appendix E** is the reclamation plan for the Proposed Action and Alternatives B, D, and F; **Appendix M** is the reclamation plan for Alternative C.
RCL	Appendix E	In01	25	APC believes Instructional Memorandum 2012-005 cited on page E-16 provides a suitable approach to reclamation plans for the CD-C project area. However, the CD-C IRO outlined later in appendix E creates over-burdensome requirements – something to be avoided as stated in the High Desert Instructional Memorandum. APC recommends the BLM use IM WYD 2012-005 consistently throughout Appendix E to eliminate conflicting references.	Please see the updated document. **Appendix E** is the reclamation plan for the Proposed Action and Alternatives B, D, and F; **Appendix M (Interim Rollover Objective)** is the reclamation plan for Alternative C. The IRO document does not create over-burdensome requirements but rather attempts to deal with the complicated task of determining rollover criteria and when rollover is justified. The criteria presented in Appendix M for achieving rollover are not more stringent than that required by the RMP; they are simply more specific for rollover and interim reclamation.
RCL	Appendix E	In01	26	Page E-26 states “It is understood that many of the items we are recommending may appear duplicative to the existing Wyoming BLM Reclamation Instructional Memorandum or other Field Office reclamation policy. As part of the more flexible rollover criteria outlined below, we recommend that many of these duplicative practices should be required as part of the rollover criteria and not be optional.” While there are duplicative required practices, the practices are inconsistent. The BLM should provide a clear understanding of reclamation requirements.	Please see the updated document. **Appendix E** is the reclamation plan for the Proposed Action and Alternatives B, D, and F; **Appendix M** is the reclamation plan for Alternative C.
RCL	Appendix E	In01	27	The reference site selection requirement on page E-28 provides a redundant effort necessitating operators to complete extensive pre-site vegetation inventories, but also use a reference site to measure successful interim and final reclamation. To determine success of reclamation, BLM should only require pre-site vegetation inventories or reference sites, not both.	Operators are only required to submit data on either pre-disturbance locations or reference sites, but are not required to submit data on both.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
RCL	Appendix E	In01	28	Page E-28 discusses the development of a site-specific invasive/noxious (invasive) plant management plan; however, this requirement is already in place. APC suggests referring to the existing PUP process to eliminate redundant efforts.	The site-specific invasive/noxious (invasive) plant management plan can be written similarly to the PUP but must also specifically address monitoring and success criteria.
RCL	Appendix E	In01	29	Page E-31 states “Both soil and water samples should be tested before application and water source should meet appropriate limits for SAR and EC.” The BLM should list the appropriate limits for SAR and EC in the Draft EIS.	If the IRO is associated with the ROD, appropriate SAR and EC will be specified.
RCL	Appendix E	In01	30	Where monitoring and reporting protocols are discussed on page E-31, the process by which BLM will make “changes” to the operator’s reclamation plan is unclear. APC requests the BLM provide further description of how and through what process an operator may pursue a reduction of monitoring and reporting.	The BLM will provide the Operator with comments concerning where further clarification is needed. There will be no opportunities for a reduction in monitoring as this is not consistent with the Rawlins RMP or other BLM regulations regarding reclamation. The Operator is responsible for maintaining successful reclamation. Operators would still be responsible for monitoring to ensure that reclamation is successful. This may be accomplished through a reduced monitoring program (if the IRO is implemented through the selection of Alternative C) but does not mean that Operators will not be required to continue monitoring disturbed sites to some degree, as required by the BLM. The BLM would have to approve any reduction in monitoring; a reduced monitoring program would only be applicable through Alternative C and the IRO, and only be approved if the IRO were consistently met.
RCL	Appendix E	In01	31	Appendix E refers to BLM monitoring methodologies to be used, which conflicts with the statement made on page E-31 that “Monitoring should be designed and implemented by the Operator to document continuing successful reclamation rollover using methodologies approved by BLM.” APC requests that the BLM provide clarity and consistency in monitoring protocols and identify who is to “design” them.	Monitoring methodologies would be determined by the Operator, but would be required to be BLM-approved. Therefore, the actual design and implementation of the monitoring would be the responsibility of the Operator, but would have to conform to BLM standards and requirements.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
RCL	Appendix E	In01	32	Page E-31 states “Once the IRO is achieved and reclamation rollover granted by BLM, the Operator will continue to monitor the condition of the reclamation, document that the revegetation continues to meet IRO.” This statement is inconsistent with an above paragraph (C.8.a) which suggests a reduction in monitoring and reporting when IRO is achieved. Please consider revising these items to eliminate the contradiction.	The BLM will provide the Operator with comments concerning where further clarification is needed. There will be no opportunities for a reduction in monitoring as this is not consistent with the Rawlins RMP or other BLM regulations regarding reclamation. The Operator is responsible for maintaining successful reclamation. Operators would still be responsible for monitoring to ensure that reclamation is successful. This may be accomplished through a reduced monitoring program (if the IRO is implemented through the selection of Alternative C) but does not mean that Operators will not be required to continue monitoring disturbed sites to some degree, as required by the BLM. The BLM would have to approve any reduction in monitoring; a reduced monitoring program would only be applicable through Alternative C and the IRO, and only be approved if the IRO were consistently met.
RCL	Appendix E	In05, In08	106	We appreciate that under the Rawlins RMP, the BLM and the project proponent are encouraged to establish "reasonable, achievable, and measurable reclamation goals." CD-C Draft EIS, Appd. E, pg. E-5. Devon supports this statement but in the past has found that the BLM's determination of reasonable reclamation is neither achievable nor consistent. As noted above, Devon encourages the BLM to establish achievable and realistic reclamation goals that can be objectively monitored. Devon also is concerned with the BLM's continued use of language from the Rawlins RMP suggesting that the BLM and the project proponent are required to return the land condition better than that which existed before it was disturbed. CD-C Draft EIS, Appd. E, pg. E-6. It is unreasonable to require operators or other users of the public lands to return the conditions to better-than-those which they found them. Finally, the BLM reclamation guidance from the Rawlins RMP indicates that monitoring reporting is due on December 1. CD-C Draft EIS, Appd. E, pg. E-12. The BLM currently requires operators to submit their monitoring data on April 1. Devon suggests that BLM synchronize their dates for the CD-C Area so the operators clearly know when their monitoring reports are due.	Thank you for your comment. Please see updated **Appendix E, Reclamation Plan**.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
RCL	Appendix E	S03	2	WDEQ worked with other state cooperators, the BLM, the University of Wyoming, and the producers to develop the Proposed Interim Rollover Objective (IRO). Although developed for interim reclamation, the WQD requests that the guidance in the IRO be incorporated into the Preferred Alternative.	The **Interim Rollover Objective (Appendix M)** has been included as part of Alternative C. Because the Agency Preferred Alternative does not incorporate the use of a disturbance cap, the use of rollover criteria would not be applicable. Please see updated **Appendix E, Reclamation Plan** for information on the proposed reclamation plan for the Agency Preferred Alternative.
RCL	Appendix E, criteria	In04	68	Appendix E, page E-6, last sentence of the third paragraph: Please list the criteria under which addressing interim reclamation guidelines on a case-by-case basis is appropriate.	There are no such criteria. All disturbances are evaluated on a case-by-case basis to determine the appropriate measures necessary to "initiate or accelerate the recovery of an ecosystem."
RCL	Appendix E, pre-disturbance inventory	In09	22	"Minimum Level of Pre-disturbance Data. Page E-16, is part of the Wyoming State Reclamation Policy. Paragraph I states the RFO is more interested in actual reclamation than in preliminary data gathering. The policy further states: 'To that end it is imperative that we require the reclamation plans to include no more than the minimum level of pre-disturbance site data and project component description than is essential to assure the plan will meet the reclamation objective for the site.' The recommended data initially required by the RFO to be included in the site specific reclamation plan and the reporting protocol after initial reclamation requires more than the minimum level to be successful, particularly as it applies to pipeline construction."	The information recommended to be compiled in the reclamation appendices is what is considered by the Rawlins BLM to be what is necessary to ensure successful reclamation that is consistent with the goals and objectives of the BLM.
RCL	Appendix E, seed mixes	In09	20	"Pre-Disturbance Vegetation. Page E-8, SEED, paragraph 2, requires a list of pre-disturbance vegetation. A high percentage of vegetation in the Wamsutter area has no commercially available seed. Seed mixes, therefore, are based on a few of the existing plants and on soil type. Seed mixes should be developed based on soil type, annual moisture, and existing vegetation. It is not necessary to gather information to the extent noted in this section. Also, paragraph 3 states wildlife and livestock use should be taken into consideration when planning the seed mix. This contradicts paragraph 2 and allows leeway in developing seed mixes."	The BLM is responsible for ensuring that reclamation is occurring in a manner consistent with the goals and objectives of the BLM. This includes identifying and implementing methods that would result in successful reclamation and includes the use of native seeds and specific seed mixes.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
RCL	Appendix E, clarity	In04	64	Appendix E, page E-4, last sentence: Increasing the cap by roll-over disturbance could lead to a situation where the cap is met and previously rolled over acreage is requiring disturbance for P and A activities. It should be stated that roll over acreages can be re-disturbed for activities that will lead to environmental gains such as P and A.	Re-use of rolled-over acreage is permitted by definition.
RCL	Appendix E, clarity	In04	67	Appendix E, page E-6, the first sentence states that reclamation will return land to a condition approximate to or better than that which existed before. The recommended fix is: or otherwise agreed to condition.	Thank you for your comment.
RCL	Appendix E, clarity	In04	73	Appendix E, page E-11, Planning and Monitoring, first sentence of the second paragraph: *With the exception of active work areas, disturbed areas anticipated to be left bare and exposed will be stabilized with at least a 50-percent cover of mulch to prevent soil erosion*. This statement requires further definition. How many weeks, days, or minutes can soil be left bare? Are other erosion controls, acceptable?	Thank you for your comment.
RCL	Appendix E, clarity	In04	74	Appendix E, page E-12, Project Proponent Reclamation Monitoring Reports, second open circle bullet states that sites will be identified by reclamation years. Sites may experience re-disturbances (i.e. staging of equipment) such that a site is a mosaic of restoration years. Please explain.	The indicated text is intended as general guidance.
RCL	Appendix E, clarity	In04	75	Appendix E, page E- 31, 6.b. State the appropriate SAR and EC limits and please list them.	If the IRO is associated with the ROD, appropriate SAR and EC will be specified.
RCL	Appendix E, correction	In07	21	Appendix E. The RMP reclamation success criteria (80% of pre-disturbance ground cover, 90% by dominant species, etc.) are applicable for bond release, not interim reclamation.	Please see the updated **Reclamation Plan (Appendix E)**. Specific criteria for interim reclamation are identified.
RCL	Appendix E, correction	In07	24	Appendix E. Generally topsoil piles are listed as being less than 13 ft deep, seeded, and having slopes less than or equal to 3:1; these slopes may not be attainable.	If certain criteria as required in **Appendix E or M** are not attainable, they would be addressed on a site-specific basis in the reclamation plan that would be submitted with the APD or right-of-way application. These would be approved (or not) by the BLM on a case-by-case basis.
RCL	Appendix E, correction	In07	25	Appendix E. Cover monitoring the first year post-seeding is unnecessary, what is required is an evaluation of germination and establishment which is not well described by measurements of cover.	Thank you for your comment.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
RCL	Appendix E, correction	In07	26	Appendix E. Both basal and foliar cover monitoring are required annually. Will alternate site-specific monitoring schedules and protocol included with APDs and ROW applications be accepted?	If certain criteria as required in **Appendix E or M** are not attainable, they would be addressed on a site-specific basis in the reclamation plan that would be submitted with the APD or right-of-way application. These would be approved (or not) by the BLM on a case-by-case basis.
RCL	Appendix E, correction	In07	27	Page E-26. Proposed IRO Reclamation Criterion, paragraph 2: A 70% cover standard is identified. It is recommended that this be replaced by the qualitative standards proved at other locations in this appendix.	Thank you for your comment.
RCL	Appendix E, cost estimate	In04	66	Appendix E, page E-5, second paragraph, third bullet: *An estimate of the specific costs of reclamation.* It seems this is irrelevant information and shouldn't be public.	Thank you for your comment.
RCL	Appendix E, Invasive species	In01	33	Page E-32 states "No invasive weeds will be allowed. Invasive species cover no greater than adjacent invasive species cover will be allowed. All other undesirable perennial or annual plants as defined in the site-specific APD should be controlled or eradicated on the disturbed area." "No invasive weeds will be allowed." is in direct conflict with the rest of the statement. Additionally, the BLM has not provided any guidance as to which species will be included within the statement "All other undesirable perennial or annual plants…" or how these species will be determined.	If the IRO is associated with the ROD, the apparent contradiction would be clarified.
RCL	Appendix E, inventories	In09	24	"Vegetation Inventories. Vegetation inventories listed [on] page E-27, item 3. Conduct a Vegetation Inventory, have limited value, not only for pipeline construction but for all disturbances in general. Many of the seeds for native plants in the Wamsutter area are not commercially available [and] often are replaced by suitable alternatives. A basic overview of vegetation, including type of community (such as saltbush or greasewood), soil type (loam, sandy loam, clay, etc.), and precipitation levels, will provide the same value as a specific vegetation inventory and will fulfill the reclamation requirements of stabilizing soils and establishing a self-perpetuating plant environment that will, over time, reach pre-construction conditions.	The BLM is responsible for ensuring that reclamation is occurring in a manner consistent with the goals and objectives of the BLM. This includes identifying and implementing methods that would result in successful reclamation and includes the use of native seeds and specific seed mixes.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
RCL	Appendix E, monitoring	In09	17	"Monitoring and Reporting. The introduction, page E-3, states operators should develop a monitoring and reporting strategy as per the Wyoming State BLM Reclamation Policy. The RFO has created criteria for monitoring and reporting primarily focused on well pads, not pipelines. The CD-C EIS should utilize the Pipeline Reclamation Plan to adjust these criteria for pipelines."	All of the information found in company-specific and project-specific reclamation plans will be applicable to the project area, on a site-specific basis.
RCL	Appendix E, monitoring	In09	25	"Annual Monitoring. Page E-32, provides a suggested list of monitoring items to be recorded for annual submission [that] is beyond what is necessary to determine if reclamation is progressing. The list should either be reduced to basic information regarding the progression of soil stabilization and establishment of a self-perpetuating plant environment (presence of weeds, if any, and growth of desirable, similar vegetation to the surrounding area), or operators should be given the leeway to determine what will add value for their specific project, or to report when they are ready to request rollover credit for the disturbance."	The BLM is responsible for ensuring that reclamation is occurring in a manner consistent with the goals and objectives of the BLM. This includes the submission of annual data by the Operators as outlined in the reclamation appendices and as is also required by the Rawlins RMP.
RCL	Appendix E, pre-disturbance inventory	In09	23	"Soil Inventories. Page E-27, item 2. Conduct a Suitable Soil Inventory, discusses the need for soil sampling and testing to determine what type of soil is being disturbed and potential soil horizons. These activities are appropriate when soil will be stripped, segregated and stored for an extended period of time [but] have no beneficial use when applied to pipeline construction. Because the minimum possible amount of topsoil is removed and immediately replaced, gathering soil data neither will have any impact on the method of construction, nor will it benefit reclamation. An exception from the soil sampling data requirement should be included in the CD-C EIS for pipeline construction and reclamation."	The Reclamation appendices have been updated to incorporate specific information that pertains to pipelines.
RCL	Appendix E, preference	In07	22	Appendix E. The interim reclamation success criteria established here are preferable to those identified in Appendix C.	COAs are provided in individual APDs and right-of-way grants and are not subject to revision in this document.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
RCL	Appendix E, rationale	In04	65	Appendix E, page E-5, second paragraph: The reclamation plan will contain sufficient monitoring requirements, reports, and components to ensure the reclamation plan is current. Explain why these items are necessary to make the plan current and what items comprise the content.	The cited text is from Appendix 36 of the Rawlins RMP, Reclamation Plan. The term 'current' in that context is explained by an earlier sentence in the same paragraph: "The reclamation plan... for the expected reclamation condition of the disturbed lands and must be periodically reviewed and modified as necessary." The reclamation plans, or portions of plans, may need to be updated or modified as part of an adaptive management program that takes into account existing and/or changed conditions. Please refer to the ROD of the Rawlins RMP for the full text of Appendix 36.
RCL	Appendix E, reclamation	In09	16	"Reclamation. Language in Appendix E is drawn directly from Appendix 36 of the RMP. Williams recommends Appendix E include appropriate elements from the Pipeline Reclamation Plan to augment and improve the issues related to pipeline construction and reclamation."	All of the information found in company-specific and project-specific reclamation plans will be applicable to the project area, on a site-specific basis.
RCL	Appendix E, reporting	In09	18	"Reclamation Plan Monitoring and Reporting. Page E-5 paragraph 2 describes the requirement for reclamation plan monitoring and reporting as being 'sufficient.' Later suggestions in the document become excessive and unnecessary thereby exceeding the RFO standard of 'sufficient.' Other language allows flexibility depending on the type of disturbance. This document, however, does not provide guidance as to what types of disturbances or flexibility will be allowed."	Reclamation guidance in this document does not exceed what the RFO describes as sufficient.
RCL	Appendix E, rollover	In05, In08	105	We remain concerned that the proposed reclamation roll-over criteria identified on page E-4 are vague and arbitrary. The determination of a successful roll-over can be dependent purely on the person reviewing each location rather than a set of objective criteria. We encourage the BLM to develop a clear and objective set of criteria that can be utilized to determine when reclamation is successful.	Thank you for your comment.
RCL	Appendix E, seed mix	In04	70	Appendix E, page E-8, Seed. The first sentence requires seed to be weed free. Since the term weed is defined variously, it would be more useful to have a list of species prohibited within a seed mix. Or example, Indian rice grass could be a weed present in a sand dropsied planting.	'Weed free seed' refers to the 2006 BLM seed policy. All seed to be applied on public land must have a valid seed test from a registered seed analyst. The seed lot shall contain no noxious, prohibited, or restricted weed seeds according to state seed laws in the respective state(s).

Category	Sub-Category	Comment		Comment	Response
		Code	No		
RCL	Appendix E, seed mix	In04	71	Appendix E, page E-9, Seed Suppliers, last sentence: *Do not rely on a single supplier for all seed needs.* Many seeds may only be available through a single supplier.	Seeds will be purchased from suppliers where the desired species are available. The BLM is the largest native seed buyer in the United States. Currently, native seed is not available in the quantity and quality the BLM needs. Therefore, a single supplier cannot be relied on for all BLM needs.
RCL	Appendix E, seed mix	In04	72	Appendix E, page E-10, Mulch, last sentence: *Any mulch used must be certified free from mold or fungi…* Molds are fungi, so the term mold is redundant. Fungi are ubiquitous, and may not be. There are fungi that live in soils but enter and spore within plants only to be released when the plant decays. Certifying a mulch from plant material as fungus free may be impossible. Please reconsider this requirement.	Thank you for your comment.
RCL	Appendix E, seed mixes	In09	21	"Standard Seed Mixtures. Page E-9, "Standard Seed Mixtures," states the ultimate responsibility for reclamation lies with operators. It also states there are standard seed mixes available at the RFP. This statement conflicts with other areas of the document where it states site specific seed mixes should be suggested by the operators and approved by the RFO. Standard seed mixes should be acceptable depending on soil type."	Operators are ultimately responsible for successful reclamation, both interim and final. The BLM is responsible for ensuring that reclamation is occurring in a manner consistent with the goals and objectives of the BLM. This includes approval of seed mixes, reclamation techniques, and other information that may be pertinent to reclamation.
RCL	Appendix E, topsoil	In04	69	Appendix E, page E-7, Soil. In the second and last paragraphs adding top soils is discussed. Typically, thin soils indicate high erosive potential and trucked-in soils will also be vulnerable to erosion. We suggest these areas of thin soils represent unique habitats and are also important.	Thank you for your comment.
RCL	Appendix E, topsoil	In09	19	"Topsoil. Page E-7, paragraph 2, states topsoil should be salvaged so that 4" to 6" of topsoil can be re-spread over the disturbance area. This requirement may have a negative impact on pipeline reclamation. Unlike well pad and road construction practices, pipeline construction often removes less topsoil to preserve root base consistent with the Pipeline Reclamation Plan. The RFO has allowed Williams to bypass extra topsoil removal because of its unique construction techniques. This paragraph should include an exception for pipeline construction."	All of the information found in company-specific and project-specific reclamation plans will be applicable to the project area, on a site-specific basis.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
RCL	Baseline data	C02	77	Draft EIS p. 3-28 The reclamation potential of the CD-C project area is primarily poor, with 537,228 acres or 50 percent of the total project acreage having this rating (Map 3.3-5, Table 3.3-1). Locations identified as “No Rating” on Map 3.3-5 generally consist of rock outcrops or rock surfaces that did not include a topsoil rating since topsoil is not present in these locations. CLG Comment: The map needs to be revised. The field trip showed how a site said to have low potential featured excellent reclamation. The sweeping generalization would lead to the conclusion that all reclamation will fail and that is incorrect. CLG believes that assessment of reclamation potential needs to be made on a site specific basis not generalized conclusions at a programmatic level.	Thank you for your comment. Please see the updated **Reclamation Plan (Appendix E)**. Reclamation potential is based on a site-specific assessment when APDs are submitted to the Field Office. However, the overall quality of the soils, the low precipitation, and other factors in the CD-C project area are consistent with a generally poor reclamation potential.
RCL	Bonding	C03	20	Sweetwater County encourages the BLM and the Wyoming Oil and Gas Commission to require sufficient upfront bonding to cover the complete cost of final reclamation at the end of the project's life.	The BLM has bonding requirements in place that have been deemed sufficient by the regulatory authorities.
RCL	Challenges	O03	2	Page 4-76, *long-term impacts would be positive, assuming successful re-vegetation.* However, the Draft EIS also reference the challenges of reclamation. *Extended drought conditions throughout southwestern and south-central Wyoming have adversely impacted many native shrub communities and several drought-related die-backs and die-offs are evident throughout the project area* (page 3-67). The lack of local seed sources, slow recovery rate, and high salt concentrations in the soils are all also specifically referenced (pages 4-73 and 4-227). Failed mitigation and ineffective revegetation efforts should be included in future evaluations.	Annual monitoring will identify any issues impacting reclamation efforts and areas in need of additional reclamation (**Appendix E**).
RCL	Clarification	In09	7	"Reclamation Guidance. Chapter 4 -Line 4.3.3 page 4-15 references the RFO RMP and its Appendix 36... These 2008 documents were written with little consideration for pipelines...Although the RFO has worked with pipeline companies to remediate these differences, the implementation of a new RMP and ROD provides an opportunity to make necessary distinctions and clear up potential issues. This clarification would benefit both the pipeline companies and the Rawlins Field Office. (Please see the Pipeline Reclamation Plan for proposed insight.)"	Please see updated **Appendix E, Reclamation Plan**. Pipelines have been incorporated as part of the reclamation guidance.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
RCL	Clarification	In09	8	"Seed Mixes. Section 4.6, line 4.6.2, item 1,refers to the need for seed mixes 'consistent with site potential.' Allowing modified seed mixes that do not necessarily match existing vegetation, but which provide the same benefit to the soil and which are adapted to the soil in that location, would allow the RFO to grant approval for different seed mixes while supporting the removal of the pre-disturbance vegetation inventory, and will provide the same level of detail as has been historically required. (see In09-20, Pre-disturbance vegetation, for further discussion regarding vegetation analysis)."	Thank you for your comment. Reclamation practices must be consistent with Field Office, BLM Washington, and BLM State guidance.
RCL	General	In09	1	The draft CD-C EIS does not mention Williams Master Reclamation Plan for the Wamsutter Area Gathering System (Pipeline Reclamation Plan) developed in 2012 by Williams and the RFO and specifically tailored to Williams' gathering pipelines in the CD-C EIS area. Nor does [it] acknowledge the significant differences between the construction and reclamation of gathering pipelines [and] well pads and roads. This oversight could have material adverse effects on natural gas development within the CD-C EIS area. [Williams recommends] including the Pipeline Reclamation Plan as an exhibit to the draft CD-C EIS [and that] appropriate elements from the Plan [be used] to augment and improve the issues related to pipeline construction and reclamation.."	Please see updated text in the **Reclamation Plan (Appendix E)** regarding pipeline reclamation. Information specific to pipeline reclamation has been included.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
RCL	Grazing rights	O12/ O13	10	The area is extremely difficult to reclaim to native vegetation due to levels of precipitation and poor soils. Traditional reclamation techniques are not sufficient! There must be an increased interest in developing acceptable reclamation techniques and standards prior to permitting this level of development. Due to the loss of native vegetation due to invasive plant infestations initiated by prior developments in the area, the assumption that use of native seed and traditional procedures will result in "sufficient" quality and quantity of reclaimed disturbances will be challenging if not impossible to achieve. Reclaimed lands are attractive to both wildlife and livestock due to the vigor and higher nutritional quality of the regeneration. This must be addressed prior to development. One possible remediation to this problem is to have the energy companies that are proposing this development purchase the grazing rights of affected public land grazing allotments from the affected livestock producers. This would be a small, negligible cost compared to the scale of development and the potential profits from the minerals extracted. By compensating the livestock producers for losses accrued by not grazing impacted allotments, increased success of reclaimed areas would be expected and impacts to wildlife lessened by the proposed development.	Please see the revised **Reclamation Plan (Appendix E)** which places a greater emphasis on interim reclamation and provides specific criteria that must be achieved for interim reclamation to be considered successful. The BLM has worked with Operators in the past and will continue to work with both livestock and natural gas operators to mitigate impacts to reclaimed areas.
RCL	Impact analysis	O12/ O13	23	Due to hydrology, soil and vegetative complex within the area, it seems more data needs to be provided on reclamation of habitat and potential mitigation of impacts. There is conflicting data as to the use of non-native species as acceptable reclamation and in a xeric area, potential negative impacts of currently used/accepted reclamation plant species may have detrimental impacts on a large scale. Would like to see more data included in this document to support HOW reclamation and mitigation will occur.	Information is provided in Appendix E, Reclamation Plan. In addition, the Rawlins RMP has reclamation guidance and criteria, and the BLM Wyoming reclamation policy is available online at: http://www.blm.gov/wy/st/en/programs/reclamation.html
RCL	Interim reclamation	C02	43	The Draft EIS should also provide for interim reclamation similar to those described in the Proposed Interim Rollover Objectives in Appendix E (E-26 - E-32).	Please see the updated **Reclamation Plan (Appendix E)**. Specific criteria for interim reclamation are identified.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
RCL	Interim Rollover Objective	C02	10	The Draft EIS fails to identify when roll-over reclamation will be credited to the operator... the Draft EIS fails to analyze or disclose how it would work....and it is still unclear whether BLM intends to use the reclamation plan.	Rollover reclamation would be credited to the Operator when the interim reclamation objective criteria are met, as stated in the **Interim Rollover Objective (Appendix M)**. The IRO would be implemented should Alternative C be selected. **Appendix E, Reclamation Plan** would be applicable to the remainder of the Alternatives, with the exception of Alternative E, No Action.
RCL	Process	O12/ O13	29	There needs to be better description of reclamation processes that would occur by the widespread impacts from adding an additional 8950 wells in the affected area. Specifically would like to see more information on how reclamation activities can occur in this type of hydrology, climate, soil system where natural vegetation is a slow process and more importantly how would reclamation and mitigation efforts be monitored. This could be better quantified.	Information is provided in Appendix E, Reclamation Plan. In addition, the Rawlins RMP has reclamation guidance and criteria, and the BLM Wyoming reclamation policy is available online at: http://www.blm.gov/wy/st/en/programs/reclamation.html
RCL	Process	S04	10	Reclamation has been extremely difficult in CD-C due to limited precipitation and poor soils. There must be increased attention to developing and implementing acceptable reclamation techniques, reclamation management and standards prior to permitting this level of development. There have been significant invasive weed infestations that need to be reduced. Since reclaimed lands are attractive to both wildlife and livestock, this must be addressed prior to development. We suggest that energy companies work with permittees to prevent grazing on reclamation sites until successful reclamation is achieved. By compensating the livestock producers for losses accrued by not grazing impacted allotments, increased success of reclaimed areas would be expected. We also suggest that BLM and developers make a concerted effort to develop successful CD-C project area reclamation techniques including a reclamation office to track and monitor disturbance, reclamation and invasive weeds.	Please see the updated **Appendix E** with regard to reclamation planning in the CD-C project area. More coordination between the BLM and affected users is an objective of the Agency Preferred Alternative, through the use of the CD-C consultation and coordination group.
RCL	Process and monitoring	O12/ O13	3	The soil and hydrology of the area are not as conducive to standard reclamation activities and the use of non-native vegetation in reclamation activities would also not ecologically suffice. We would like to see more specifics as to how the process of reclamation of proposed activities would occur and specifically how these activities would be monitored.	Information is provided in Appendix E, Reclamation Plan. In addition, the Rawlins RMP has reclamation guidance and criteria, and the BLM Wyoming reclamation policy is available online at: http://www.blm.gov/wy/st/en/programs/reclamation.html

Category	Sub-Category	Comment		Comment	Response
		Code	No		
RCL	Reclamation	In05, In08	84	BLM indicates that under the PA, timely reclamation could provide grass and revegetation within one to several years depending on reclamation effectiveness. This seems to contradict the language in section 4.3.3 wherein BLM inaccurately suggests that pipeline ROW will not be reclaimed as soon as practical under the PA. BLM should revise the document to ensure the pipeline ROW will be timely reclaimed under all alternatives, including the PA.	Please see the updated Final EIS. Text has been clarified.
RCL	Research	O12/ O13	20	Producers must be encouraged to research and develop more appropriate, more successful methods of reclamation if over 57% of the disturbance is going to be located in areas that are rated "poor" for reclamation.	The CD-C Operators will submit reclamation plans for site-specific development proposals based on the BLM's guidance and requirements and also based on their own experience and their own understanding of the conditions where their sites are located.
RCL	Rollover credits	O12/ O13	16	2.2.4 This type of reclamation is often used and very rarely is successful in this precipitation zone and soil type. In theory, this is an acceptable reclamation process, but in a very slow growing, fragile vegetation system. Rollover credit tend to be awarded prematurely and the operators are no longer held accountable for reclamation success. This trend leads to insufficient reclamation, especially 10-20 years post disturbance. If this type of reclamation is to be implemented, the BLM must be willing to hold the operators more accountable to long-term reclamation success or have much more stringent reclamation success standards. These must include adequate shrub and forb components (comparable to adjacent, undisturbed sites) and establishment of NATIVE grass species. A good resource to use in determining success of reclamation is section 3.6 if the Draft EIS which identifies acceptable species that can be found within each ecotype. If this level of reclamation success is unattainable, the permitting of a project of this size is ill-advised and should be postponed until proper reclamation techniques are developed to adequately reclaim these vegetative types.	Thank you for your comment.
RCL	Standards	C03	19	Reclamation: Sweetwater County encourages development techniques that minimize disturbance and accelerate reclamation. Reclamation seed mixes should consider wildlife and noxious and invasive weed control and are should be in conformance with the best management practices recognized by the University of Wyoming and local conservation districts.	Please see the updated **Reclamation Plan (Appendix E)**.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
REC	Carbon County Comp. Use Plan	C01	11	Recreation Trends: The 1998 Carbon County Land Use Plan has been replaced by the 2010 Comprehensive Land Use Plan, Amended 2012.	**Section 3.12.3 Recreation Trends** has been revised to reflect the 2010 Carbon County Comprehensive Land Use Plan, Amended 2012, and the citation has been updated.
REC	Lands with Wilderness Characteris-tics	O04	67	The Draft EIS notes no lands with wilderness characteristics within the Project Area. Draft EIS at 3-138. However, BCA has through intensive field inventories determined that an eastward extension of the Red Lake Wilderness Study Area (located entirely within the Rock Springs Field Office) extends a distance into the Rawlins Field Office and includes part of the Project Area in question. We petition BLM pursuant to 5 USC § 555(e) to evaluate these lands with wilderness characteristics in the context of the project-level NEPA for CD-C, and apply measures for interim protection of wilderness qualities while a Plan Amendment is being prepared to address this significant new information. See letter for more information on this issue.	Evaluation of Lands with Wilderness Characteristics is not within the scope of this EIS.
REC	Protections	O01	16	Recommendation for Recreation: We agree with No Surface Occupancy (NSO) for a quarter mile surrounding the Little Robbers Gulch Reservoir. If the area is going to be available for oil and gas leasing, NSO is suitable for protecting the recreation component.	An NSO for Little Robbers Gulch Reservoir cannot be included in the Final EIS as this may be considered a significant change between Draft and Final EIS. In addition, an NSO at this reservoir would require an RMP amendment.
RG	Baseline data	S02	6	Page 3-203, second paragraph: The WDA asks that NASS and WASS data be updated to 2012.	The cited data have been updated in the Final EIS.
RG	Editorial	O04	62	There are major differences in the estimated AUMs of forage lost by alternative between Table ES-2 and the body of the Executive Summary. See Draft EIS at ES-13, ES-25. Please explain these large-scale discrepancies. Which figures are correct?	The discrepancies noted in the Draft EIS have been corrected in the Final EIS.
RG	Impact analysis	In07	18	Page 4-210 to 4-218, Range Resources. No mention is made of the possibility that many reclaimed areas, particularly those on allotments with degraded range, may within just a few years provide increased livestock forage(grass) above that of the adjacent native range.	As described in **Section 4.6.4, "**Long-term impacts would be positive, assuming successful revegetation of BLM-approved seed mixes which would provide a younger, more vigorous and nutritious food source for wildlife, livestock, and wild horses on reclaimed areas."
RG	Impact analysis	S02	7	Page 4-215, third paragraph: The WDA asks that the BLM analyze in the Final EIS how to address the allotments that may have exceeded the significance criteria already and to define and clarify the difference between the use of the words *long-term* and *permanent* in this context.	Based on the data presented in Chapter 3, none of the allotments in the CD-C project area has exceeded the significance criteria. "Short-term" and "long-term" in this context are defined in **Section 3.18.2**. "Permanent" is a term from the Livestock Grazing section of the RMP, meaning "not expected to change or revert to a prior state."

Category	Sub-Category	Comment		Comment	Response
		Code	No		
RG	Livestock	C02	35	The Draft EIS states that rangeland standards were not met within the project area due to livestock grazing, weeds, drought, and oil and gas development. CD-C Draft EIS at 3-207. However, as recognized in the Rawlins RMP, wild horse numbers and elk numbers exceed population objectives and are direct competitors to livestock and also reasons why rangeland standards are not reached..... See Rawlins RMP at 3-28 (2008).....The Draft EIS cannot limit its analysis to just the listed factors but must also include all herbivore wildlife impacts on range resources.	The cited text refers to the 2002 and 2003 BLM assessments of rangeland health in the Upper Colorado River and the Great Divide Basin watersheds. These watersheds were reassessed in 2012 and 2013 and management progress as well as range improvements resulted in "substantially meeting standards and guidelines in these watersheds within the CD-C project area."
RG	Mitigation	C02	3	"The SWCCD LRUPP [Land and Resource Plan and Policies] also supports the continued use of private, state, and federal land for the production of livestock, and supports the...protection of all private property rights, including water rights... Any NEPA documents addressing the impacts from field development must also address mitigation and compensation to affected ranchers for loss of and disruption to grazing."	**Appendix C**, **Best Management Practices and Conditions of Approva**l, describes numerous measures to mitigate and offset the impacts on livestock. **Section 4.18.5** describes additional measures that BLM might pursue to mitigate those impacts.
RG	Road impacts	C02	34	The Draft EIS incorrectly assumes that new and improved access could improve livestock operations by improving access. CD-C Draft EIS at 4-214. The ranchers already have access to their grazing allotments for all operations as a statutory right under the Taylor Grazing Act and such access routes are well established.... Further, oil and gas development quite often interferes with stock drives and decreases access to grazing allotments.	New access roads to oil and gas operations will improve access for livestock operators, as these will be new roads and will provide access to areas that were not previously accessible by livestock operators.
RG	Stocking rates	O12/ O13	19	There must be adequate and representative adjustments in stocking rates in areas that are impacted by the development of the project. If stocking rates are not decreased when available AUMs are decreased due to disturbance, livestock stocking rates will become unsupportable by available forage and irreparable damage will occur.	**Section 4.18, Range Resources**, evaluates the potential for forage losses in each allotment in the CD-C project area. The Rawlins RMP considers a 10 percent reduction in AUMs available for livestock grazing within a given allotment a significant impact. Based on the information presented in Chapter 3, none of the allotments within the CD-C project area are close to reaching the 10 percent permanent loss of AUMs.
SE	Additional data	C01	18	Page 3-165; 3.15.4.1 Law Enforcement: The EIS should include the Wyoming State Patrol and the additional traffic enforcement on 1-80 and Highway 789, and additional WY Game & Fish enforcement, if not included under wildlife.	Text has been added to **Section 3.15.4.1** to acknowledge Wyoming State Patrol and Wyoming Game and Fish resources within and near the project area and the potential for increased demands on those resources.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
SE	Baseline update	C01, O11, P08	13	Based upon experience from past developments in the region, we are recommending that an updated socioeconomic study be prepared for the EIS that includes potential impacts to the Upper North Platte Valley, including the towns of Saratoga, Riverside and Encampment.	Although some direct project workers associated with the CD-C Proposed Action and alternatives may choose to live in the Upper North Platte Valley or may be current residents of the valley, it is anticipated that their numbers would be relatively small for the following reasons: (1) Saratoga, the nearest Upper North Platte Valley community to the CD-C project area is about 70 miles distant. Riverside and Encampment are about 85 and 86 miles from the eastern boundary of the project area via I80 and WY 230. Although Riverside and Encampment are somewhat closer to the southern portion of the CD-C project area via WY 70, this highway is often closed during winter months; (2) Temporary workers choosing the UNPV would be driving an extra 80 to 120 miles daily, as compared to living in Rawlins, and Rawlins has substantially more housing resources than the Upper North Platte Valley communities; (3) There is also competition for temporary housing (motels and recreational vehicle parks) in the Upper North Platte Valley during summer months, which is the period when CD-C-related development would be at its highest levels; and (4) Most of the oil and gas service companies that provide services within the CD-C project area have their headquarters in Rock Springs or Rawlins. Local employees of these companies may work in the CD-C project area on some occasions and may work elsewhere (e.g., Pinedale or Northern Colorado) on other occasions. Therefore the bulk of the project workers are likely to live in these communities, near their employers. Nevertheless, several commenters have stated that some oil and gas workers currently live in Upper North Platte Valley communities, indirect and induced workers whose place of work may be in Rawlins may choose to live there, and some CD-C-related employees may recreate in the valley, text will be added to describe existing socioeconomic conditions in the valley and discuss potential effects associated with the Proposed Action and alternatives.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
SE	Clarification	In07	14	Page 4-116 (4-145?), Economic Effects. It is important to state that the assumption that all employment and income associated with development will cease after 15 years is for analysis purposes only, and that it is quite likely that development and its associated employment and income will continue after this period. Under the subsection "Uncertainty" In Section 4.15.2 on page 4-145, the Draft EIS The socioeconomic assessment assumes a sustained, relatively high level of new well development over time. However, the actual pace of natural gas drilling has been and will continue to be variable and unpredictable because development decisions are dependent on a variety of factors including natural gas demand, pricing, regulatory approvals, rig and manpower availability, transmission pipeline capacity, weather, and the overall investment and development strategies of individual energy companies."	**Section 4.15.2.2** (Proposed Action) of the Draft EIS states, "The actual pace and timing of development in the project area would be dependent on a variety of factors including natural gas demand, pricing, regulatory approvals, rig and manpower availability, weather, and corporate strategies." A sentence has been added that identifies the possibility that development could continue beyond the 15-year period associated with the Proposed Action, but that the 15-year assessment period was chosen by the BLM and the Operators as the development period for assessment purposes.
SE	Comprehen-sive Economic Dev. Strategy	C01	12	Carbon and Sweetwater County formed the Great Divide Economic Development Coalition and adopted a "Comprehensive Economic Development Strategy" in November 2012. The CEDS Plan should be referenced and reviewed for updated socioeconomic data.	Thank you for bringing this document to our attention. The Great Divide Economic Development Coalition's Comprehensive Economic Development Strategy has been reviewed and considered. It provides a great deal of useful information.
SE	County land use plans	C01	3	The FEIS should accurately refer to the County Land Use Plan and consider applicable Goals and Policies,	All references to the Carbon County Land Use Plan in the EIS have been changed to Carbon County *Comprehensive* Land Use Plan.
SE	Cumulative impacts	C03	5	Cumulative Socioeconomic Impacts: Sweetwater County encourages industry, the BLM, State of Wyoming and local governments to work as partners in monitoring, evaluating, and mitigating identified cumulative socioeconomic impacts.	Thank you for your comment.
SE	Editorial	C01	19	Page 3-166; 3>15.4.2 Emergency Mgmt. and Response: The Noyes Medical Clinic is no longer operating in Baggs. Contact the Little Snake River Rural Health District (307-383-7645) for more information.	**Section 3.15.4.2** has been updated with current information on emergency response facilities.
SE	Editorial	C01	20	According to their web site www.imhcc.com MHCC is a 25 bed acute care facility, not 35 beds.	The text has been revised to show that MHCC is a 25-bed acute-care facility.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
SE	Impact analysis	C04	4	Reasons for the inaccuracy of socio-economic analysis include: 1) a limited scope of work provided to the socio-economic contractors/ subcontractors; 2) failure to provide the contractors/ subcontracts with clear information pertaining to the restrictions considered in the alternatives; and 3) and failure to involve the cooperating agencies in the development of the scope of the socio-economic analysis, model inputs and quantitative description.	The socioeconomic analysis is accurate based on the assumptions pertaining to the alternatives.
SE	Impact analysis	In05, In08	71	The information in the Draft EIS demonstrates the importance of O&G development to the state and regional economies. It is a primary driver for employment in the region. BLM should ensure its decisions do not adversely impact employment or other sources of income for the economy. It is important for BLM to note that Carbon and Sweetwater Counties are highly dependent upon mineral production and development for tax revenue. As a result, BLM should not take any action which could impact the value of these minerals or harm the economies of the Counties. The analysis also confirms that O&G development in the project area contributes significant revenue to the State of Wyoming and the federal government.	Thank you for your comment.
SE	Impact analysis	O02	3	"... we find not a single reference to tourism [which is second only to energy extraction in producing income for local economies], let alone the unique subdivision of heritage tourists…."	Section 3.5 (Tourism, Travel and Outdoor Recreation) of the 2008 Baseline Socioeconomic Technical Report provides a discussion of the regional tourism economy and the effects of oil and gas development on tourism resources including heritage tourism. **Section 3.15.1** of the Draft EIS (Travel and Tourism, Including Outdoor Recreation) summarizes the discussion in the Socioeconomic Technical Report. The subsections Effects on Other Uses in the Project Area (Recreation and Ranching/Grazing) and Effects on Environmental Amenity Values in **Section 4.15.2** of the Draft EIS discuss potential effects on recreation visitors and tourism and the resources that support these activities.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
SE	Impact analysis	O02	7	"You point out that, as unrestricted viewscapes vanish, 'recreationists seeking natural-looking landscapes would have to travel elsewhere and perhaps for greater distances" (p. 5-38) but completely ignore the fact that... extra travel means not stopping in the affected communities and a resulting... very negative [cultural and economic] impact in those communities."	As noted in the Draft EIS, "Much of the project area has already been affected by development, adversely affecting some outdoor amenities including wildlife and wildlife habitat, scenic vistas, and areas that provide opportunities for solitude." (see **Section 3.15.7.3** (Recreation Users of the Area), **Section 4.15.2.1** (Impacts Common to All Action Alternatives) "Effects on Other Uses in the Project Area (Recreation and Ranching/Grazing)" and "Effects on Environmental Amenity Values." These sections also note that "The effect of doubling the average annual level of drilling and field-development activity under the action alternatives would increase the potential for conflict with recreation activities and for displacement of recreation use of the area… Shifts in the geographic distribution of hunting and other recreation activity could have corresponding economic implications as well." The Draft EIS also notes that… "All alternatives would continue to affect these amenities (wildlife and wildlife habitat, scenic vistas, and areas that provide opportunities for solitude) although the No Action Alternative would result in no incremental effect. The action alternatives would intensify development in many currently developed areas of the project area and perhaps result in development in currently undeveloped areas." Additionally, Section 3.5 (Tourism, Travel and Outdoor Recreation) of the 2008 Baseline Socioeconomic Technical Report provides a discussion of the potential effects of energy resource development on the amenity values of public lands and the resultant effects on tourism and travel-related businesses (pages 22 and 23). It should also be noted that the oil and gas development has been ongoing in and around the CD-C project area for over 50 years and much of the land within the project area has already seen intensive levels of development. The communities within and adjacent to the CD-C project area serve tourism and recreation visitors to a broad area of southwestern Wyoming. It is not known how many of these visitors recreate within the CD-C project area specifically, but given the historic and ongoing level of development in the area, tourism and recreation use of the area is thought to be low. It is likely that most visitors to the affected communities recreate in other areas of southwest Wyoming.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
SE	Impact analysis	P23	3	The proponent and others should proactively address the social impact of more jobs and people to small towns in Wyoming.	Thank you for your comment.
SE	Impact analysis	O11	1	The Upper North Platte Valley (UNPV) communities of Saratoga, Encampment and Riverside are not considered for analysis and consultation. This assumption is inconsistent with our experience. In the past, many workers from similar developments have found places to live in the UNPV. The impact area should be expanded to include the UNPV and the same socioeconomic information provided for the other communities in the impact area should be provided for communities in the UNPV.	Although some direct project workers associated with the CD-C Proposed Action and alternatives may choose to live in the Upper North Platte Valley or may be current residents of the valley, it is anticipated that their numbers would be relatively small for the following reasons: (1) Saratoga, the nearest Upper North Platte Valley community to the CD-C project area is about 70 miles distant. Riverside and Encampment are about 85 and 86 miles from the eastern boundary of the project area via I80 and WY 230. Although Riverside and Encampment are somewhat closer to the southern portion of the CD-C project area via WY 70, this highway is often closed during winter months; (2) Temporary workers choosing the UNPV would be driving an extra 80 to 120 miles daily, as compared to living in Rawlins, and Rawlins has substantially more housing resources than the Upper North Platte Valley communities; (3.) There is also competition for temporary housing (motels and recreational vehicle parks) in the Upper North Platte Valley during summer months, which is the period when CD-C-related development would be at its highest levels; and (4) Most of the oil and gas service companies that provide services within the CD-C project area have their headquarters in Rock Springs or Rawlins. Local employees of these companies may work in the CD-C project area on some occasions and may work elsewhere (e.g., Pinedale or Northern Colorado) on other occasions. Therefore the bulk of the project workers are likely to live in these communities, near their employers. Nevertheless, several commenters have stated that some oil and gas workers currently live in Upper North Platte Valley communities, indirect and induced workers whose place of work may be in Rawlins may choose to live there, and some CD-C-related employees may recreate in the valley, text will be added to describe existing socioeconomic conditions in the valley and discuss potential effects associated with the Proposed Action and alternatives.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
SE	Impact analysis	O11	1, cont.		Additionally, the communities' experience with temporary workers would be expected given the industrial construction projects in Sinclair, wind energy construction projects in the Arlington area, and more proximate oil and gas development in the Seminoe Road, Atlantic Rim, and South Baggs fields and in northern Colorado. There have also been recent pipeline construction and operations activities to the north. However, all of those locations are substantially closer to the Upper North Platte Valley than is the CD-C area.
SE	Jobs	In05, In08	99	The BLM's analysis indicates the Proposed Action can lead to approximately 430 direct jobs and as many as 4,000 direct and indirect jobs within Sweetwater and Carbon Counties, Wyoming. CD-C Draft EIS, pg. 4-155. The BLM should take any action necessary to encourage the development of new economic activity and employment within the area, especially given the economic down-turning experienced by the region over the past several years. The BLM must ensure that it does not take any action that would jeopardize or decrease the creation of future jobs within the project area, such as the unnecessary and unwarranted mitigation measures imposed under Alternative B. CD-C Draft EIS, pg. 4-157. The adoption of the Proposed Action has significant potential for job creation in the area including a ten percent increase over current activity. The BLM's analysis also demonstrates that adoption of the Proposed Action would lead to significant sources of revenue for the federal, state, and local treasuries. Total taxes from the project may be greater than $818 million in severance tax alone. CD-C Draft EIS, pg. 4-170. Projected federal royalties will be even greater and it is estimated that in the first ten years, over one billion dollars in total revenues may be provided to the federal treasury and the State of Wyoming. CD-C Draft EIS, pg. 4-171. Over the life of the project nearly four billion dollars in revenue could be generated from the Proposed Action. The significant source of revenue will be distributed to counties across the State of Wyoming through education funding and state budget reserves. CD-C Draft EIS, pgs. 4-172 -4-173.	Thank you for your comment. The BLM expects that three of the action alternatives would generate socioeconomic effects similar to the Proposed Action with minor differences. The Final EIS also recognizes that Alternative D may reduce the drilling rate and socioeconomic benefits. Please see updated text and analysis that further describes this conclusion.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
SE	Local customs and culture	C01	1	Carbon County is supportive of the proposed CD-C development project; however, it should be developed with respect for local customs and culture and be developed in accordance with locally adopted Plans and Policies.	Thank you for your comment.
SE	Local workers	In05, In08	101	As a proposed mitigation measure, the BLM proposes to require the operators to attempt to hire and train only local workers and to obtain all their materials and supplies from the local area. CD-C DEIS, pg. 4-189. Although Devon attempts to utilize a significant number of local workers and to utilize local sources of supplies and equipment, the BLM cannot mandate such a requirement. Its requirement to utilize only local contractors would likely violate federal law.	The proposed mitigation measure states "To the extent practicable, the Operators should attempt to hire and train local workers from Carbon and Sweetwater counties" (emphasis added). It does not suggest that the BLM require Operators to hire only local workers. Neither does the assessment suggest that Operators obtain all materials and supplies from the local area. However, hiring qualified local workers and obtaining supplies locally, to the extent practicable, are widely recognized as methods to reduce adverse socioeconomic effects of oil and gas development and enhance beneficial economic effects.
SE	Rates of development	In05, In08	100	The BLM erroneously concludes that the same degree of oil and gas development will occur under Alternatives B, C, and D. Substantial mitigation measures required under each of these alternatives will necessarily foreclose some oil and gas development within the CD-C Project Area. It is inappropriate for the BLM to assume the same level of oil and gas development will take place given the cost of development incorporated within Alternatives B and D, in particular. If one-hundred percent directional drilling is required, for example, the operators would make careful decisions about how many oil and gas wells would actually be developed within the area. Under no circumstance would the same number of wells be developed under Alternatives B, C and D as would be developed under the Proposed Action or Alternative A. The BLM has not attempted to and cannot justify this position. The BLM should accurately report to members of the public the socioeconomic disadvantages associated with Alternatives B, C, and D.	Based on several comments on the Draft EIS, the RFO reviewed the likely effect of the requirements of the CD-C alternatives on drilling rates and total number of wells drilled in the project area. The review concluded: (1) Existing seasonal activity constraints already affect decisions about directional drilling under the Proposed Action as much as they would under the alternatives; (2) The alternatives encourage greater use of directional drilling, a technology that operators are already adopting on their own; (3) While some of the alternative requirements are likely to increase costs, the cost increases would likely be such that they are within the normal realm of operational cost increases (such as those that arise from the switch to directional drilling) or of natural gas price changes; (4) Requirements that emphasize improved reclamation are based on the premise that the project's 15-year development period provides sufficient time to achieve reclamation goals; and (5) Alternative D, Directional Drilling, is likely to result in a decline in drilling rates and well numbers. This has been reflected in the Final EIS. The impact analysis in the Final EIS recognizes this determination.
SE	Recreation	O10	6	Trout Unlimited feels that the Draft EIS does not sufficiently analyze the impacts to recreation and sportsmen, in particular the socioeconomic effects.	**Section 4.15.4, Effects on Other Uses in the Project Area (Recreation and Ranching/Grazing)** summarizes potential effects on recreation users for all action alternatives.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
SE	Seasonal drilling limitations	C01	15	Carbon County is also concerned about the possible negative impact of seasonal drilling limitations and environmental restrictions on project drilling objectives. While recognizing the need to protect wildlife habitat and particularly Sage Grouse in the project area, Carbon County believes that a common sense approach to project alternatives, such as allowing possible year round drilling outside of the Sage Grouse Core Area, would maximize drilling and economic opportunity while still adequately protecting wildlife concerns. This discussion should be considered in any update of socioeconomic analysis.	Seasonal timing stipulations are required by the Rawlins RMP, and would be implemented regardless of alternative. In order to allow for year-round drilling in the project area. The project proponents would need to receive blanket exemptions to seasonal wildlife stipulations. This was considered in the Focused Development Alternative that was dropped from detailed study for two reasons, one of which concerned the legality of exempting Operators from the seasonal wildlife stipulations for lengthy periods of time.
SE	Temporary living facilities	C01	16	Page 3-161: Temporary living facilities along Hwy 789 have been permitted by Carbon County and some permits have recently been modified. Please contact Carbon County Planning & Development for more specific information.	The Final EIS has been modified to reflect modifications to permitted temporary living facilities along WY 789.
SE	Updated information	C01	17	Page 3-161: Updated information is available in the City of Rawlins Economic Development Plan-October 2012 and the Draft Comprehensive Master Plan-20 13.	Thank you for bringing these documents to our attention. They have been reviewed and considered. While they provide much data and information, incorporating this information into the Final EIS would not change the conclusions of the socioeconomic assessment.
SL	Baseline data	In01	22	Page 3-18 cites NRCS soils data which ranks soils mainly for suitability as farmland/commercial crop production and livestock production. This soil “ranking” may not be appropriate for the analysis of oil and gas development. APC recommends that the BLM disclose typical uses of NRCS soils data and identify how this data relates to oil and gas development.	The livestock production ranking is suitable for the CD-C project area, as the majority of the project area is also used for livestock production. The reference to the NRCS soils data is sufficient for the concerned public.
SL	Impact analysis	C02	40	The Draft EIS discusses the surface runoff potential of the soils in the project area and...gives a percentage of those areas that have high and moderate runoff potential, as well as the percentage of wells currently drilled within the moderate runoff potential area. Id. at 3-24. However, it fails to state the percentage of wells currently drilled in the high and low runoff potential areas. It is misleading to only provide this information for the moderate runoff potential area when the project area is almost equally comprised of high, moderate, and low runoff areas.	The information sought can be found in **Table 3.3-1**.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
SL	Reclamation	In01	23	When discussing direct and indirect impacts to soils on page 4-15, no consistent guideline or document for reclamation is identified. The BLM should identify one consistent approach to reclamation to eliminate potential confusion.	Please see the updated document. **Appendix E** is the reclamation plan for the Proposed Action and Alternatives B, D, and F; **Appendix M** is the reclamation plan for Alternative C.
SL	Reclamation	In05, In08	60	Since the majority of soils in the project area have poor reclamation potential, BLM should reward operators that engage in enhanced reclamation programs in any alternative selected as the Preferred Alternative.	Thank you for your comment.
SL	Rights-of-way	In05, In08	77	Throughout the soil section, the BLM suggests that reclamation of pipeline right-of-way disturbances would be initiated immediately upon the completion of the construction under Alternatives B, C, and D, but not the Proposed Action. CD-C Draft EIS, pgs. 4-18 -4-19. The BLM has not explained or justified why the benefits of immediately reclaiming pipeline disturbances would be initiated only under Alternatives B, C and D. It is Devon's experience and its common practice to begin reclamation of pipeline corridors immediately after construction operations are complete. The BLM should revise the Final EIS to clarify that reclamation would be immediately initiated after all pipeline construction is complete under the Proposed Action as well as Alternatives B, C, and D. As currently drafted, the language in the CD-C DE IS reflects a bias against the Proposed Action that is neither justified nor warranted.	The description of reclamation practices in the Proposed Action was provided by the Operators and did not include any detail as to pipeline reclamation. However, based on BLM regulations and requirements, the Operators would be expected to initiate reclamation within six months of completion, or immediately as in the case of pipelines.
SS	Aquatic COAs	S04	18	Aquatic standard site-specific requirements that should be added to the Preferred Alternative: maintenance of existing roads to ensure that are not contributing sediment to Muddy Creek or adjacent wetlands and boring of all pipeline crossings of riparian areas.	Maintenance of roads is a requirement of the Rawlins RMP, site-specific design features, and other BLM regulations. Boring of all pipeline crossings of riparian areas is generally required but is considered on a case-by-case basis at the discretion of the BLM hydrologist.
SS	Fish	S04	17	Sensitive fish habitat should be identified in the Final EIS and Muddy Creek (including the Red Wash/Muddy Creek Sensitive Fish Habitat and the Muddy Creek and Bitter Creek watershed for water quality, aquatic physical habitats and sensitive fish habitat (Map 3.9-5).	"Sensitive fish habitat" is not a formal designation. All of Lower Muddy Creek and Red Wash within the project area (**Map 3.9-5**) are considered sensitive fish habitat.
SS	Sage-Grouse	S02	4	Page 3-105,106, last paragraph each page: The WDA asks that the word *undetermined* not be used a modifier of lek here and elsewhere in the Draft EIS.	The word "undetermined" is a category used by the Wyoming Game and Fish Department and its use is appropriate here.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
T&E	Alternative B	In05, In08	93	The description of potential environmental consequences in Alternative B appears to be extraordinarily biased. The language and commentary contained in chapter 4 appears to be designed to force BLM to select Alternative B. Given the numerous failings of Alternative B, Devon encourages the BLM not to select Alternative B and to revise Chapter 4 to contain an accurate and unbiased description of Alternative B.	Thank you for your comment. All alternatives have been analyzed.
T&E	Appendix I, Bald Eagles	In01	17	Due to the confirmed lack of nesting habitat for bald eagles within the Project area, surveying general flight patterns mentioned on page I-8 offers little value to the environmental assessment and is not needed to assess impacts of the Project. The BLM should revise this survey stipulation to at a maximum, include limited point count surveys to document general usage.	Please see the updated text in **Appendix I**. Not all species need to be monitored every year; rather, the Monitoring Without Borders group will determine on a yearly basis which species should be monitored and surveyed for. If bald eagles become a species of concern in the project area, then this monitoring plan allows for the flexibility to address the needs of species that may not initially be species of concern, but that may become species of concern.
T&E	BFF and Prairie Dogs	O04	44	A firm scientific understanding of the distribution of white-tailed prairie dogs throughout the Project Area and the potential impact of project-related activities is essential to adequate NEPA analysis of the likely direct, indirect, and cumulative impacts of oil and gas development on the white-tailed prairie dog, and associated species, including black-footed ferret. The information in these documents constitutes the best available science on white-tailed prairie dogs, and the impacts of oil and gas development on white-tailed prairie dogs. The BLM has yet to consider the information contained within these documents as part of a National Environmental Policy Act (NEPA) analysis of the impacts of oil and gas development on white-tailed prairie dogs or associated species, including black-footed ferrets. See letter at p.18 for the document citations including information from BLM's programmatic BE.	The USFWS determined in 2013 that the Endangered black-footed ferret does not inhabit the CD-C project area; therefore, the project will have no effect on the species and it is not discussed in the Final EIS.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
T&E	BFF and Prairie Dogs	O04	45	The Draft EIS indicates that prairie dog colonies in the Dad Complex, within the Project Area, have not yet been surveyed to determine the presence or absence of black-footed ferrets. Draft EIS at ES-20. Given that the Project Area is less than 100 miles from known occupied black-footed ferret habitat in the Shirley Basin and Wick-Beumee WHMA, and predators are known to disperse long distances, BLM must require such surveys to be completed as part of the NEPA analysis for the project in order to meet NEPA's 'baseline information' requirements.	Please see **Section 3.9.1**, where the changed status of the black-footed ferret within the CD-C project area is discussed.
T&E	Black-footed ferret	F03	18	Page 4-100, Black-footed ferret: The Final EIS should identify the effects of the project to the black-footed ferret and identify all measures the BLM will use to avoid and minimize the adverse effects of the Proposed Action. We encourage The BLM and project proponents to protect all prairie dog towns or complexes for their value to the prairie ecosystem and we encourage the BLM to analyze potentially disturbed prairie dog towns for their value to future black-footed ferret reintroduction.	Please see **Section 3.9.1**, where the changed status of the black-footed ferret within the CD-C project area is discussed. In addition, on a project basis, surveys for prairie dog towns are undertaken and every effort is made to avoid impacting these areas. Most often, the proposed project is moved to avoid the prairie dog town.
T&E	CBM development	F03	7	The Draft EIS does not include an analysis of the potential direct, indirect and cumulative effects of CBM development to endangered, threatened, proposed, candidate species, species of concern and migratory birds and the habitats upon which these species depend.	The disposal of produced water from CBM development is not analyzed in this EIS, only the surface disturbance and the disruptive activity associated with such development. If the BLM receives proposals for disposal of CBM-produced water within the CD-C project area, those proposals will be analyzed in a subsequent NEPA document.
T&E	Clarification	In07	11	Page 4-112, Sage-grouse, various locations. While habitat enhancements/vegetation treatments are identified, the responsible entities for implementation are not; please specify responsible entities.	The Greater Sage-Grouse element of Alternative B has been removed. Management of Greater Sage-Grouse under all alternatives will be consistent with the BLM Approved Resource Management Plan Amendments for Greater Sage-Grouse, and the Wyoming Greater Sage-Grouse Conservation Strategy. Please see **Section 2.2.7.9** of the Final EIS for a description of Greater Sage-Grouse management in the CD-C project area.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
T&E	CO cutthroat trout	O01	14	To successfully conserve CRCT habitat, we recommend consideration and adoption of the following additional lease stipulations, COA, and other management prescriptions within the Muddy Creek and Little Snake Watersheds: Full mapping of streams, riparian areas, and wetlands prior to any drilling authorization. • Require one-mile setbacks for drilling and construction from waterways and riparian areas. • Mapping of all steep and/or high erodible soils and prohibition on their disturbance. • No use of open pits (production, disposal, or otherwise) within CRCT watersheds. • Requirements for secure off-site disposal of all wastes. • Avoidance of new stream crossings wherever possible, and adherence to the highest possible standards for habitat protection where such crossings cannot be avoided.	Onsite inspections will be conducted prior to any drilling authorizations, which would identify any wetlands and riparian areas in the project area. One-mile setbacks from waterways and riparian areas would preclude any development, and the BLM is required by law to allow development of existing leases. Soil mapping is currently being done for the area by the NRCS and will be completed soon. This information would be used on a site-specific basis prior to approval of any permit applications. No use of open pits within the CRCT watersheds is being proposed as part of a mitigation measure of Alternative B. Site-specific onsite inspections generally result in re-routing of roads and pipelines that cross drainages.
T&E	COAs	F03	25	Page C-7, COA Number 9: The Service recommends this COA be revised by adding *eagle (bald or golden)* to the species list.	COAs cannot be modified using the EIS. COAs are developed based on the BLM interdisciplinary process and implemented at the APD level.
T&E	COAs	F03	26	Page C-7. COA Number 10: The Service recommends this COA be revised by adding *U.S. Fish and Wildlife Service's Wyoming Field Office* and *its law enforcement office* to the contact list.	Please see the response to F03-25 above.
T&E	COAs	F03	27	Page C-7, COA Number 11. The Service recommends this COA be modified by clarifying the process when a take permit is required.	Please see the response to F03-25 above.
T&E	Conserva-tion measures	F03	3	The Final EIS and BA should incorporate BLM's programmatic BA's and the Service's BOs, which have conservation measures and terms and conditions that are in the Rawlins RMP.	The CD-C BA explicitly references the relevant programmatic BAs and BOs and the conservation measures that would serve to protect the species if they were present in the project area.
T&E	Conserva-tion measures	F03	24	Page C-1. Because BMPs are not regulatory, they cannot be considered by the Service as conservation measures used to avoid or minimize adverse effects during the Section 7 consultation process. We recommend Appendix C clearly identify which measures are voluntary BMPs and which conservation/mitigation measures will be required by the BLM as programmatic COAs within the project area.	The BMPs considered in Appendix C arise out of the Rawlins RMP and are coupled with COAs because they may at times on a site-specific basis be applied to an APD as COAs or to a Right-of-Way as a Terms and Conditions. In that context they become regulatory. In the case of T&E species included in the CD-C BA, none of them - the Lynx, the fish of the Upper Colorado River, or the Ute Ladies'-tresses - is reliant on BMPs for their effects determination.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
T&E	Depletions	F03	12	The Service recommends the BLM consult on the maximum amount of water anticipated to be withdrawn from the system to avoid the need for additional consultations.	The discussion in the BA and the Final EIS has been modified to address the maximum depletion, not the average depletion.
T&E	Editorial	In07	13	Page 4-116, paragraph 3, line 7. Change the word "non-core" to "core".	The language in that section has been revised.
T&E	Fish	In01	10	Urbanization is listed as a category of impacts to new roads and other facilities on fish habitats on page 4-106; however, urbanization is not an appropriate impact category for the CD-C project area as urbanization, commonly defined as taking on the characteristics of a city, is not occurring in the Project area.	The reference to urbanization has been removed.
T&E	Fish	In01	11	Urbanization is again discussed on page 4-108 and is inappropriate in the context of the analysis. Urbanization should be replaced with “infrastructure development” to more appropriately address this aspect.	The reference to urbanization has been removed.
T&E	Fish	In01	14	Page 5-32 of the Draft EIS states “Suitable habitat for [Colorado pikeminnow, bonytail, humpback chub, and razorback sucker species does exist downstream of the CD-C and Atlantic Rim project areas in the Little Snake, Yampa, and Green Rivers,” but then contrarily states “Because the Colorado pikeminnow is found in the Little Snake River, it could migrate into Muddy Creek, which makes Muddy Creek potential habitat for this species. Muddy Creek, however, is not suitable habitat for this species.” Please consider revising these statements to eliminate the contradiction.	The statement has been revised.
T&E	Fish	In01	15	The BLM should provide documentation to support the claim that “[t]he Atlantic Rim project, however, has produced-water discharges to Muddy Creek that may be altering the hydrology of the creek.” (Page 5-32). If supportive documentation cannot be produced, this statement should be revised to remove speculation.	This statement has been removed from the Final EIS.
T&E	Fish	F03	11	Page 3-110, Section 3.9.1.2. The Service recommends the Final EIS include an analysis of the potential to adversely affect the four downstream endangered fish species by: pollutants - accidental releases of fluids, CBNG produced water, and other hazardous materials – discharged to surface-water systems; improper drilling and completion operations; and subsurface disposal of produced water.	The text of the BA and the Final EIS have been modified to include a more thorough analysis of the risks to these species from these materials.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
T&E	Fish	F03	13	The effects for Colorado River fish have not adequately been analyzed. Further, conclusions are supported by BMPs and conservation measures which may or may not be implemented at the discretion of the applicant. We recommend the Final EIS clearly identify all applicant committed measures, BMPs and programmatic conservation measures which will be used to avoid and minimize adverse effects to listed species.	The BMPs considered in Appendix C arise out of the Rawlins RMP and are coupled with COAs because they may at times on a site-specific basis be applied to an APD as COAs or to a right-of-way as Terms and Conditions. In that context they become regulatory. In the case of T&E species included in the CD-C BA, none of them—the Lynx, the fish of the Upper Colorado River, or the Ute Ladies'-tresses—is reliant on BMPs for their effects determination.
T&E	Impact analysis	F03	2	The Service recommends a more thorough analysis of direct, indirect and cumulative effects on species and habitats and clearly identify measures BLM will implement to avoid or minimize adverse effects.	The direct, indirect, and cumulative impact analyses of Threatened, Endangered, Candidate and Proposed species potentially affected by the CD-C project have been reviewed and in some cases modified or expanded. The BLM specialists are satisfied that the analysis of these impacts in the Final EIS is sufficient.
T&E	Impact analysis, plants	F03	6	With respect to Special Status Plants, the Service recommends the Final EIS include an analysis of the potential effects of accidental releases of fluids, the discharge of produced water and other hazardous pollutants, changes to hydrology and hydrograph of streams and springs from the removal of groundwater, improper drilling and completion operations, subsurface disposal of produced water, and the deposition of dust on listed plants and plant species of concern. In addition, the Final EIS should clearly identify what measures the BLM will implement to avoid and minimize potential adverse effects to listed plants.	The analyses of the direct, indirect, and cumulative impacts on the Threatened Ute Ladies'-tresses produced by the CD-C project have been reviewed and in some cases modified or expanded. The BLM specialists are satisfied that the analysis of these impacts in the Final EIS is sufficient.
T&E	Mountain plover	O04	54	The mountain plover is a BLM Sensitive Species that has been documented within the Project Area. Draft EIS at Map 3,9-4. In the Draft EIS, BLM fails to provide baseline information about the size of the present population, and also fails to predict the population trend as a result of the project. It is interesting to note that mountain plover nesting was initially believed to be compatible with oil and gas development based on observations of plovers nesting near drilling pads in the Myton Bench area of northeastern Utah. However, this observation has subsequently been undercut by the fact that the Myton Bench plover population ultimately went extinct in the face of intensifying oil and gas development. The last mountain plover to be recorded in Utah was sighted in 2003. *More information regarding mt. plover follows in the letter.*	There are no population data for mountain plover in the project area. However, specific protection measures are considered on a site-specific basis when projects are proposed in mountain plover habitat.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
T&E	Mountain plover	O04	55	Oil and gas development in nesting concentration areas is a direct threat to mountain plover population viability… *Backup information follows in the letter.*	The Rawlins RMP specifies protections in identified mountain plover-occupied habitat.
T&E	Mountain plover	O04	56	BLM documents a considerable amount of mountain plover occupied habitat within the project area, heavily concentrated around Mexican Flats and southwest of Sweetwater County Road 23S. *See* Map 3.9-4. Mountain plover nesting habitat should be subject to a suspension of disruptive activities (including vehicle traffic) during the nesting period	Please see the response to O04-55 above.
T&E	Muddy Creek	In05, In08	91	When describing the potential impact to sensitive species under Alternative B, the BLM inappropriately suggests that operators, private land owners, and the State of Wyoming should make commitments to apply enhanced resource protections along the Muddy Creek drainage. CD-C DE1S, pg. 4-111. This is not a description of potential impacts as required by NEP A, but is rather a personal commentary from the BLM. This language is inappropriate and should be removed from the final E1S.	The text has been changed to indicate that the potential success of the buffer is diminished because BLM does not manage all of the mineral estate in the area. There is no reference to commitment.
T&E	Pygmy rabbits	O04	57	Occupied pygmy rabbit habitat needs to be mapped throughout the CD-C project area, and areas of mapped habitat should become avoidance areas for surface-disturbing activities. We can find no indication that BLM has mapped occupied habitat for this species, as it did in the Lost Creek EIS. This is important baseline information, determining the distribution and connectivity of known and suitable habitat and identifying the locations of occupied burrow complexes. For the Proposed Action, impacts to occupied burrow complexes are expected.	BLM has a survey and avoidance policy for protection of the species.
T&E	Pygmy rabbits	O04	58	The RFO has a “survey and avoidance” policy for pygmy rabbit burrow complexes (*id.*), but it is difficult to see how this will be implemented if the survey does not occur in the context of the CD-C EIS, the level at which sensitive habitats should be mapped so that future project-related developments can be designed to avoid them. BLM should fully field-survey the Project Area to identify occupied habitats, and require no surface disturbance on such sites.	A complete survey of 800,000 acres is not feasible; site-specific surveys are and will be more effective. In addition, timing stipulations to protect mountain plover are implemented on a site-specific basis.
T&E	Reclamation	F03	28	Page C-14, Reclamation Plan: The Service recommends the reclamation plan include a provision that prior to final reclamation, surveys for threatened, endangered, proposed and candidate species will be conducted.	COAs are provided in individual APDs and right-of-way grants and are not subject to revision in this document.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
T&E	Sage-Grouse	In01	5	The Greater Sage-Grouse discussion on page 3-105 fails to include hunting as a factor related to sage-grouse population declines. The most precipitous declines in the species may be observed from direct correlations with significant hunting mortality. Failure to include this factor in the sage-grouse discussion renders the analysis incomplete and skewed.	Hunting is discussed on pg. 3-108 of the Draft EIS. According to the generally accepted literature, a direct correlation between hunting and population declines cannot be made; however, there is some discussion that it may be additive rather than compensatory.
T&E	Sage-Grouse	In01	6	The Draft EIS utilizes greater sage--grouse data from 1990 on page 3-109. This is an inappropriate starting point for evaluation of population data for Greater Sage-Grouse. With the implementation of new hunting rules in 1995 which substantially reduced hunter participation and sage-grouse harvest rates in Wyoming, Greater Sage-Grouse saw a dramatic uplift which is captured on Figure 3.9-1 but discussed inappropriately as a natural cyclical population cycle. We urge BLM to shift the analysis timeframe to 1996 to be more representative of a “natural cycle.”	1990 is an appropriate starting point; Coonley et. al 2004 demonstrates similar populations trends rangewide including areas with no hunting.
T&E	Sage-Grouse	In01	13	“Severe winter use habitat” is discussed on page 5-30 in regards to sage-grouse habitat use; however, this term is not defined or consistent with standard terminology in use such as “winter concentration areas” or “winter use habitat.” APC recommends using terms that are consistent with current sage-grouse habitat use descriptors.	The term “severe winter use habitat” was a misstatement of the term used in the cited text, Dzialak et al., 2013b. The correct term is “severe winter habitat” and the text in the EIS has been corrected.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
T&E	Sage-Grouse	O04	24	Oil and gas development poses perhaps the greatest single threat to sage-grouse persistence across the eastern half of its range. Walker et al. (2007) found that sage-grouse habitat within 4 miles of a lek site was important to the persistence of the lek. Conversely, Walker et al. (2007) concluded that leks heavily impacted by oil and gas development "typically became inactive within 3-4 years." Harju et al. (2008) found a time lag of 2-10 years post-development, at which point negative effects became evident. The same is true for winter habitats. Indeed, Naugle et al. (2006) found that a model using habitat variables and coalbed methane development provided a near perfect fit for grouse distribution data. In the Powder River Basin, CBM well density within a 4 km2 area provided the best fit for modeling sage-grouse habitat use (Doherty et al. 2008). Holloran (2005) found that well densities greater than one well per 699 acres were correlated with lek declines. Doherty et al. (2010) did a statewide analysis in Wyoming and found that well densities greater than 1 well per square mile were correlated with sage-grouse declines.	The research from Montana and Eastern Wyoming (SG Management Zone 1) is not applicable to the CD-C project area (Management Zone 2) or project components since CBNG is not a part of the analysis. State of Wyoming policy limits surface disturbance to one well per 640 acres in core area. Please see **Section 2.2.7.9** of the Final EIS for a description of Greater Sage-Grouse management in the CD-C project area. Management of Greater Sage-Grouse under all alternatives will be consistent with the BLM Approved Resource Management Plan Amendments for Greater Sage-Grouse, and the Wyoming Greater Sage-Grouse Conservation Strategy.
T&E	Sage-Grouse	O04	25	No alternative, including Alternative D, in implementing the Governor's Core Area strategy, includes biologically sufficient conservation standards to promote the conservation and recovery of sage grouse. The Bureau of Land Management has released new planning guidance along with a scientific review and recommendations for sage grouse conservation issued by its National Technical Team. The National Technical Team's Report is online at http://www.blm.gov/pgdata/etc./medialib/blm/wo/Information_Resources_Management/policy/im_attachments/2012.Par.52415.File.dat/IM%202012-044%20Att%201.pdf, and would like to call attention to the fact that the NTT recommendations do constitute adequate conservation measures, at least for oil and gas development. The BLM should assiduously incorporate each of the recommendations in this report in full into the CD-C ROD.	Please see **Section 2.2.7.9** of the Final EIS for a description of Greater Sage-Grouse management in the CD-C project area. Management of Greater Sage-Grouse under all alternatives will be consistent with the BLM Approved Resource Management Plan Amendments for Greater Sage-Grouse, and the Wyoming Greater Sage-Grouse Conservation Strategy.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
T&E	Sage-Grouse	O04	29	Holloran (2005) found that well densities greater than one well per 699 acres were correlated with lek declines. Doherty et al. (2010) did a statewide analysis in Wyoming and found that well densities greater than 1 well per square mile were correlated with sage-grouse declines.	Please see **Section 2.2.7.9** of the Final EIS for a description of Greater Sage-Grouse management in the CD-C project area. Management of Greater Sage-Grouse under all alternatives will be consistent with the BLM Approved Resource Management Plan Amendments for Greater Sage-Grouse, and the Wyoming Greater Sage-Grouse Conservation Strategy.
T&E	Sage-Grouse	O04	30	Road construction related to energy development is a primary impact on sage-grouse habitat from habitat fragmentation and direct disturbance perspectives. *See letter for supporting information.*	Thank you for your comment.
T&E	Sage-Grouse	O04	31	In Core Areas and non-Core areas, disruptive activities are prohibited in all nesting and early brood-rearing habitat from April 1 through July 15. Draft EIS at 3-108. Please confirm that these activities include vehicle traffic, which has been shown to be disruptive to sage grouse. The EIS is ambiguous in this regard, as in some spots it states that limits to disruptive activities only apply within 0.25 or 0.6 mile of active leks. Draft EIS at 4-101. What measures will be put in place to enforce these measures? Will BLM gate well field access roads, as the Forest Service does in sensitive elk habitat?	Please see **Section 2.2.7.9** of the Final EIS for a description of Greater Sage-Grouse management in the CD-C project area. Management of Greater Sage-Grouse under all alternatives will be consistent with the BLM Approved Resource Management Plan Amendments for Greater Sage-Grouse, and the Wyoming Greater Sage-Grouse Conservation Strategy.
T&E	Sage-Grouse	O04	35	A more detailed statement of baseline information for sage grouse populations in the Project Area is warranted. The BLM has provided a map showing the locations of sage grouse leks and their occupied/unoccupied status. See Map 3.9-2. However, WGFD has the most recent lek counts for most if not all of these leks, and these data should also be presented so that the reader can appreciate the relative importance of the leks in question. For examples and suggestions, see the letter.	The most recent WGFD data for Greater Sage-Grouse are included in the Final EIS, **Section 3.9**.
T&E	Sage-Grouse	C02	49	The mitigation measure calling for man-made/artificial nests for ferruginous hawk nesting habitat when surface disturbance adversely impact their population must consider the potential conflicts with sage-grouse seasonal habitats. See id. at 4-114. The Draft EIS already provides for sage grouse consideration in the Chapter 2 discussion of this same mitigation measure. Id. at 2-15. Therefore, the two chapters must be consistent.	The habitats of all potentially affected wildlife are taken into consideration when options for improving habitat are analyzed.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
T&E	Sage-Grouse	In05, In08	66	BLM includes the GSG under the heading Threatened or Endangered Wildlife Species. Since the GSG is a candidate species, it would have been more appropriate to include discussion of GSG in 3.9.2 or BLM should change the section heading to indicate the section describes threatened, endangered and candidate species.	The status of the Greater Sage-Grouse has been clarified in the Final EIS.
T&E	Sage-Grouse	In05, In08	67	The BLM has not included maps identifying sage-grouse winter concentrations areas in the CD-C Draft EIS. This is particularly concerning for winter concentration areas given the fact the operators funded wildlife studies to locate and identify winter concentration areas during the pendency of the CD-C EIS. It is irresponsible and inappropriate for the BLM not to make this data available in the Draft EIS. (see comment 38)	Neither the BLM nor the WGFD has delineated any winter concentration areas for the CD-C project area. When such areas are delineated within the project area, the BLM will implement prohibitions of surface disturbing and disruptive activities as described in the Rawlins RMP.
T&E	Sage-Grouse	In05, In08	68	The information in the Draft EIS demonstrates that sage-grouse populations have not been significantly impacted by O&G operations in the project area. Figure 3.9-1 demonstrates that GSG populations within the project area generally track with statewide averages. In fact, the data indicates that GSG lek count within the project area fared better than the rest of the state between 1997 and 2006, a period that coincided with historic levels of O&G development in the area. It also demonstrates that GSG populations within the CD-C area fared better than GSG leks located immediately outside of the project area. BLM should highlight this fact.	Thank you for your comment.
T&E	Sage-Grouse	In05, In08	92	The BLM should revise the language in section 4.9.5 in which it indicates that there would be significant impacts to sage-grouse under all Alternatives except Alternative B. CD-C Draft EIS, pg. 4-121. In section 4.9.4, the BLM indicates there would not be significant impact to sage-grouse under Alternative D. CD-C Draft EIS, pg. 4-120.	The discussion was revised based on changes made to the alternatives.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
T&E	Sage-Grouse	O09	4	Walker et al. (2007) indicates that the current 0.25-mile buffer lease stipulation is insufficient to adequately conserve breeding sage-grouse populations in areas having CBNG development. A 0.25-mi. buffer leaves 98% of the landscape within 2 miles open to full-scale energy development. In sage grouse habitats such as the Powder River Basin, 98% CBNG development within 2 miles of leks is projected to reduce the average probability of lek persistence from 87% to 5% (Walker et al. 2007). Only 38% of 26 leks inside of CBNG development remained active compared to 84% of 250 leks outside of development (Walker et al. 2007). Of leks that persisted, the numbers of attending males were reduced by approximately 50% when compared to those outside of CBNG development (Walker et al. 2007). The Alternatives within the CD-C Draft EIS must take these concerns into consideration. The Alternatives in the Draft EIS must provide sufficient buffers to sustain sage grouse populations on the proposed area.	The research from Montana and Eastern Wyoming (SG Management Zone 1) is not applicable to the CD/C project area (Management Zone 2) or project components as CBNG is not a part of the analysis. Please see **Section 2.2.7.9** of the Final EIS for a description of Greater Sage-Grouse management in the CD-C project area. Management of Greater Sage-Grouse under all alternatives will be consistent with the BLM Approved Resource Management Plan Amendments for Greater Sage-Grouse, and the Wyoming Greater Sage-Grouse Conservation Strategy.
T&E	Sage-Grouse	O09	6	*See letter for additional sage grouse information and concerns re: lek persistence and effective buffers, nesting buffers, and crucial winter range*	Thank you for your comment.
T&E	Sage-Grouse	O09	7	In April 2010, the U.S. Fish and Wildlife Service (FWS) announced that the Greater Sage-Grouse biologically warrants protection under the Endangered Species Act (ESA). However, because of the need to address higher-priority species first, the FWS placed the sage-grouse on the candidate list for future action. It should also be recommended that the Western Association of Fish & Wildlife Agencies (WAFWA) Recommended Guidelines for Greater Sage-Grouse Management, which consists of guidelines for habitat management and restoration. The Rawlins Field Office of the BLM must implement the right conservation practices in the right locations to preclude the need to list the species as threatened or endangered. This is in the best interest of all multiple-uses (energy development, grazing, and hunting & fishing, etc.).	Please see **Section 2.2.7.9** of the Final EIS for a description of Greater Sage-Grouse management in the CD-C project area. Management of Greater Sage-Grouse under all alternatives will be consistent with the BLM Approved Resource Management Plan Amendments for Greater Sage-Grouse, and the Wyoming Greater Sage-Grouse Conservation Strategy.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
T&E	Sage-Grouse	F03	19	Page 4-100. Past and present actions have already exceeded Significance Criteria I and 2 for Greater Sage-Grouse, a candidate for listing. The service recommends that BLM pursue additional consultation with the WGFD on the core area strategy as it relates to this project. No project activities that may exacerbate habitat loss or degradation should be permitted in important habitats. We recommend the Final EIS identify all important Greater Sage-Grouse habitats within the project area, seasonal restrictions within the project area, and all appropriate measures to minimize potential impacts from the proposed project. In addition, the Final EIS should include analysis using the RFD for the CD-C and the Density Disturbance Calculation Tool for all lands within the core area.	The impact analysis discussion has been revised using a DDCT existing disturbance analysis on the three Priority Habitat Management (core) areas affected by the CD-C project. Management of Greater Sage-Grouse under all alternatives will be consistent with the BLM Approved Resource Management Plan Amendments for Greater Sage-Grouse, and the Wyoming Greater Sage-Grouse Conservation Strategy. Please see **Section 2.2.7.9** of the Final EIS for a description of Greater Sage-Grouse management in the CD-C project area.
T&E	Sage-Grouse	O01	15	We suggest utilizing the management protocols laid out in EO 2011-5. Until the RMP can be updated, the EO is the best tool for protecting the status of this bird.	Please see **Section 2.2.7.9** of the Final EIS for a description of Greater Sage-Grouse management in the CD-C project area. Management of Greater Sage-Grouse under all alternatives will be consistent with the BLM Approved Resource Management Plan Amendments for Greater Sage-Grouse, and the Wyoming Greater Sage-Grouse Conservation Strategy.
T&E	Sage-Grouse	O04	36	BLM asserts that significant impacts would not occur to sage grouse populations inside Core Areas due to the application of measures included in the state Core Area Executive Order 2011-5. This is a false premise and violates NEPA's requirement [to] take a 'hard look' at impacts to resources including BLM Sensitive Species, and also violates NEPA's requirements for scientific integrity. Actual scientific analysis is required to support this premise, which has yet to be provided in the context of the CD-C Draft EIS. We expect the BLM to fully analyze at least one alternative that applied the National Technical Team recommendations on oil and gas drilling to protect sage grouse within Core Areas. These measures are the level at which "no significant impact" would occur, as these are the standards designed to comport with the scientifically known disturbance thresholds for oil and gas development in sage grouse habitats.	Thank you for your comment. The statement regarding the impacts on Greater Sage-Grouse inside Priority Habitat Management (Core) Areas is not a premise but a conclusion reached after a hard look at the alternatives.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
T&E	Sage-Grouse	O09	3	Research in Montana and Wyoming in coal-bed methane natural gas (CBNG) and deep well fields suggests that adverse impacts to leks from energy development should be predicted out to a minimum of 4 miles, and that some leks within this radius have been extirpated as a direct result of energy development (Holloran 2005, Walker et al. 2007). The proposed development area in the Continental Divide-Creston (CD-C) Natural Gas EIS does not provide adequate buffers that will allow for persistence of the sage-grouse populations. We recommend that all of the Alternatives in this EIS be developed to take this into consideration.	The research from Montana and Eastern Wyoming (SG Management Zone 1) is not applicable to the CD/C project area (Management Zone 2). Please see **Section 2.2.7.9** of the Final EIS for a description of Greater Sage-Grouse management in the CD-C project area. Management of Greater Sage-Grouse under all alternatives will be consistent with the BLM Approved Resource Management Plan Amendments for Greater Sage-Grouse, and the Wyoming Greater Sage-Grouse Conservation Strategy.
T&E	Sage-Grouse	O09	5	Walker et al. (2007) studied lek persistence in relation to coal bed natural gas (CBNG) development in the Powder River Basin. This study demonstrated that development within 4 miles of leks are known to decrease breeding populations, in particular a reduction of males (Holloran et al. 2005, Walker et al. 2007), and 52% and 74-80% of hens are known to nest within 2 and 4 miles of leks, respectively (Holloran and Anderson 2005, Colorado Greater Sage-Grouse Conservation Plan Steering Committee 2008). Sizes of NSO buffers required to protect breeding populations may be underestimated because leks in CBNG fields have fewer males per lek and a time lag occurs (avg. 3-4 years) between development and when leks go inactive. As a result, it is expected that not only will lek persistence decline; the number of males per lek will also decline. In contrast, sizes may be overestimated where high lek densities cause buffers from adjacent leks to overlap. These concerns demonstrate a need for better analysis to be utilized when developing Alternatives for the CD-C Draft EIS.	Please see the response to O09-3 above.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
T&E	Sage-Grouse Core Area strategy	In07	12	Pages 4-112 to 4-113, Sage-grouse. This entire section, and the restrictions to benefit sage grouse in Alternative B, violate Wyoming's Core Area Strategy as set forth in Wyoming Executive Order 20 11-5 and generally followed in BLM IM WY-2012-019 for sage grouse core areas. The basis of the Core Area strategy is encouraging development outside the identified core areas in exchange for the extreme development restrictions inside core areas. Any additional restrictions in non-core areas, as proposed in Alternative B, violates the spirit and the direct language of the policy. In addition, this section gives responsibilities to the WGFD which would require WGFD to violate the EO by triggering heightened mitigation in non-core.	Please see **Section 2.2.7.9** of the Final EIS for a description of Greater Sage-Grouse management in the CD-C project area. Management of Greater Sage-Grouse under all alternatives will be consistent with the BLM Approved Resource Management Plan Amendments for Greater Sage-Grouse, and the Wyoming Greater Sage-Grouse Conservation Strategy.
T&E	Sage-Grouse EO	C03	6	Sage Grouse Conservation Strategy: The Draft EIS does not provide sufficient information about how wildlife mitigation for sage grouse will align with the State of Wyoming's Sage Grouse Conservation Strategy and Executive Order... Sweetwater County strongly believes the final record of decision should reflect the Governor's Executive Order and, to ensure this, the Draft EIS should provide a more thorough discussion of the development limitations that would be imposed in core and non-core areas.	Please see the response to In07-12 above.
T&E	Sage-Grouse EO	S04	5	The EIS does not apply the non-core area stipulations from the guidance in EO 2011-5, citing that the Rawlins RMP does not provide the flexibility to relax stipulations. We think the RMP (Appendix 9) does provide this flexibility and recommend that BLM's Preferred Alternative follow the BLM IM 2012-19 and the SGEO for both core and non-core stipulations.	Please see the response to In07-12 above.
T&E	Sage-Grouse EO	In10	19	We take exception to the statement that the WY conservation strategy continues to evolve and is subject to change. We understand that the State of WY will maintain EO 2011-5 and the provisions within it.	Please see the response to In07-12 above.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
T&E	Sage-Grouse EO	In10	20	BLM should apply EO 2011-5 in the project area and manage sage grouse consistently with this policy. Consistent management across the state is a practical approach that will illustrate WY's dedication to protecting sage grouse and will decrease confusion and increase predictability for agencies and operators. Also, USFWS has identified the EO as an effective strategy and commended the state for the development and adoption of this policy,	Please see **Section 2.2.7.9** of the Final EIS for a description of Greater Sage-Grouse management in the CD-C project area. Management of Greater Sage-Grouse under all alternatives will be consistent with the BLM Approved Resource Management Plan Amendments for Greater Sage-Grouse, and the Wyoming Greater Sage-Grouse Conservation Strategy.
T&E	Sage-Grouse habitat	O04	32	The one well pad per 640 acres limit is biologically well-founded in the scientific literature. The surface disturbance caps set at 5% per 640 acres in under the Governor's Executive Order 2011-5 are too high; a 2.5% acreage cap is more appropriate. Surface disturbance caps should be defined as initial surface disturbance, because it takes sagebrush up to a century to grow back following surface-disturbing activities, rendering interim reclamation efforts irrelevant in terms of sage grouse habitat.	Please see the response to In10-20 above.
T&E	Sage-Grouse habitat	O04	33	Under current state and BLM Core Area standards in Wyoming, disturbance thresholds are set at five percent of the land area, beyond which additional surface disturbance is not permitted. However, the five percent disturbance threshold corresponds with oil and gas well densities that are far beyond the point where sage-grouse declines occur. For example, in the Atlantic Rim coalbed methane field, 2,000 wells were permitted at a density of eight wells per square mile, far above the threshold known to cause sage grouse declines. The projected surface disturbance for this project is 15,800 acres (BLM 2005), or 5.85% of the project area. Clearly, a threshold of five percent is too high to sustain sage-grouse. Assuming a 10-acre multi-well well pad and 0.75 miles of road per square mile – a generous figure (at 9.85 acres per mile of road), the estimated surface disturbance for a well field at one well per square mile would be 2.7 percent. Thus, a one- to three-percent disturbance threshold is more reasonable; the National Technical Team has recommended a 3% disturbance cap.	Please see the response to In10-20 above.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
T&E	Sage-Grouse habitat	O04	34	It is also critically important that the acreage cap on surface disturbance be applied on a per-each-square-mile basis, without playing games with the percentages by allowing a higher percentage in developed areas to be compensated for by a lower percentage in undeveloped parts of the Core Area. Higher percentages result in degradation and/or elimination of habitat effectiveness in sage grouse habitats, and rendering portions of sage grouse Core Areas uninhabitable will result in population declines and potentially result in BLM's conservation measures being viewed as inadequate regulatory mechanisms by the USFWS and/or the courts in the context of Endangered Species Act decisions. This is an outcome that would best be avoided by adopting unequivocally adequate regulatory mechanisms instead.	Please see **Section 2.2.7.9** of the Final EIS for a description of Greater Sage-Grouse management in the CD-C project area. Management of Greater Sage-Grouse under all alternatives will be consistent with the BLM Approved Resource Management Plan Amendments for Greater Sage-Grouse, and the Wyoming Greater Sage-Grouse Conservation Strategy.
T&E	Sage-Grouse leks	O04	26	Breeding and nesting activity are concentrated in the habitats surrounding the lek site. *See letter for studied and citations.* Thus, 0.6-mile NSO lek buffers within Core Areas (or outside them) are inadequate to protect nesting grouse.	Please see the response to O04-34 above.
T&E	Sage-Grouse leks	O04	27	Outside Core Areas, quarter-mile lek buffers are proposed. See letter for additional studies and citations. A multi-state group of fish and game biologists evaluated the standard BLM mitigation measures for grouse and found them wholly inadequate. They recommended that sage-grouse habitat should be protected within 3.2 km of lek sites under ideal habitat conditions, within 5 km when habitat conditions are not ideal, and within 18 km where sage grouse populations are migratory. Furthermore, these researchers stated that in areas where 40% or more of the original breeding habitat has been lost, all remaining habitat should be protected.	Please see the response to O04-34 above.
T&E	Sage-Grouse RMP	C02	48	The Draft EIS discusses BLM's current effort to revise all RMPs addressing sage grouse conservation efforts. However, the Draft EIS fails to recognize that the proposed activities will have to be consistent with the RMP revisions. The status of the sage grouse may change after the CD-C EIS is completed, so any activity taking place within the RMP revision areas will need to conform to these amendments.	Please see the response to O04-34 above.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
T&E	Sage-Grouse RMP	In10	18	Because SG policy and stipulations are subject to change with the RMP amendments, it is impossible to comment at this time. We reserve the right to supplement these comments with those submitted on the RMP amendment.	Thank you for your comment.
T&E	Sensitive fish	O04	38	Muddy Creek is a waterway of particular concern for conserving Sensitive native fishes. The presence of the rare bluehead sucker and roundtail chub led Knight et al. (1976) to propose Muddy Creek as a potential National Natural Landmark. Muddy Creek historically had a perennial flow at its confluence with the Little Snake River, but in recent years, the lower reaches of this stream are intermittent, possibly impeding the dispersal and spawning runs of the flannelmouth sucker, bluehead sucker, and bluehead sucker in the stream. See letter for more information on problems with water in Muddy Creek.	Thank you for your comment. Please note that the Agency Preferred Alternative (Alternative F) calls for intensive management within the Muddy Creek and Bitter Creek watersheds.
T&E	Sensitive fish	O04	39	There are real problems with the condition of the Muddy Creek channel and its water, and the Proposed Action and Alternative B will only make them worse. BLM reports that as of 2004, “unstable stream channels and loss of riparian functions threaten aquatic life uses in Muddy Creek and McKinney Creek.” See letter for backup info. The appropriate response to these problems is for BLM to require all of the mitigation measures contained in Alternative B to reduce sedimentation, salinification, and other impacts to aquatic systems, plus decreasing the overall number of well pads and roads required for this project (as these are the sources of the impacts) under Alternative D.	Please see the response to O04-38 above.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
T&E	Sensitive fish	O04	40	Some 29 percent of the project area is in the Muddy Creek watershed. Draft EIS at ES-16. The impact to BLM Sensitive fishes in the Muddy Creek system is certain to exceed impact significant thresholds for the Proposed Action and Alternative A. Draft EIS at Table ES-2. This outcome clearly represents unnecessary degradation to these fish habitats, given that other alternatives at least offer uncertainty over whether impact thresholds will be exceeded for these species. The loss of this stream would likely contribute significantly to the trend toward ESA listing for these three species under the Proposed Action and Alternative A, as each species is down to less than 50% of its historic range (see Rees et al 2005a, 2005b; Ptacek et al. 2005). These two alternatives therefore violate the BLM's Sensitive Species policy, and should not be implemented	Please see the response to O04-38 above.
T&E	Sensitive fish	O04	41	We support the provision in Alternative B requiring No Surface Occupancy within 0.25 of Muddy Creek and its tributaries (Draft EIS at 1-12); we do not agree that this would require a Plan Amendment because keeping developments at least 0.25 mile away from a waterway is in conformance with the RMP requirement of a 500-feet buffer for water features; the Continental-Creston ROD could require greater setbacks but not lesser ones absent an RMP amendment. A quarter-mile setback would not violate the RMP provision of a 500-foot buffer because no development would be permitted within 500 feet perennial waters, springs, and wetlands. This is particularly compelling given the high runoff potential (*see* Map 3.3-3) and more spatially limited but still significant areas of severe water erosion potential (Map 3.3-2) in the Muddy Creek watershed.	Thank you for your comment. Please note that the Agency Preferred Alternative (Alternative F) calls for intensive management within the Muddy Creek and Bitter Creek watersheds.
T&E	Ute ladies-tresses	F03	14	The effects for Ute ladies-tresses have not adequately been analyzed. Further, conclusions are supported by BMPs and conservation measures which may or may not be implemented at the discretion of the applicant. We recommend the Final EIS clearly identify all applicant committed measures, BMPs and programmatic conservation measures which will be used to avoid and minimize adverse effects to listed species.	The analyses of the direct, indirect, and cumulative impacts on the threatened Ute Ladies'-tresses produced by the CD-C project have been reviewed and in some cases modified or expanded. The BLM specialists are satisfied that the analysis of these impacts in the Final EIS is sufficient.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
T&E	Ute ladies-tresses	F03	20	Page 4-103. Threatened and Endangered Plant Species: The Draft EIS does not provide any references for the surveys that failed to document the presence of Ute ladies'-tresses within the project area. The Service recommends inclusion of such survey reports.	The study is cited in the references section of the Final EIS. The report results are included in the BA and the EIS. Our records indicate the final report was mailed to Brian Kelly (FWS, Cheyenne) on 1 May 2008.
T&E	Ute ladies-tresses	F03	21	Page 4-103. Threatened and Endangered Plant Species: The analysis for Ute ladies'-tresses appears to rely on a COA which applies a 500-foot buffer on riparian areas to avoid direct effects to the plant. The Final EIS should identify the potential effects of the project to Ute ladies'-tresses and identify all measures the BLM will use to avoid and minimize adverse effects.	The plant is not found in the project area nor is the habitat. In the unlikely event that plants or habitat are identified in the future, the required 500 foot buffer would assure that no impact would occur.
T&E	WY pocket gopher	O04	46	The WY pocket gopher is very rare and found both north and south of I-80 in the project area. Very little is known about this species so stipulations and mitigation measures proposed to date cannot guarantee adequate protection. The Draft EIS provides no analysis whatsoever on impacts to pocket gophers. See Draft EIS at 4-104. More needs to be done.	BLM requires pre-disturbance site-specific survey and avoidance to protect the species and has concluded those measures are sufficient.
T&E	WY pocket gopher	O04	47	Oil and gas development poses perhaps the greatest threat to Wyoming pocket gopher viability. Both breeding and foraging activities of Wyoming pocket gopher populations are impacted by above and below ground disturbances associated with oil and gas exploration, drilling and associated activities. Impacts of oil and gas development to Wyoming pocket gopher include (1) direct habitat loss from new construction, (2) increased human activity and pumping noise causing generally known and unknown behavioral changes, (3) direct mortality associated with reserve pits, crushing due to vehicular movements and construction activities, and (4) lowered water tables resulting in herbaceous vegetation loss. These impacts have not been thoroughly evaluated with full NEPA analysis.	BLM requires pre-disturbance site-specific survey and avoidance to protect the species and has concluded those measures are sufficient.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
T&E	WY pocket gopher	O04	48	More information is needed about Wyoming pocket gophers to confidently assess the spatial dynamics of populations. Factors such as low dispersal ability, high inbreeding, and high variation over small geographic areas suggest that Wyoming pocket gopher meta-population structures could easily be disrupted when local populations are isolated over relatively short distances (Patton and Dingman 1968). The continuity of suitable habitat thus becomes an important component in the conservation of Wyoming pocket gopher populations. See the next several pages of the letter for more information on pocket gophers.	BLM requires pre-disturbance site-specific survey and avoidance to protect the species and has concluded those measures are sufficient.
T&E	WY pocket gopher	O04	49	Development is not just destroying and fragmenting habitat, it is also degrading it. Soil disturbances typical of oil and gas development projects, motorized vehicle impacts, and other activities are known to exacerbate the introduction and subsequent spread of noxious weeds. Noxious weeds limit population density in fossorial mammals (Slobodchikoff et al. 1988). In addition, herbicide use that invariably precedes and follows most forms of development also degrades pocket gopher habitat (Reid 1973). Finally, individual pocket gophers are killed in the pursuit of commercial and industrial development. Additional information in letter.	Please see the response to O04-48 above.
T&E	WY pocket gopher	O04	50	Negative impacts of oil and gas operations on Wyoming pocket gopher and their implications for the species are named in virtually every scientific Wyoming pocket gopher (*Thomomys clusius*) conservation assessment and survey. Wyoming pocket gopher mitigation measures are essentially non-existent due to their extremely limited range and a paucity of scientific knowledge concerning its ability or inability to adapt to changing habitat conditions. BLM has failed to provide any analysis, whether field experiments or literature reviews, that describes if and how disturbance to *T. clusius* habitat would be “avoided.”	Please see the response to O04-48 above.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
T&E	WY pocket gopher	O04	51	There is substantial new information in recent studies to warrant supplemental NEPA analysis of the impacts of oil and gas development to Wyoming pocket gopher. It is incumbent upon BLM to consider the most recent scientific evidence regarding the status of this species and to develop mitigation measures, if possible, which will ensure the species is not moved toward listing under the Endangered Species Act. It is clear from the scientific evidence and a total absence of meaningful BLM (state and federal levels), Wyoming Game and Fish, and U.S. Fish and Wildlife Service conservation measures for the Wyoming pocket gopher that current protections are non-existent, thereby allowing if not encouraging habitat degradation and destruction. New and continuing Wyoming pocket gopher survey information (such as Keinath and Beauvais 2006) constitutes significant new information that requires amendment of the Resource Management Plans before additional oil and gas leasing can move forward.	BLM requires pre-disturbance site-specific survey and avoidance to protect the species and has concluded those measures are sufficient.
T&E	WY pocket gopher	O04	52	BLM itself has been forced to admit that “New information from monitoring and studies indicate that current RMP decisions/actions may move the species [greater sage grouse] toward listing…conflicts with current BLM decision to implement BLM’s sensitive species policy” and “New information and science indicate 1985 RMP Decisions, as amended, may not be adequate for greater sage grouse.” Continued application of stipulations known to be ineffective in the face of strong evidence that they do not work, and continuing to drive the greater sage grouse toward ESA listing in violation of BLM Sensitive Species policy, is arbitrary and capricious and an abuse of discretion under the Administrative Procedures Act. We hold that, in the case of the Wyoming pocket gopher, relevant stipulations do not exist. Further, we hold that a total absence of stipulations serves to drive the Wyoming pocket gopher toward ESA listing in violation of BLM Sensitive Species policy, is arbitrary and capricious, and is an abuse of discretion under the Administrative Procedure Act.	Please see **Section 2.2.7.9** of the Final EIS for a description of Greater Sage-Grouse management in the CD-C project area. Management of Greater Sage-Grouse under all alternatives will be consistent with the BLM Approved Resource Management Plan Amendments for Greater Sage-Grouse, and the Wyoming Greater Sage-Grouse Conservation Strategy. Protection measures for the Wyoming pocket gopher implemented by the BLM have been deemed sufficient.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
T&E	WY pocket gopher	O04	53	No lease parcels which contain known and potential Wyoming pocket gopher habitat should be offered until a full NEPA analysis on impacts to this BLM Sensitive Species is performed and appropriate stipulations are formulated and attached to ensure the viability of pocket gopher populations in the area. We request that these parcels be withdrawn from the lease sale. Failing withdrawal of the parcels, it is critical that NEPA analysis occur on each parcel before leasing, and NSO stipulations be placed on all lease parcels containing known and potential Wyoming pocket gopher habitat. These stipulations should be attached at the leasing stage, when BLM has the maximum authority to restrict activities on these crucial habitats for the protection of the species, and that no exceptions to the stipulations be granted. BLM's failure to do so will permit oil and gas development activities which will directly and indirectly negatively impact Wyoming pocket gopher populations and habitat and increase the potential for listing by USFWS as a Threatened or Endangered species, in violation of BLM's duty to take all actions necessary to prevent listing. *Additional information follows in the letter.*	The CD-C Natural Gas Development Project EIS does not deal with decisions regarding federal mineral estate leasing. Wyoming pocket gopher surveys are conducted on a case-by-case, project-specific basis and appropriate protection measures (such as avoidance) are implemented if gophers are present in the area.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
T&E	Sage-Grouse	In05, In08	90	When discussing potential mitigation measures for sage-grouse, the BLM indicates that it may require the operators to bury all new power lines near sage-grouse leks. CD-C Draft EIS, pg. 4¬lll. The BLM should be aware that in some situations burying power lines could significantly increase surface disturbing operations. In order to safely and successfully install power lines below ground, operators may need to construct concrete vaults to encase and protect the power lines. These vaults usually need to be installed between five and 12 feet below the surface in order to be below the frost line and may require the installation of a trench between five and six feet wide and 15 to 20 feet deep in order to fully encase the power lines. In places where there is shallow bedrock, extensive surface disturbing operations and even blasting may be required. Although burying power lines may reduce potential impacts to sage-grouse, Devon believes the same benefits can be achieved with appropriate anti-perching devices. The strict requirement to bury all power lines may not be reasonable and may actually lead to a significant increase in surface disturbance. The BLM should carefully consider this factor when developing the Final EIS for the CD-C Project.	The necessity of buried power lines would be assessed on a site-specific basis and would take into account all the potential impacts to all resources. If greater damage to other resources would occur to surrounding resources than would benefit sage grouse, then it is unlikely that the BLM would require the power lines to be buried.
T&E	Sage-Grouse EO	In10	21	There are numerous documents that apply and establish sage grouse stipulations in core and non-core areas. In general they are consistent. We urge BLM to ensure that the Rawlins Sage Grouse RFO Amendment is consistent with EO 2011-5. This includes distinguishing between core and non-core areas and adopting appropriate sage grouse management policies that are consistent with such designations.	Please see **Section 2.2.7.9** of the Final EIS for a description of Greater Sage-Grouse management in the CD-C project area. Management of Greater Sage-Grouse under all alternatives will be consistent with the BLM Approved Resource Management Plan Amendments for Greater Sage-Grouse, and the Wyoming Greater Sage-Grouse Conservation Strategy.
T&E/WL	Depletions	F03	4	Depletions discussed in the Draft EIS - 510 acre-feet on average - aren't minor.	The question of depletion amounts and their implication is clarified in the project BA and in the Final EIS.
T&E/WL	Depletions	F03	5	If the Proposed Action and alternatives will include depletions of the Colorado River system in excess of 0.1 acre-foot per year, then the determinations for endangered fish should be changed to may affect, likely to adversely affect and may contribute to the destruction or modification of designated critical habitat for Colorado River endangered fish.	The question of depletion amounts and their implication is clarified in the project BA and in the Final EIS

Category	Sub-Category	Comment		Comment	Response
		Code	No		
T&E/WL	MBTA analysis	F03	9	The Service believes the Final EIS would be strengthened with a better description of the applicable provisions of the MBTA, Eagle Act, Executive Order 13186, and BLM's MOU with the Service to Promote the Conservation of Migratory Birds.	The descriptions of the protections provided to upland game bird species, neotropical and other migratory bird species, and their habitats have been expanded in the Final EIS. IN particular, WY BLM IM WY-2013-005 is cited for the guidance it provides for minimizing impacts to migratory bird species.
T&E/WL	MBTA analysis	F03	10	The Service's Region 6, Migratory Bird Program has developed conservation measures to avoid impacts to birds. In addition, the WGFD Bird Conservation Plan identifies BMPs to benefit migratory birds. We recommend these conservation measures and BMPs be incorporated into the Final EIS.	The discussion has been revised to discuss the BLM IM and the provisions of the RMP that provide for protection of neo-tropical song birds.
T&E/WL	Raptors	F03	15	Page 4-88. Raptors. The year-round buffers and timing periods for active nests may not be adequate to protect all raptors. The Service recommends the project be constructed outside of the migratory bird nesting season (January 15 -August 30). If this is not possible, then surveys for raptors should be conducted within 0.5-mile of the outside edge of the project actions prior to construction.	The extensive year-round buffers and seasonal restrictions provided by the Rawlins RMP have been described more fully in the Final EIS.
T&E/WL	Raptors	F03	16	The FEIS should describe the size of the NSO and seasonal buffers and the dates they would be in effect. It should also include an analysis of the effectiveness of the NSO and seasonal buffers to protect raptors from nest-abandonment and failure and possible violations of the MBTA and Eagle Act.	The extensive year-round buffers and seasonal restrictions provided by the Rawlins RMP have been described more fully in the Final EIS.
T&E/WL	Raptors	F03	23	Page 5-26, Raptors: *potentially positive cumulative impacts from the creation of nesting sites (including hydrocarbon stock tanks) are known from other oil and gas projects in the vicinity of the CD-C project area.* Although it is well documented that raptors will use artificial structures such as hydrocarbon stock tanks for nesting, these nesting attempts on oil or gas infrastructure usually end in a failed nest. The Service does not consider this loss of annual productivity to be a positive cumulative impact. We recommend, in areas where there are problems with raptors and corvids nesting on hydrocarbon stock tanks, that the tanks be reconfigured to lie on the horizontal axis.	The reference to positive impacts has been removed.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
T&E/ WR-S	Muddy Creek	O04	42	The Upper Muddy Creek and Lower Muddy Creek watersheds were found not to meet Standard 1 (Watershed Health) in the most recent analyses. Draft EIS at 3-28. Key watershed issues included runoff from improved and unimproved roads and well as oil and gas field development Id. In addition, the lower reaches of Muddy Creek are a Section 303(d) listed segment under the Clean Water Act. See Map 3.4-2. Muddy Creek is noted for high salinity and turbidity. Draft EIS at 3-38. In lower Muddy Creek, listed as “threatened” by WDEQ, watershed problems are related to overgrazing and past oil and gas development. Final EIS at 3-39. Selenium and chloride criteria violations have been key to these violations. Draft EIS at 4-23. The Proposed Action would result in significant further impacts to impaired waters (Draft EIS at 4-32) and Alternative A (Draft EIS at 4-33), but not under the other alternatives (although significant impacts on stream channel geometry and salt-loading would still be significant under these alternatives. These factors provide a strong reason to eliminate the Proposed Action and Alternative A from consideration.	Alternative A has been removed from consideration in the Final EIS. The BLM's Preferred Alternative in the Final EIS, Alternative F, specifies measures to address water quality concerns in the Muddy Creek and Bitter Creek watersheds, described in **Section 2.2.6**.
TR	Analysis	P23	2	Increased truck traffic may limit citizen use of county roads, creating dust, and negatively impacting wildlife.	It is unlikely that increased oil and gas-related truck traffic would limit citizen use of county roads in the project area, although some roads may temporarily be more congested. **Section 4.8.3.1** of the Draft EIS acknowledges that … "Disturbance during construction and production, such as human presence, dust, and noise may displace or preclude wildlife use..." (page 4-82).

Category	Sub-Category	Comment		Comment	Response
		Code	No		
TR	Baseline data	C02	51	The Draft EIS... fails to address R.S. 2477 rights-of-way, private roads, and other rights-of-way. (Maps 3.16-1, 3.16-2). The roads and rights-of-way appear to be on Map 3.16-1, but are not specifically identified on the map. While BLM has no authority to adjudicate R.S. 2477 rights-of-way, it does have a disclosure obligation under NEPA to identify the county roads and rights-of-way. See Southern Utah Wilderness Alliance (SUWA) v. BLM, 425 F.3d 735, 479-58 (10th Cir. 2005). Just placing them on the map, without identifying road ownership, is not sufficient.	The local roads shown in **Maps 3.16-1 and 3.16-2** were digitized from aerial photography for the surface disturbance analysis. The attribute fields populated from the photo-interpretation were physical attributes, such as surface type (paved, improved exotic/gravel, improved natural, unimproved), and did not include administrative attributes, like management agency or road name. Designations for numbered county roads were obtained from the respective counties. The Transportation and Access element of the Draft EIS is intended to estimate traffic volumes and associated effects on the highway and numbered road network providing access to and within the CD-C project area. Effects on individuals road which provide access to specific well and ancillary facility sites would be addressed in the site-specific NEPA and APD processes, at which time the appropriate road owners would be consulted.
TR	Impact analysis	In07	15	Page 4-199 to 4-203, Alternatives B, C, & D. While increased directional drilling will reduce traffic needs for construction and rig moves, the increased duration of the drilling and completion period for each well (from 15 to 50 days, see Table 4.15-1) may lead to increased, not decreased traffic requirements for alternatives with increased directional drilling requirements.	The comment misinterprets the information presented in Table 4.15-1. The estimated 15-day average duration (10 days for drilling and 5 days for completion) is for a single vertical well. The 50-day average duration (42 days for drilling and 8 days for completion) is for four wells on a single pad, which yields a 12.5-day per well drilling and completion cycle for a multi-well pad compared to a 15-day drilling and completion cycle for a single well pad. While traffic for a multi-well pad would obviously result in more traffic to a single location, overall traffic in the area would be substantially reduced by the reduction in access road/pad construction, rig moves and by batch completion of multiple wells.
TR	Impact analysis	P05	4	"The dust created by the traffic would also be a hazard."	Thank you for your comment. **Section 4.5.9** (Mitigation Measures for Adverse Air Quality Impacts) under the Air Quality section of the Draft EIS lists "Application of chemical suppressant (magnesium chloride) on unpaved roads and additional watering during construction activities to minimize fugitive dust, reducing particulate (PM_{10} and $PM_{2.5}$) impacts" as an additional mitigation measure that could be implemented.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
TR	Jurisdiction	C02	53	Jurisdiction of the roads is also important for purposes of determining which roads will be closed or open to use.	The local roads shown in **Maps 3.16-1 and 3.16-2** were digitized from aerial photography for the surface disturbance analysis. The attribute fields populated from the photo-interpretation were physical attributes, such as surface type (paved, improved exotic/gravel, improved natural, unimproved), and did not include administrative attributes, like management agency or road name. Designations for numbered county roads were obtained from the respective counties. The Transportation and Access element of the Draft EIS is intended to estimate traffic volumes and associated effects on the highway and numbered road network providing access to and within the CD-C project area. Effects on individuals road which provide access to specific well and ancillary facility sites would be addressed in the site-specific NEPA and APD processes, at which time the appropriate road owners would be consulted.
TR	Mitigation	C02	52	The party with jurisdiction over the roads must be determined before any type of action or mitigation measures can be applied to the roads. Jurisdiction of the roads is also important for purposes of determining which roads will be closed or open to use.	Please see response to CO2-53 above.
TR	Road Standards	O04	65	Operators have committed to construction to road standards “no higher than necessary” to accommodate their intended use. Draft EIS at B-24. How does BLM interpret what is “necessary?” In the Powder River Basin, spur roads to well pads in coalbed methane fields are often two-track jeep trails. There would seem to be no reason that well pad spurs, and sometimes wellfield collector roads, could be engineered to this standard for the CD-C project as well. Would BLM be willing to require two-track access routes in the CD-C project, especially in sensitive wildlife habitats and/or viewsheds (such as historic trail corridors)?	Coalbed methane development in the Powder River Basin has been accomplished by the use of much smaller drilling rigs and equipment than the rigs and equipment required for the deeper formations in the CD-C project area. The larger drilling rigs and the large number of completion vehicles and equipment necessary for the wells in the equipment required for the deeper formations in the CD-C project area require improved roads, both for access and to prevent environmental damage. The roads will be constructed to the standards required by the BLM.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
TR	Speed limits	C03	15	Sweetwater County strongly encourages BP, other operators and their contractors to instruct their vehicle drivers to use safe driving practices and to adhere to speed limits that match driving and road conditions. As established by Wyoming Statutes, speed limits on county roads are set at 55 miles per hour unless otherwise established through engineering studies and are properly posted. Sweetwater County recognizes that this 55 mile per hour speed limit may be too fast for some portions of county roads, but the County lacks the funding to complete the traffic studies required by Statute to set proper speed limits for these stretches of road. To accommodate the lack of traffic studies needed to post the proper speed limits, the County encourages all county road users to use good judgment and safe driving practices.	Thank you for your comment.
TR	Traffic	P10	7	Encourage reduction of traffic however possible.	Thank you for your comment.
TR	Transporta-tion planning	In05, In08	72	There is a MOU between BLM and operators within the CD/Wamsutter area regarding transportation planning and road use. Although the MOU does not technically include the Creston portion of the project area, operators such as Devon that operate in the Creston Area already attend the meetings and participate in transportation planning for the overall project area. The BLM should amend the MOU to specifically include all of the operators within the larger project area as this will codify current practices.	The MOU has been amended to include the Creston portion of the project area.
VEG	Dust	In01	8	The Draft EIS, on page 4-83, suggests that dust related impacts impact 24.3 percent of the project area, which may result in some habitat avoidance. A dust impact to over 24 percent of the project area seems arbitrarily high, unsupportable, and lacking documentation. Further elucidation on the methods used to quantify this amount is recommended	**Section 3.6.4** describes the methods and assumptions used in arriving at this figure. That section emphasizes that this total, at any given time, would be dependent upon season of use, the primary factors listed in this section, and weather-related factors, especially the timing and amount of precipitation events (or lack thereof).

Category	Sub-Category	Comment		Comment	Response
		Code	No		
VEG	Dust	In04	45	Page 4-76, 4.6.5, Unavoidable Adverse Impacts and Additional Mitigation Measures: Road dust is brought up as a result of increased traffic. Our comment can be summarized as follows: *The recommendations of managing dust as a safety issue and protecting lichen rich habitats seems to make good sense. In areas of extremely high dust deposition, dust may affect photosynthesis, plant respiration, and transpiration (Farmer 1993), but these levels of dust would be such a safety hazard that energy development operators would typically fix the issue before somebody got hurt.*	The primary factors that generate fugitive dust are fully described and discussed in **Section 3.6.4**. It is also stated in this section that, "A proactive and aggressive road-watering/dust-suppression program could noticeably lower this estimate during the hotter and drier summer months that are generally associated with greater dust-generation potential. Alternative F(Agency Preferred Alternative) calls for implementation of **Best Management Practices for Fugitive Dust Control (Appendix P)** which would work to reduce the amount of fugitive dust generated.
VEG	Dust control plan	C01	24	Section 3.6.4, Fugitive Dust Effects on Vegetation Dust Abatement: The Final EIS should include a detailed fugitive dust control plan and Carbon County is recommending the implementation of an aggressive dust suppression program.	Please see updated text. A Fugitive Dust Control Plan (**Appendix P**) has been included as part of the Preferred Alternative.
VEG	Impact analysis	In01	18	"Long-term loss of shrubs" is wording used in Table ES-2 on page ES-9, on page ES-18, and in Table 2.4-2 on page 2-26. This wording is speculative, and the BLM should consider stating "possible long-term loss of shrubs."	Surface disturbance will result in the long-term loss of shrubs. Please see **Section 4.0** for a discussion of short-term and long-term in the context of surface disturbance.
VEG	Impact analysis	C02	37	The Draft EIS discusses the historical disturbance in the project area but never makes clear what portions of the disturbance has been revegetated, partially revegetated, or unreclaimed. CD-C Draft EIS at ES-10, 4-72....the Draft EIS must describe those areas of the project area that are currently unreclaimed compared to reclaimed from past disturbances.	The analysis of impacts associated with the Proposed Action and the alternatives was completed in the context of existing disturbance (see **Sections 4.0.2 and 4.0.3**). The estimates of historical disturbance are based on aerial photography made during 2006-2007. It was not possible using aerial photography to discern the degree to which reclamation has been successful on any of the parcels. Determining success of reclamation is a matter dealt with by the Operators and the BLM or the WOGCC on a case-by-case basis.
VEG	Impact analysis	C02	38	The Draft EIS must also identify who owns these lands and where the unreclaimed acreage is located, such as if it is on BLM land or is in sage-grouse core habitat.	Please see the response to C02-37 above.
VEG	Playa	In04	41	Page 3-77, 3.6.2.14 Non-vegetated cover type – Playa, final sentence: *several major orders of insects* depend on playas. In fact, no order of insects depends on playas. It could be stated a unique suite of invertebrates (including species like *Triops longicaudatus*) depends on playas.	Sentence reworded to include citation: " In Wyoming, playas, when flooded, are important sources of habitat for wildlife including waterfowl such as ducks and geese, along with sandhill cranes and shorebirds and amphibians such as frogs, toads, and salamanders. Haukos and Smith (1992) have identified seven Orders of invertebrates (33 Families) that are closely associated with playa lakes."

Category	Sub-Category	Comment		Comment	Response
		Code	No		
VEG/WL	Dust	O04	66	The effects of fugitive dust on vegetation, and therefore forage, are significant. Draft EIS at 3-81. This is focused on a corridor 500 to 646 feet on either side of the road. Draft EIS at 3-81, 82. We also understand that dust pollution causes sickness in livestock (Nils Hansen, pers. Comm.), and based on this principle it is likely causing health problems for wildlife ranging from elk to sage grouse as well. BLM notes that watering of gravel roads can reduce dust pollution (id.), but by far the most preferable means to keep dust and its effects on vegetation, wildlife, and livestock to a minimum is to minimize the additional mileage of additional improved gravel roads as well and to implement measures to reduce truck traffic, particularly by 18-wheelers which cause disproportionately more dust. Draft EIS at 3-81.	The Agency Preferred Alternative (Alternative F) contains measures that would reduce the amount of traffic and the number of new roads, which would reduce the amount of dust generated. The alternative also provides for implementation of **Best Management Practices for Fugitive Dust Control (Appendix P)**, which would further reduce the amount of fugitive dust generated.
VRM	BMPs/ COAs	In05, In08	95	When describing the type of BMPs and COAs that can be applied within VRM Class III Areas, the BLM must acknowledge that it cannot impose unreasonable restrictions on existing leases. Courts have recognized that once the BLM has issued an oil and gas lease conveying the right to access and develop the leasehold, the BLM cannot later impose unreasonable mitigation measures that take away those rights. See Conner v. Burford, 84 F.2d 1441, 1449-50 (9th Cir. 1988); 43 C.F.R. § 3101.1-2 (2012) (BLM can impose only "reasonable mitigation measures... to minimize adverse impacts... to the extent consistent with lease rights granted"). We are concerned that the language currently proposed by the EIS would encourage or allow BLM to adopt management directives that will preclude or limit our rights under existing leases or will later adopt COAs that are inconsistent with our rights. See previous comments.	No valid existing rights would be infringed upon by the selection of any of the alternatives. This has been clarified in the Final EIS.
VRM	Class IV manage-ment	C03	10	Visual Resource Management (VRM): Sweetwater County strongly encourages the BLM to manage the visual resources with this region as a VRM Class IV giving oil and gas the maximum flexibility to develop from visual management perspective. Sweetwater County recognizes that there may be a case by case need for the BLM to apply more restrictive management decisions to address special resources or sensitive resources such as historic trails or cultural sites.	Thank you for your comment. The management of this area as a particular VRM class is dependent upon decisions made at the Resource Management Plan level and is outside the scope of this document.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
VRM	Cumulative Impact	C01	26	Chapter 5, Cumulative Impacts: The Final EIS should fully disclose the anticipated cumulative and visual change due to past, present and reasonably foreseeable future actions. Four major power lines (TWE, Zephyr, EGS and EGW) are platted to go through the project area. In addition, the overhead electrical system is estimated to include approximately 36 miles of overhead lines.	Information pertaining to all reasonably foreseeable future actions has been updated in **Table 5.0-1** and analyzed in **Section 5.11**.
VRM	RMP	In05, In08	69	BLM should correct the information related to the Director's decision to remand portions of the Rawlins RMP to the FO for reconsideration. The text in section 3.11.3 suggests that the "Approved RMP" was protested. As the BLM is aware, only proposed RMPs can be protested to the BLM Director. The approved RMP was only issued after the BLM Director resolved all protests related to the proposed RMP. The BLM is currently in the process of amending the visual resource management classifications for the Rawlins RMP in light of the remand described above. Given the uncertainty created by the plan amendment, Devon reserves the right to submit additional comments regarding the CD-C Draft EIS when the draft plan amendment for the Rawlins Field Office is released later this year.	**Section 3.11.3** has been revised to explain that a protest was lodged against the Proposed ROD and Final EIS for the proposed RMP, and that "As a result, the BLM-preferred VRM decisions in the Proposed RMP/Final EIS were remanded, in accordance with guidance in the BLM Land Use Planning Handbook, H-1601-1."
WH	Gather and removal	In10	23	Yates has leases within the Lost Creek HMA. However they are not listed under Alt B and are currently well over AML targets. The focus of wild horse management in the HMA will be gather and removal. It is unlikely that our operations in the HMA will be impacted by wild horses or related activities in the HMA	Thank you for your comment.
WH	Impact analysis	C02	29	The Draft EIS discussion on wild horses and predation is not accurate and does not reflect the experience in southwestern Wyoming where wild horse numbers have continued to increase. The Draft EIS lists mountain lions and the gray wolf as a type of animal that preys on wild horses. Id. at 3-125. This is an incorrect statement. Wild horses do not have any natural predators. As support for this assertion, the Draft EIS cites to reported mountain lion predation on wild horses in the southern Great Basin of Nevada. Id. The Draft EIS involves public lands in Wyoming, not Nevada. The proposed project area does not provide much if any mountain lion habitat except for Iron Mountain, Laramie Peak, Snowy Range, Seminoe, Sierra Madre, and Haystacks.	The text has been modified to more appropriately describe wild horse mortality agents.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
WH	Impact analysis	C02	30	Also, the wild horse populations have exceeded appropriate management levels (AMLs) for around 40 years and at a time when the coyote, fox, and wolf populations were at unprecedented levels. For example, in 2010, the wild horse populations in Adobe Town and Salt Wells Creek herd management areas (HMAs) were 1,436 and 975 wild horses respectively. See Environmental Assessment Adobe Town - Salt Wells Creek HMA Complex Wild Horse Gather, at 3, 11 (Aug. 26, 2010). This is far above the AMLs for each area, which are 610-800 wild horses for Adobe Town and 251-365 wild horses for Salt Wells Creek. Id. at 3. Therefore, it is inaccurate to conclude that predation has had any measurable impact on wild horse numbers.	The text has been modified to more appropriately describe wild horse mortality agents.
WH	Impact analysis	C02	31	The Draft EIS should also include the adverse impacts that wild horses have on the environment and other wildlife due to their trailing and their grazing patterns as they use some areas season long, and the implications for reclamation success.	The impact of wild horses on the environment is outside the scope of this analysis.
WH	Impact analysis	P14, P30	1	**Note: This comment letter represents a total of 8,376 identical letters received via email as a result of a website post on American Wild Horse Preservation <http://wildhorsepreservation.org>.** "Further industrialization of over 125,000 acres of lands falling within the Lost Creek and Adobe Creek Herd Management Areas will increase wild horse stress, habitat loss, potentially impact water availability and quality, potential for wild horse/vehicle collisions, increase dust given traffic, and otherwise further deter wild horses from impacted areas and denude the habitat and living conditions of wild horse herds."	The peer-reviewed scientific literature is lacking on the effects of energy development/ industrialization on wild horse ecology. Any perceived or real effects would best be determined by a long-term research project. It is beyond the scope of this analysis to speculate what these effects may or may not be.
WH	Mitigation	O06, P17	2	If you choose to go forward with this during the environmentally risky CD-C Project then we ask that you: take immediate action to ensure native wild horses will live in their native habitat and not be rounded up for permanent removal; prohibit drilling in native wild horse habitat; work with the energy companies involved including BP American Production to create a 50 million dollar Protect Wyoming Mustangs Fund; never grant NEPA waivers for any aspect of this project.	A very small portion of the project area would impact wild horse HMAs and no portion of this project would result in rounding up the horses for permanent removal. Drilling in HMAs cannot be prohibited due to valid existing rights in the HMAs.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
WL	Advisory groups	In04	4	There are a number of references to technical teams, advisory groups and consultation groups that will assist in management issues, but there is little discussion about who will be asked to participate in those teams and what level of stakeholder input there may be. What are their powers? How will membership be determined? Will membership change over time? Will operators be allowed to participate? If so, will the BLM charter the committee under FACA? Who will fund the group? Does the BLM intend for this working group to be similar to the JIO or Pinedale Anticline Project Offices? This is an important issue for local governments and the public to understand, since it seems that many future management decisions may be delegated to these teams.	Please see the updated text. The CD-C consultation and coordination group's duties have been further defined in the Agency Preferred Alternative. The group would not be chartered under FACA as it would not require the group's consensus to change management direction. Operators would not be included in the group. Management decisions would not be delegated to the group and the BLM would make the ultimate decision on any proposed management actions.
WL	Advisory groups	C02	16	"The Draft EIS fails to identify the legal structure of the proposed Interagency Working Group...It would appear to be designed to remove the most important and significant decisions from the public eye. It should be deleted."	Please see updated text for clarification on the role of the CD-C consultation and coordination group.
WL	Advisory groups	C04	9	The document makes several references to technical teams and advisory groups that will be formed; however, the details as to the various group's memberships, roles and responsibilities are not clearly defined.	Thank you for your comment. Please see updated text; the duties and functions of the CD-C coordination and consultation group have been expanded upon and clarified in the Agency Preferred Alternative.
WL	Advisory groups	C04	10	The Draft EIS states that if the WGFD expresses concern that a species population is declining at an accelerated rate, a technical team would be assembled to prepare a mitigation plan. Questions that need to be answered before this can seriously be commented upon include: What constitutes *an accelerated decline?*; Who will be on the technical team?; What is their authority?; What types of mitigation will be considered?; How do you determine what is causing the decline?; Is there a cap on the mitigation?; Who will pay for the mitigation and how?; and What if the mitigation is unsuccessful?	Please see updated text. Alternative B has been clarified in the Final EIS.
WL	Advisory groups	S01	5	The governor requests that the BLM clarify the make-up and the function of the various technical and advisory groups described in the Draft EIS.	Thank you for your comment. Please see updated text; the duties and functions of the CD-C consultation and coordination group have been expanded upon and clarified.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
WL	Advisory groups	C03	8	Technical Teams and Advisory Groups: The Draft EIS makes a number of references to technical teams and advisory groups. In forming these groups, care should be taken to ensure that each group has a clear mission, its membership is stated, and the level of stakeholder input is defined. From past experience, Sweetwater County has found the Wamsutter-Continental Divide Transportation Working Group valuable for resolving road maintenance and transportation issues.	Thank you for your comment. Please see updated text; the duties and functions of the CD-C consultation and coordination group have been expanded upon and clarified.
WL	Amphibian/ reptile monitoring	S04	12	The WGFD recommends that incidental monitoring of amphibians and reptiles be conducted in conjunction with other wildlife surveys, providing general trend data to reveal possible shifts in species assemblages resulting from development.	All potential impacts from a proposed project are assessed on a site-specific basis. If there is potential for amphibian and reptile habitat in the proposed project location, surveys and monitoring would be conducted accordingly.
WL	Appendix G, Energy by Design	In01	16	Page G-1 references moose, which do not occur within the project area. Accordingly, the reference to moose should be omitted.	Thank you for your comment. The reference to moose has been removed.
WL	Appendix G, Energy by Design	In05, In08	108	We appreciate the BLM's inclusion of the Energy by Design project as appendices to the CD-C Draft EIS. We understand that the document may be utilized to the extent off-site mitigation is considered as part of the selected Alternative and voluntarily agreed to by the operators. We are concerned, however, that the proposed areas identified for off-site mitigation, Map G-3 -G-7, fail to recognize that the Desolation Flats Natural Gas Field is located to the southwest of the CD-C Project Area and that the Atlantic Rim Natural Gas Field is located to the southeast of the CD-C Project Area. The Nature Conservancy appears to have • proposed several mitigation areas within the boundaries of both of these existing oil and gas fields. Funding offsite mitigation projects within an existing oil and gas field does not appear rational.	The BLM is aware that the Desolation Flats and Atlantic Rim Natural Gas Fields have been identified as areas with potential for off-site mitigation in **Appendix G, Energy By Design**. This appendix was designed as a way of identifying areas that have similar habitat and features to those areas in the CD-C project areas that may be impacted by development and may require the use of off-site mitigation. The appendix does not identify to the site-specific level where off-site mitigation activities may occur. Even though some identified areas are within other active natural gas fields, this does not necessarily preclude the opportunity of developing off-site mitigation in areas within those natural gas fields.
WL	Appendix G, mitigation	In04	76	Appendix G, Preface, page G-II. The voluntary nature of the Mitigation Planning should be clearly stated in the preface.	Thank you for your comment. The voluntary nature of the mitigation planning is clearly stated.
WL	Appendix G, off-site mitigation	O16	1	Conservation easements used with off-site mitigation (as described in Appendix G, page G-5) must not only support off-site mitigation but also ensure the landowner's management flexibility.	Thank you for your comment.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
WL	Appendix G, WY pocket gopher	In05, In08	109	Update the scientific name of the Wyoming pocket gopher on p. G-2 which is *Thomomys clusius*, not S. *elegans* which is the Wyoming ground squirrel. The document should also be updated with more recent information regarding the Wyoming pocket gopher. Devon and several other oil and gas operators teamed up with the State of Wyoming to conduct studies for the species for the last several years and gained significant information about the species.	Thank you for your comment. The text has been updated.
WL	Appendix H	In07	28	Appendix H. BLM requested inclusion of a number of species that are unlikely to be found in the area. It is suggested that the following species be removed from the list: Wyoming toad; Preble's jumping mouse, black-tailed prairie dog, and lynx.	The species were added because the BLM had reasons for considering them in the context of the CD-C EIS.
WL	Appendix I	C01	25	A goal of the CCCLUP is to sustain scenic areas, wildlife habitat, and other important open spaces. An implementation strategy is to limit development in wildlife migration corridors, winter ranges, birthing areas, and sage grouse core areas. Conformance with this County goal can be achieved and maintained with the implementation of Appendix I, Wildlife Inventory, Monitoring and Protection Plan.	Thank you for your comment.
WL	Appendix I	F03	29	Appendix I. Page I-1: The Service recommends the Wildlife Mitigation, Monitoring and Protection Plan include a provision for the collection of baseline data prior to implementation of the project.	The CD-C **Wildlife Inventory, Monitoring, and Protection Plan** will be an extension of the Monitoring Without Borders program that has been actively collecting information pertaining to various wildlife species within the CD-C project area since the signing of the 1994 Creston Blue Gap Record of Decision.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
WL	Appendix I, Annual Inventory and Monitoring	In05, In08	115	Throughout this section the BLM identifies numerous annual monitoring reports that allegedly must be conducted each year. As noted above, we estimate these reports could cost in excess of $100,000 per year. The BLM has not and cannot justify such a substantial monitoring and mitigation program, especially given the relatively low level of impacts expected to occur to most species within the Project Area. Overall, the BLM appears to require an EIS-level wildlife analysis to be conducted annually at the operator's expense. Such an expense cannot be justified, particularly when on-site wildlife studies will be conducted by the operators as needed when specific development operations are opposed. We understand and appreciate the need to conduct surveys for threatened, endangered, and candidate species as well as BLM sensitive species before any site-specific operations take place. We cannot, however, justify field-wide studies on an annual basis simply to satisfy the curiosity of BLM personnel. Several of the proposed annual studies appear to be particularly unnecessary such as the use of marine surveillance radar to determine whether eagles fly across the CD-C Project Area. The BLM's own analysis in the CD-C Draft EIS indicates that there is no eagle habitat within the Project Area and that no significant impacts to bald eagles are anticipated. CD-C Draft EIS, pg. 4-104. As presented, many of the studies appear to be completely unnecessary and unjustifiable.	Please see updated text.
WL	Appendix I, annual meetings	O01	8	Annual meetings are said to be set to identify methods for accomplishing the four step plan. We suggest bi-annual meetings to evaluate the need for changes and to identify the four step plan is being adhered to. For instance, what if an operator doesn't provide their inventory/monitoring reports and description of all existing and proposed project developments within the timeframe allotted?	This monitoring plan has been in place since 2000, and this document only extends the existing monitoring into areas where the previous monitoring plan did not extend to. This group has been successful in the past for implementing the required monitoring and working together for success, and would continue to be successful.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
WL	Appendix I, annual report	In04	77	Appendix I, Section 2.1 Annual Reports and Meetings, Content requirements a-h. The components of the annual report are extensive research items. The BLM, in conjunction with the WGFD, should take primary responsibility for wildlife inventory and monitoring. It is not explained how the BLM intends to use all of this information. We request that this be clarified in the Final EIS.	The **Wildlife Inventory, Monitoring, and Protection Plan (Appendix I)** is a cooperative effort between the BLM, the WGFD, and the Operators and has been an ongoing effort since 2000. The information is collected to determine what impacts, if any, oil and gas development is having on identified wildlife species. Please see the publication available online at http://www.blm.gov/wy/st/en/info/NEPA/documents/rfo/cd_wamsutter.html for information pertaining to how the data are used. Also, please see Appendix I, Wildlife Monitoring and Mitigation Plan for more information on how the information would be used.
WL	Appendix I, annual reports	In10	34	The components of the annual report are extensive research items requiring the use of third party contract biologists. Placing this burden on some of the smaller operators with relatively limited leasehold and activity in the project area is unreasonable and unnecessary to successfully evaluate wildlife in the project area. Additionally, BLM, in conjunction with WGFD, is in a better position to gather and evaluate items a-h in order to prepare the annual report. It is not explained how BLM intends to use all of this information and how all these requirements will be used by the BLM in their annual report prepared each February. As such, we recommend that BLM assume responsibility for gathering and assessing this information in preparing the annual report, and/or limits the application of wildlife monitoring requirements to larger operators in the project area.	The **Wildlife Inventory, Monitoring, and Protection Plan (Appendix I)** is the continuation of the Monitoring Without Borders implemented in the CD/WII ROD. Appendix I has been updated and clarified.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
WL	Appendix I, annual reports and meetings	In05, In08	114	BLM needs to identify how the annual reports would be organized and implemented given the number of operators within the CD-C area. BLM must also explain how it intends to require operator participation and upon what basis operators will be required to participate. Will costs be proportional to the number of wells drilled in a particular year? Will costs be proportional to the number of acres operated within the CD-C Project Area? Will the BLM require a specific operator to serve as the administrator? Further, the annual report purportedly required by this section would require a massive undertaking each and every year. We estimate the costs of this report could exceed $100,000 on an annual basis. The report is a substantial undertaking that is completely unreasonable for the BLM to require. The BLM also suggests in this section that the annual reports would be prepared by the operator's third-party contractor with BLM oversight. The BLM has not explained how the operator would be selected and funded. We are not aware of any legal authority that would allow the BLM to require this type of open-ended funding for third party monitoring requirements.	The implementation of the **Wildlife Inventory, Monitoring, and Protection Plan (Appendix I)** would be consistent with what has been done for the Monitoring Without Borders group for the past ten years.
WL	Appendix I, baseline data	O01	10	“Inventory/monitoring also includes the process of compiling general (overview) information on the historical and current abundance and distribution of a species, its habitat requirements, rate of population change, and limiting factors (species statistics).” (Draft EIS, Appendix I, I-3) The Appendix document does not say the operators and/or the BLM will collect baseline data for wildlife populations, distribution, and migration paths. WWF and NWF request these data be collected prior to any development for accuracy and wildlife management effectiveness.	Data have been collected in and adjacent to the project area since 2000 for certain species. However, development has been occurring in the project area for decades and any data that are collected in the project area cannot be considered true baseline. The ability of the BLM to halt development is limited for a number of reasons, most importantly being the inability of the BLM to infringe on valid existing rights and the stipulations of the contract that is created between a leaseholder and the federal government when a lease is issued.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
WL	Appendix I, clarification	In07	29	Appendix I. This appendix is to be applied under all alternatives for the life of the project. As written, many surveys may be required outside of the site-specific APD process and potentially for the entire CD-C area. An annual Operator report is to be provided to the BLM by Nov. 11. The report will contain GIS of existing and next-year's proposed disturbance; a summary of wildlife data; monitoring results; existing, new, and proposed protections and effectiveness determinations; trends analyses; and recommendations based upon failures and successes and additional species to be monitored. An annual meeting will be held in December where additional monitoring may be determined to be required. Operator requirements and financial assistance are identified, but not well defined. The level of Operator required support (financial or otherwise) needs to be identified and negotiated with Operators. Additionally, annual reporting beyond existing and proposed development actions appears to belong with BLM not Operators, particularly as all data (e.g., site-specific APD surveys) will have been provided to BLM. Operator requirements to assess trends, determine protection measure/mitigation efficacy, and provide recommendations also appear out of place.	Please see updated text.
WL	Appendix I, clarification	In04	78	Appendix I, page I-4, 2.2.1, second paragraph. Inventory and monitoring surveys for Special Status Species will be conducted by the BLM or a BLM-approved Operator-financed biologist in areas of potential habitat within the CD-C project area and all surveys will be conducted in coordination with the BLM. It should be noted that if operator financed biologists are to be used, those should be limited to where proposed projects may occur in potential habitat. While BLM has the basis to conduct surveys within the CD-C project area, the project area includes over 1 million acres. Operator funded surveys should only occur in association where project activities are planned. Therefore, a portion of the sentence referring to operator financed surveys should be revised to read … or a BLM-approved Operator-financed biologist in areas of potential habitat where projects are proposed within the CD-C project area.	All mitigation would occur at the site-specific level. However, regional off-site mitigation may need to be considered as a result of the cumulative impacts from multiple projects (or as a result of the direct impacts from one project). Limiting the ability of the BLM to develop regional mitigation by stating that inventory and monitoring of species would only occur where projects are proposed would hinder the successful implementation of regional mitigation. Via IM-2013-142, the BLM must consider regional and off site mitigation in all proposed projects.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
WL	Appendix I, clarity	In04	79	Appendix I, page I-5, 2.1, 2, Greater Sage Grouse (Candidate), third paragraph. Helicopter surveys for wintering areas will occur when weather conditions provide the best opportunity for these types of surveys and will be scheduled between December 15 and February 30. A sentence which can be found in later portions of this plan reads Operators may provide financial assistance for aircraft rental, as necessary. This should be revised to read, Operators may choose, at their sole discretion, to provide financial assistance for aircraft rental, as necessary.	As is currently written, it is clear that Operators may choose to provide financial assistance, and that this would be voluntary. Text has not been revised.
WL	Appendix I, cost	In05, In08	110	We are strenuously opposed to the proposed wildlife mitigation, monitoring and protection plan described in Appendix I. The proposed plan would impose significant financial burdens and responsibilities on the operators for an unknown period of time. As presented, the wildlife mitigation, monitoring and protection plan would virtually require the operators to fund any and all wildlife studies deemed necessary by the BLM without regard to the level of development ongoing or even potential impacts to wildlife species. The BLM has not justified this significant regulatory and cost burden and Devon urges the BLM to significantly revise if not eliminate entirely this proposal for the CD-C Project.	Thank you for your comment. Please see updated text.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
WL	Appendix I, cost	In05, In08	83	BLM states that the wildlife mitigation and monitoring plan would be required under all alternatives. We are strenuously opposed to the adoption of Appendix I in its current form as it creates unnecessary, vague, and virtually limitless requirements for the operators to engage in wildlife monitoring studies. As currently drafted, Appendix I would allow the BLM to require the operators to engage potentially expensive and unnecessary wildlife studies whenever it was deemed necessary by the BLM. It would be impossible for the operators to adequately budget or prepare for this seemingly endless set of monitoring requirements. Further, given the numerous oil and gas operators in the area, the BLM needs to determine how it would apportion the costs and responsibilities for engaging in the monitoring requirements proposed in Appendix I. Unlike areas where there are few operators, such as Jonah, Pinedale Anticline, and even the Atlantic Rim Area, the CD-C Project Area contains dozens of oil and gas operators. Without a clear mechanism of allocating costs and responsibilities for wildlife mitigation and monitoring, it would be virtually impossible for the BLM to administer these responsibilities and requirements equitably. Finally, Devon disagrees with the BLM's decision to require the wildlife mitigation and monitoring plan under all alternatives. It would have been more consistent with the mandates of NEP A to require the wildlife plan only under one or two alternatives so that the public may understand the differences between various alternatives and the impacts therefrom.	Please see updated text/**Appendix I**.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
WL	Appendix I, cost allocation	In05, In08	111	We are particularly concerned that given the number of operators within the CD-C Project Area, it will be virtually impossible for the BLM to implement or utilize this type of mitigation or monitoring plan. Unlike oil and gas fields such as the Jonah Field, Pinedale Anticline Project Area, and the Atlantic Rim Area, where there are very few operators, the CD-C area is operated by dozens upon dozens of separate operators. Because the average lease size in the CD-C Project Area is a single section given the checkerboard ownership within the area, very few portions of the CD-C Project Area are "blocked up" or consolidated such that studies could be targeted at specific regions. Because oil and gas operations in the area are significantly diversified, it would be incredibly difficult for the BLM to determine how the costs of wildlife studies proposed under Appendix I would be allocated and enforced. As presented, Appendix I is inappropriate. We also do not believe the BLM has justified the significant monitoring and mitigation requirements proposed by Appendix I. The type of mitigation and monitoring required by Appendix I is more arduous than the type required in either the Jonah Field or the Pinedale Anticline Field where the impacts are arguably more severe given the density of surface disturbing activities and year-round operations. Absent justification by the BLM for this monitoring and mitigation proposals, it appears to be an inappropriate attempt to coerce the operators to fund unnecessary studies.	Thank you for your comment. Please see updated text.
WL	Appendix I, funding	In04	50	Page 4-82, second paragraph: The BLM indicates the Wildlife Monitoring and Protection Plan will be required under all Alternatives. The plan seems to require an open-ended commitment of the operators to fund any and all wildlife studies deemed necessary by the BLM. How will the BLM decide what studies are necessary? How does the BLM intend to solicit funding from such a diverse group of operators? Will the operators have the opportunity to review and provide input to the BLM's decision process regarding studies?	Please see updated **Appendix I**.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
WL	Appendix I, helicopter surveys	In10	36	Operators should not be expected to fund helicopter surveys. This expense is unjustified and unnecessary to execute effective and thorough monitoring of wintering areas. The WGFD conducts aerial surveys of wintering areas and should be able to provide BLM with this data. This provision should be removed or revised to read that "Operators may choose, at their sole discretion, to provide financial assistance for aircraft rental, as necessary."	The **Wildlife Inventory, Monitoring, and Protection Plan (Appendix I)** is the continuation of the Monitoring Without Borders implemented in the CD/WII Record of Decision. Appendix I has been updated and clarified.
WL	Appendix I, implement-tation	O01	5	The Draft EIS addresses concerns with terrestrial wildlife chiefly through a proposed requirement for mitigation once surface disturbance exceeds 10%. We have several concerns with this approach. First, it is vital that operators be obligated to follow this plan to its full intent. Often, as in the Atlantic Rim area to the east, adaptive management and mitigation plans are incorporated into management plans, but are not followed through upon, don't start in a timely fashion, or don't become implemented until problems have gotten out of control. BLM states that "Implementation of the plan will provide opportunities for land managers and project personnel to achieve and maintain desired levels of wildlife productivity and populations within and adjacent to the CD-C project area (e.g., at pre-project levels) by minimizing and/or avoiding potential adverse impacts to wildlife species." (Draft EIS, Appendix I, page I-1) For that claim statement to have merit, the land managers and operators need to start early and effectively succeed and meet this goal.	Thank you for your comment. The Monitoring Without Borders group has been working on compiling data since the signing of the CD/WII ROD and will continue to do so with the signing of the CD-C ROD.
WL	Appendix I, implement-tation	O01	7	"Considerable efforts will be required by agency and operator personnel for Plan implementation each year." (Draft EIS, Appendix I, page I-1) What type of checks are in place to guarantee these efforts are carried out and/or what type of assurances does the public have for this plan moving ahead as planned? What are the penalties, if any, if the agency or operator fails to follow through?	The Monitoring Without Borders group has been meeting on a regular basis since 2000, with the signing of the CD/WII ROD to implement the same monitoring that is being proposed for the CD-C project. This group has been successful in the past for implementing the monitoring required in the CD/WII ROD, and would continue to do so for the CD-C ROD.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
WL	Appendix I, implemen-tation	In05, In08	113	The BLM suggests the Monitoring Without Borders may play a significant role in the future mitigation and monitoring processes. The BLM should explain how this group will be funded and whether or not the BLM can ensure it has sufficient funding to utilize this group. The BLM also indicates that considerable effort will be required by agency and operator personnel for the monitoring plan explained in Appendix I. To the best of our knowledge, the BLM has neither inquired whether the operators would be willing to participate in such monitoring plan nor explained the consequences for operators not participating in this plan. As already discussed, given the number of operators within the CD-C Project Area, implementation of this plan would be virtually impossible. How does the BLM propose to require literally dozens upon dozens of operators to participate in these mitigation and monitoring studies and meetings? Finally, the BLM should acknowledge the operator's willingness to fund studies that will be impacted by the alternative selected by BLM.	Thank you for your comment. Please see updated text.
WL	Appendix I, inventory and monitoring	O01	11	“The frequency of inventory and monitoring requirements will be dependent upon the level of development in the project area.” (Draft EIS, Appendix I, I-3) Quantify this – will inventory and monitoring not be required if no development will be conducted in that area that year or will inventory and monitoring not be required if up to 100 wells will be developed in that area that year. This needs to be spelled out so the public, land managers, and operators have a clear understanding of what is expected.	This has been clarified in **Appendix I**.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
WL	Appendix I, mitigation	In05, In08	116	To the extent the BLM is simply applying the mitigation measures provided for in the Rawlins RMP, Devon has no objections. To the extent the BLM is attempting to impose new or different mitigation measures, the BLM must ensure that the mitigation measures are consistent with existing lease rights. The BLM often cites a relatively recent decision from the Interior Board of Land Appeals ("IBLA") for the proposition that the agency can impose COAs on existing leases. Yates Petroleum Corp., 176 IBLA 144 (2008). The Yates decision does not stand for the proposition that BLM can impose COAs whenever it deems necessary or in broad programmatic documents such as the CD-C Draft EIS. Rather, in Yates, the IBLA merely affirmed the imposition of an additional COA based on site-specific information including recent and directly applicable scientific research. Yates, 176 IBLA at 157; William P. Maycock, 177 IBLA 1, 16-17 (2009). The Yates decision does not authorize the BLM to ignore relevant lease terms, the BLM regulations at 43 C.F.R. § 3101.1-2, or the Rawlins Resource Management Plan. Further, BLM must recall that it cannot impose new, unreasonable mitigation requirements on existing leases. Courts have recognized that once the BLM has issued an oil and gas lease conveying the right to access and develop the leasehold, the BLM cannot later impose unreasonable mitigation measures that take away those rights. See Conner v. Burford, 84 F.2d 1441,1449-50 (9th Cif. 1988); 43 C.F.R. § 3101.1-2 (2012) (BLM can impose only "reasonable mitigation measures... to minimize adverse impacts... to the extent consistent with lease rights granted").	No valid existing rights would be infringed upon by the selection of any of the alternatives. This has been clarified in the Final EIS.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
WL	Appendix I, mitigation	O01	6	In order for mitigation to effectively offset adverse impacts, it must be based on reliable, scientifically-documented techniques, not ill-defined "habitat improvement projects." Examples such as vegetation treatments, etc. are given, but no supporting studies or data are provided or cited to establish the effectiveness of these methods in addressing the specific habitat functions that will be disrupted by the proposed project. As The Wildlife Society's technical committee notes: "The examples that are outlined in the EIS will have little or no value to impacted wildlife. Once winter range has been removed or excessively impacted, no amount of water developments (which in themselves will increase summer livestock and wildlife use, further degrading winter range) and vegetation treatments (if over 10% of the land is under development, either human presence or noise pollution will cause animals to leave the area, negating any vegetation treatment within the area) will mitigate the impacts on wildlife. Off site mitigation has yet to prove highly effective with mule deer and often it is much more beneficial and cost effective to protect delineated winter ranges and migration corridors than to try to artificially reconstruct these areas outside of a proposed 'project area'".	Site-specific mitigation measures cannot be presented and analyzed in such a programmatic-level document. "Habitat improvement projects" is a general term that can be used as part of the programmatic nature of this document, and once projects are analyzed on a site-specific level, appropriate mitigation measures would be selected and analyzed. Appropriate mitigations for all impacted resources would be analyzed on the site-specific level.
WL	Appendix I, Monitoring Plan	In05, In08	112	On page I-I, the BLM indicates that the monitoring plan will begin upon the signing of the ROD and will continue for the life of the EIS. The BLM must clarify this statement. The ROD constitutes the end of the EIS process. BLM NEPA Handbook H-1790-1, section 9.1, pg. 91 (Rel. 1-1700112012008). To the extent BLM believes the monitoring plan should last for the life of development analyzed in the EIS, Devon is opposed to such a requirement as production operations in the CD-C Project Area may last for the next 30 to 50 years. The BLM has not justified such a significant period of time to conduct mitigation and monitoring requirements.	The text has been revised to indicate that the monitoring plan will continue for the life of the **project.** The plan will receive a review for effectiveness by the BLM annually.
WL	Appendix I, reports	O01	9	"The BLM will submit a final annual report to all potentially affected individuals and groups by early February of each year." (Draft EIS, Appendix I, I-2) WWF and NWF want to be on the list to receive these reports. Our preference is electronic copy to save time and money.	Thank you for your comment.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
WL	Appendix I, Studies	In06	12	Page 4-82, 4.8.3.1, second paragraph, says the Wildlife Monitoring and Protection Plan will be required. The implication is that Operators will fund any studies BLM deems necessary. What will these studies be? How will they be managed? What portions of these studies will individual operators have to fund and how will this be determined? Will operators have a say in what studies are done and how they are structured?	Please see updated **Appendix** I.
WL	Appendix I, surveys	In10	35	If operator financed biologists are to be used, those should be limited to where proposed projects may occur in potential habitat. The project area includes over 1 million acres. Operator funded surveys should only occur in association where project activities are planned. Therefore, the sentence referring to operator financed surveys should be revised to read "...or a BLM-approved Operator-financed biologist in areas of potential habitat where projects are proposed within the CD-C project area..."	The **Wildlife Inventory, Monitoring, and Protection Plan (Appendix I)** is the continuation of the Monitoring Without Borders implemented in the CD/WII Record of Decision. Appendix I has been updated and clarified.
WL	Baseline data	O04	17	Oil and gas drilling and production have been occurring in the project area since the 1950s, and the agency has prepared an analysis of disturbance density to date by square-mile section. Draft EIS at 4-2, Map 4.0-1. This provides a dataset with which trends in sage grouse lek counts, mountain plover habitat use, prairie dog colony occupation data, and any other wildlife data can (and should be) compared to determine the effects of past development within the project area on various wildlife. Information gleaned from this analysis would be quite valuable in determining thresholds at which impacts would be felt as well as making projections of future wildlife populations and/or habitat use based on the various alternatives outlined in the Draft EIS. This need not be a very difficult analysis.	Thank you for your comment. The research effort you describe is beyond the scope of the EIS. While the effort would yield interesting results, those results would be unlikely to conclusively yield useful management prescriptions.
WL	Baseline data	C02	78	Draft EIS p.p. 3-85 Table 3.8-1. Big game Herd Unit population parameters within the CD-C project area. CLG Comment: The WGFD population objectives appear to be unrelated to forage or habitat for Bitter Creek. The statement also generalizes the drought. Elk numbers far exceed objective and this will materially affect vegetation and habitat for other wildlife. The Draft EIS needs to acknowledge this fact not just for elk numbers, but for all wildlife populations.	The WGFD population objectives are outside the scope of this document. The drought discussion is taken from the WGFD Job Completion reports, and a citation has been added. The Steamboat HU is well over objective but covers only the extreme eastern edge of the project area, as such does not materially affect vegetation or habitat for other species.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
WL	Baseline data	C02	79	Draft EIS p.p. 3-86 Average hunter success in the pronghorn Hunt Areas in the CD-C project area is 92 percent, resulting in a prorated annual harvest of approximately 640 animals (WGFD 2009 data).....Although over a dozen pronghorn migratory movements have been documented within the project area, the corridors are broad and poorly defined (Map 3.8-2). Comment: The above discussion and big game numbers reflect issues not clearly related to energy development. The discussion should be revised to link it to energy development.	Average hunter success is relevant to the discussion of pronghorn population.
WL	Baseline data	S04	3	Big game population information should be updated to reflect the current status of all species discussed. Use Big Game Job Completion Report for 2012 that gives population estimates under objective for the Baggs deer herd. For pronghorn, add discussion on current population vs. herd objectives. We have seen a steady decline in pronghorn over the last 20 years and no rebound in population from the hard winter of 2007-2008.	Herd numbers have been updated in the Final EIS to reflect the 2012 report.
WL	Baseline data	O01	4	The wildlife baseline data collected from 2006 to 2007 by HWA is important to have on file prior to development. We believe baseline data is necessary to have for monitoring and mitigation purposes. We appreciate the collection of baseline data prior to a new well or new road construction and appreciate BLM and the operators working with other entities to gather relevant wildlife data for this area.	Thank you for your comment.
WL	Bats	F03	22	Page 4-103. The Draft EIS lists four bat species that would likely not be impacted by the project and then says they may be affected. This should be corrected in the Final EIS.	The apparent contradiction has been corrected.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
WL	Big game	O04	19	Alt D appears to have the least impact on big game compared to the other action alternatives. While this analysis does seem overoptimistic for outcomes under Alternative D, we concur that Alternative D would result in significantly lower impacts than the other action alternatives. We recommend the inclusion of mitigation measures outlined at Draft EIS 4-98 in any alternative that is ultimately adopted; the lockout/gate-out of crucial winter ranges and migration corridors during the duration of their season of use is a particularly important method. Monitoring of habitat use should also be provided for in such areas to determine to what extent game animals return to areas where lockout closures are in effect.	Thank you for your comment.
WL	Big game	O04	20	BLM notes that the zone of disturbance for big game typically averages 0.7 mile from roads and well pads. Draft EIS at 4-83. BLM should model typical development scenarios under each alternative and then measure and present the acreage extent of this 0.7-mile buffer for each using GIS. This GIS analysis should also reveal the acreage of big game crucial winter range and the proportion of migration corridors falling within the 0.7-mile zone for each species. Using the absolute acreage impact under each alternative (see Table 4.8-1) is misleading in that it underestimates the actual acreage lost as effective habitat for each species. Habitat unavailable to wildlife because it is avoided through disturbance is just as void of value as habitat directly converted to roads and well pads. BLM essentially concedes this, stating that avoidance through disturbance also eliminates habitat, in addition to direct disturbance through blading. Draft EIS at 4-85	Thank you for your comment. As indicated, the EIS points out that the zone of disturbance extends beyond the actual disturbance. However, the actual disturbance varies by species, by type of disturbance, and by distance from the disturbance. Modeling these parameters would be extremely complicated and beyond the scope of the EIS.
WL	Big game	In05, In08	64	BLM should update the information in Table 3.1-8 (3.8-1?) regarding big game herds and populations. It is over 3 years old and more recent information from WGFD demonstrates that pronghorn populations in the area are actually improving in the Baggs and Red Desert herd units. PH in Bitter Creek Unit remain a concern and have been below herd objectives since 2006.	The data have been revised to reflect the 2012 WGFD numbers and citations.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
WL	Big game	O01	12	p. 3-86 says "Herd numbers can be affected by several factors…" Habitat fragmentation caused by development or simply habitat fragmentation in general is missing from this sentence. An additional sentence is needed to incorporate this factor which is a known contributor to population number impacts.	Your suggestion has been incorporated into the discussion.
WL	Big game habituation	In05, In08	85	In its description of potential impacts to wildlife species, and pronghorn in particular, the BLM does not adequately recognize that many big game species including pronghorn often habituate to spending extensive time within existing oil and gas fields. (*There is an extensive discussion in the letter with many citations.*) BLM should consider these more recent studies when preparing the Final EIS.	Thank you for your comment.
WL	Columbian sharp-tailed grouse	O03	6	No maps or analyses of impacts were presented for Columbian Sharp-tailed grouse, despite being a BLM sensitive species and occurring within the project area.	Columbian Sharp-tailed grouse was included in early versions of the Draft EIS but was removed. The cited reference was mistakenly left in the document.
WL	Crucial winter range	S04	2	WGFD recommends that final mapping for crucial winter ranges, sage grouse winter concentration areas, migration routes and parturition areas be completed within the first year after the ROD is signed. A 1/2 mile buffer around current migration 'lines' is recommended until mapping is complete.	The BLM is not responsible for mapping of migration corridors.
WL	Dust	In01	12	On Page 5-21, insects, birds, and amphibians are all noted to avoid dust and noise from roads which is speculative in nature and not supported by any scientific documentation to form the basis of the statement. The BLM should either support this claim with objective scientific documentation to remove any speculation or revise accordingly.	This potentially misleading statement has been modified in the Final EIS.
WL	Fences	S04	11	Fences that create migration issues for pronghorn should be identified through monitoring GPS-collared pronghorn and modified by industry, working with the grazing permittees.	Because industry is not generally responsible for constructing fences, they cannot be made responsible for replacing existing fencing. However, fence modification and/or replacement may be part of a habitat improvement or mitigation project, at the discretion of the Operator.
WL	Fencing	In04	51	Page 4-85, first paragraph: The problems fencing poses for wintering wildlife are discussed. This problem is an ongoing, long-term one. Energy development does not utilize large fences.	Fences complicate the ability of wildlife to accommodate the changes brought about by energy development.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
WL	Ferruginous hawks	O03	7	Impacted seasonal acreage and predicted mortalities for ferruginous hawks should have been included in the Draft EIS.	Given the number and distribution of ferruginous hawk nests in the project area, the entirety of the CD-C project area could be considered the seasonal habitat of the species. There are no data regarding the anticipated level of mortality that can be attributed to oil and gas development. Given the protections in place it is expected to be low.
WL	Fish	In01	7	Page 3-120 states that connectivity among habitats is required to carry out the life-cycles of native fishes. However, connectivity among habitats is not required to carry out the life-cycles of all native fish. Rather, fragmentation by man-made structures has been documented to affect species abundance and distribution patterns.	**Section 3.9.2.2** describes the many factors that affect these sensitive species in Muddy Creek. Connectivity among habitats in Muddy Creek is required for the life cycle of these native species, especially their long-term persistence in Muddy Creek.
WL	General	O09	2	TRCP values our fish & wildlife resources and encourages you and your staff to establish options that ensure responsible energy development in a way that sustains fish & wildlife. The TRCP's recommendations and priorities regarding management of fish and wildlife during energy development are organized under the five fundamental areas of Funding, Accountability, Coordination, Transparency and Science (FACTS). *There are several pages explaining the five areas and how to manage natural resources.*	Thank you for your comment.
WL	Golden eagle	O03	8	The Golden Eagle was inadequately addressed. The Final EIS must include discussion on anticipated impacts with each alternative, as well as mitigation measures (such as carcass removal from roads) to reduce impacts to this imperiled and federally protected species. To comply with USFWS regulations, BLM must ensure additional analysis and data collection are conducted. Finally, decisions that will impact Golden Eagles must be placed within a regional population context much larger than the project area.	The golden eagle is the second-most common raptor species known in the project area. The BLM has protective measures and COAs at its disposal that can be applied to permits for additional protection of the species.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
WL	Habitat disturbance	In01	9	Page 4-90 states that "[a]n increase in disturbance of wildlife habitat would impact all species…" (emphasis added). This statement is a narrow conclusion lacking support of objective and factual information (emphasis added). No documentation has been presented indicating that "all" species would be impacted or that the functionality of their habitats would require "long-term." APC recommends that the BLM revise this statement, and all similarly broad and unsupported conclusions, to accurately represent the facts and best available science at the time.	This sentence has been removed.
WL	Habitat manage-ment areas	O04	60	Portions of the Muddy Creek WHMA fall within the CD-C project area. Draft EIS at ES-16. The Chain Lakes WHMA falls substantially within the CD-C project area. Draft EIS at ES-16. The Chain Lakes encompass "unique alkaline wetland systems," recognized by BLM as "unique, fragile, and rare." Draft EIS at 3-34. Oil and gas development is supposed to be intensively managed in this area under the Rawlins RMP. *Id*. BLM should apply special protective measures to developments approved within these WHMAs. At minimum, the setbacks for floodplains and streams contained in Alternative B need to be applied within the Muddy Creek WHMA and elsewhere in the Muddy Creek watershed. In addition, seasonal restrictions on disruptive activities (including routine operator vehicle traffic) should apply, preventing these from happening within crucial wildlife habitats such as winter ranges and nesting areas, during their season of use.	Please see Alternative F, the Agency Preferred Alternative, which calls for intensive management of the Muddy Creek and Bitter Creek watersheds.
WL	Impact analysis	In04	52	Page 4-88, first sentence: How is the determination *High Impact* obtained, based on the information presented? Please show the analysis that supports this assertion.	The definition of High Impact (2-3 well pad locations or 20-60 acres of disturbance per square mile) and the source (WGFD) has been provided and the analysis that supports the conclusion has been outlined.
WL	Impact analysis	O12/ O13	1	The proposed project is likely to have large-scale negative impacts on wildlife and wildlife habitats. The area has critical winter range for ungulates (PH & MD) as well as core areas for sage-grouse. There should be more quantification of potential impacts and monitoring activities to ensure thresholds for impacts to winter range and migration habitats are not exceeded.	Thank you for your comment.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
WL	Impact analysis	O12/ O13	5	The proposed project will increase road densities within the project area 4 fold, resulting in increased habitat fragmentation. Along with the fragmentation there will be an increased demand for year round drilling, including production sites within delineated winter ranges. The EIS calls for mitigations for these impacts, but to date very little data exists to support the actual benefit of mitigations on a project of this size. This project will have drastic impacts on wildlife across the project area and this must be investigated to a much greater extent prior to accepting this EIS.	Project-specific mitigation will be implemented on case-by-case basis, and include timing and use stipulations that are designed to reduce impacts to sensitive species and specific resources.
WL	Impact analysis	O12/ O13	18	"Big game species in the area are expected to be significantly impacted" taken directly from the EIS. A statement of this poignancy in an EIS would lead the reader to believe that the BLM is unwilling to work cooperatively with the WGFD and proponents of the project to come to a compromise that would allow for extraction of minerals while not having dramatic impact on public resources, both wildlife and public lands. Especially disturbing is the acknowledgement that the Preferred Alternative will have "high impacts" on both PH and MD populations within the project area.	The impacts by alternative have been clarified. The document provides numerous discussions regarding the application of WGFD and BLM BMPs and COAs to assist in the reduction of impacts as well as additional planning requirements, especially relative to Alternative F.
WL	Impact analysis	O12/ O13	21	The RMP states that "habitat quality will be functionally maintained within the areas of overlapping big game CWR." Creating a network of roads and well pad disturbances within CWR will not allow for habitat functionality to persist. Countless studies have proven that increased development on winter ranges have detrimental effects of large ungulate populations (ex. Moxa Arch, Pinedale Anticline, Piceance Basin, etc.). This [is] especially evident when the best available data pertaining to mule deer movements and impacts to migration corridors/winter range are not being utilized in the analysis of this project. By removing all proposed well locations from scientifically validated and delineated winter ranges and migration corridors, the impacts to both the pronghorn and mule deer herds in this area would be decreased. *(see citations in letter)*.	The alternatives to the CD-C Proposed Action, including the Agency Preferred Alternative (Alternative F), were developed with the intention, among other things, of reducing habitat disturbance and habitat fragmentation.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
WL	Impact analysis	O12/ O13	28	Would like to see more of a quantification of impact especially as it relates to CWR for ungulates. WGFD would have this type of data that could be provided to BLM so this is more enforceable.	The 2102 Job Completion Reports were reviewed for data quantifying impacts. The information included generalized statements such as, "Habitat issues in this herd unit include continued gas field development, coalbed natural gas development, opening of an in-situ uranium mine with other mines proposed and possible development of shale oil. Many miles of sheep-tight fences exist in the herd unit, impeding pronghorn movements and migrations, and increasing losses during severe winters." This statement, with the citation, has been incorporated into the document.
WL	Impact analysis	In09	9	"**Wildlife.** Section 4.8 discusses multiple possible effects that development could impose on wildlife [but] does not mention the possible positive benefits to wildlife that can be provided by pipeline construction associated with oil and gas development. Williams has consulted with wildlife biologists who have stated that pipeline construction provides edge cover for some species and, thereby, has a positive effect on wildlife. Williams recommends noting this benefit within this section."	Thank you for your comment.
WL	Impact analysis	O01	1	We have serious concerns regarding the reasonably foreseeable adverse wildlife impacts from the proposed project. The Draft EIS acknowledges, but does not give sufficient analysis to, large-scale disruptions to crucial seasonal habitats for MD, PH and GSG. The Draft EIS does not answer basic questions of how much habitat will be disturbed, what consequences will ensure for wildlife and if and how disturbed ecosystems can be reclaimed.	Thank you for your comment. BLM specialists are satisfied that the impacts to wildlife and the options for minimizing and mitigating those impacts have been sufficiently considered.
WL	Impact analysis, density	O01	13	Within seasonal ranges of big game species, and particularly within CWR and yearlong ranges, BLM has failed to consider more effective means of minimizing adverse impacts. Specifically the value of or consequences to those areas of undisturbed contiguous habitat remaining within the project area, save for vague recognition of adverse consequences from indirect habitat loss (p. 4-85). BLM appears to have neglected to consider limiting well pad density to less than an extremely-dense four pads per section even within crucial winter range - a level of disturbance density far above WGFD guidelines.	Throughout the EIS, one of the driving factors in the development of alternatives and the analysis of impacts has been the need to limit the amount of surface disturbance, particularly in more valuable habitats, and to reduce the number of disturbance sites (well pads) to minimize habitat fragmentation.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
WL	Impact analysis, migratory birds	F03	17	Page 4-88, Neotropical Songbirds: The Service recommends the Final EIS include a more thorough analysis of the effects of the project to all migratory birds and identify the measures the BLM will implement to avoid or minimize negative effects to migratory birds and their habitats. If project activities requiring repeated human presence near migratory bird nests during the nesting season cannot be avoided, we recommend the BLM require the applicant submit a Service-approved migratory bird conservation plan for inclusion in the Final EIS.	The descriptions of the protections provided to upland game bird species, neotropical and other migratory bird species, and their habitats have been expanded in the Final EIS. IN particular, WY BLM IM WY-2013-005 is cited for the guidance it provides for minimizing impacts to migratory bird species.
WL	Migration corridors	O12/ O13	27	Migration corridors are mentioned in a cursory sense but there needs to be more specifics as to how Proposed Actions such as road development and also fencing may impact migration by ungulate species in the affected areas. More recent data collected by WEST Inc. stresses the importance of maintaining migration routes and possible population level impacts from large scale/long term disruption of these routes. Would like to see more specifics on how this would be addressed.	References from WEST Inc. have been reviewed and information from that source incorporated into the discussion in the Final EIS.
WL	Mitigation	O03	3	Page 2-18, 2.2.4, fourth paragraph. Undeveloped areas amount to 400 sections. These 400 undeveloped sections will become increasingly important on the landscape, serving as refugia. Implementing an avoidance first strategy will minimize or preclude declines in the species and their habitats.	Thank you for your comment. We agree the 953 sections in the low-density area will become more important to wildlife. Less than 5 percent disturbance will be allowed in these sections.
WL	Mitigation	P10	2	• Designate wildlife corridor areas for migrating animals. • Establish and post lower speed limits throughout to help wildlife • Encourage companies to pay to convert existing fences to wildlife friendly fencing. • Establish monitoring requirements for all wildlife (ungulates, birds, reptiles, insects etc.).	Thank you for your comment.
WL	Mitigation	O12/ O13	7	Water needed for the drilling process (24 to 32K barrels) should be piped to well locations from central tank locations to help reduce heavy truck traffic throughout the drilling area, reducing noise and air pollution. This is more important near sage grouse lek locations and on big game winter ranges, where increased traffic and noise pollution have been proven to be detrimental to those species during these time periods.	Thank you for your comment. On a site-specific level, piping of water will be considered. However, in some areas, the additional surface disturbance associated with burial of pipelines may lead to increased impacts to other resources.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
WL	Mitigation	O12/ O13	8	Electrical lines to production facilities should be buried to reduce perch and nesting structures for avian predators and decrease the likelihood of bird strikes, especially in areas of known SG concentrations. Lines should be buried in the existing road right-of-ways to reduce habitat degradation.	Thank you for your comment.
WL	Mitigation	O12/ O13	9	Produced water disposal should be through buried flow lines from individual well pads to a centralized collection area to reduce heavy truck traffic to wells once the drilling process is completed. By requiring this, the probability of increased mosquito densities and subsequent increased opportunity of West-Nile Disease outbreaks, a major impact to sage grouse and other native bird populations, will be decreased.	Thank you for your comment. On a site-specific level, piping of water will be considered. However, in some areas, the additional surface disturbance associated with burial of pipelines may lead to increased impacts to sage grouse and other species.
WL	Mitigation	O12/ O13	11	Along with environmental awareness training for employees, work with operators and subcontractors to enact "firearms in vehicles" rules that specify that no employees working in the project area shall possess firearms in their vehicles while working and while commuting to and from the job site. This is especially critical during the winter when animals (specifically elk and mule deer) are increasingly visible and vulnerable in winter ranges.	The BLM has no jurisdiction over the rules that are enforced by Operators on their employees.
WL	Mitigation	O12/ O13	13	Mitigations for exceeding 10% surface disturbance thresholds must be developed prior to accepting drilling plans. They should be beneficial and meaningful. The examples will have little to no value to impacted wildlife. Once winter range has been removed or excessively impacted, no amount of water developments and vegetation treatments will mitigate the impacts. Off site mitigation has yet to prove highly effective with MD and often it is much more beneficial and cost effective to protect delineated winter ranges and migration corridors than to try to artificially reconstruct these areas outside of a project area.	Thank you for your comment.
WL	Mitigation	S04	7	The WGFD recommends that the ROD maintain seasonal stipulations.	Seasonal wildlife stipulations are a requirement of the Rawlins RMP and will be maintained regardless of alternative selected.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
WL	Mule deer	O04	22	The ability of mule deer to forage effectively on winter ranges in a stress-free environment is the key to maintaining viable populations in this region. Winter mortality has claimed up to 80% of the adult mule deer population of southeastern Wyoming, and also depresses fawn production during the following spring (Strickland 1975). On winter ranges, mule deer are easily disturbed by snowmobile traffic and even nonmotorized visitors (Freddy et al. 1996). This can be a critical factor, because metabolic costs of locomotion in snow can be five times as great as normal locomotion costs for mule deer (Parker et al. 1984). Thus, due to the sensitivity of mule deer to disturbance on winter ranges and the crucial nature of winter range performance to maintaining healthy deer populations, mule deer winter ranges must be withdrawn from all road construction and development, particularly oil and gas development, which would increase the level of human disturbance on these winter ranges.	All mule deer winter ranges cannot be withdrawn from development, because most of those areas are already leased and the BLM has an obligation to allow for exploration and development of those leases by the leaseholder. Appropriate timing and use stipulations for the protection of all relevant species would be attached as conditions of approval to all APDs and right-of-way grants.
WL	Mule deer	O04	23	Timing stipulations preventing construction and drilling activities (but not production-related vehicle traffic and human activity) have long been applied to mule deer crucial winter ranges by BLM. For mule deer on the Pinedale Anticline winter ranges, subject to the same stipulation, displacement from crucial winter ranges has been total during most years. Researchers funded by BLM and industry recorded a 46% drop in mule deer populations wintering on the Pinedale Anticline winter ranges ***while seasonal stipulations were in full force and effect***, with no corresponding decline for nearby populations unaffected by gas development; populations have not rebounded to date (Sawyer et al. 2006). It appears that during especially severe winters, snow conditions force mule deer to use traditional winter ranges even if they have been subjected to heavy oil and gas development, and population losses are the result. As much as an additional 4.5% of mule deer crucial winter range (CWR) would be disturbed by this project to make way for gas fields, with a cumulative total of 6.8% of CWR disturbed, and 298 new wells drilled in these habitats. Draft EIS at 4-85. This should not be allowed without preventing all types of disruptive activities.	Thank you for your comment.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
WL	Mule deer	In05, In08	65	BLM indicates that mule deer habitat near Dad was generally poor and not meeting wildlife health standards. Relevance of the information is questioned since it took place over a decade ago. Is there more current and relevant information? Also the site evaluated is outside of the CD-D project area and thus not relevant.	No newer data are available. This section has been modified in the Final EIS to indicate that the data are limited and somewhat dated.
WL	Mule deer	O09	8	Local (and abroad) mule deer habitats are facing unprecedented threats from a wide variety of human-related developments. The Alternatives in the Draft EIS regarding mule deer, and other wildlife such as pronghorn antelope, must be developed so that habitats will be conserved allowing for the sustainability of said species. *Additional information including a number of impacts and citations follows in the letter.*	Thank you for your comment.
WL	Population threshold	In05, In08	87	Missing language, not consistent between pgs 2-9 and 4-92 relative to causes of big game population decline.	The exact intent of the comment is not clear but we believe that revisions to both the description of Alternative B and the impacts of Alternative B will have cleared up any discrepancy.
WL	Pronghorn	O04	21	The BLM has monitored pronghorn forage status at seven locations in the Project Area, but each appears to be very close to major highways. See Map 3.8-2. It is possible that pronghorn avoid major highways, which would mean that forage utilization by pronghorns would be underestimated and pronghorn range condition would be overestimated as a result. The pronghorn crucial winter range crowded against the north side of Interstate 80 is indicative of the Interstate blocking southward migration to more favorable winter ranges. BLM should consider the inclusion (or at least recommendation) of at least one pronghorn overpass over the Interstate, as has been done at Trapper's Point, to mitigate in part project impacts on pronghorn. It is notable that pronghorn and mule deer crucial winter ranges are clustered along the southeast boundary of the Project Area. *See* Map 3.8-7. We recommend that these lands receive special management, wherein all disruptive activities (including vehicle traffic and human presence) are suspended between November 30 and April 30, including for oil and gas operators.	Thank you for your comment. The BLM, UW, and the WGFD are currently working on a pronghorn monitoring project that will provide some insight into the effects of fluid mineral development on pronghorn. Appropriate timing and use stipulations will be attached to the approvals for all APDs and right-of-way grants for all species that require special management.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
WL	Road/well densities	S04	9	Literature (Sawyer et al. 2013) shows that there were impacts to mule deer migration in areas where road densities increased from 0.56 per square km to 1.92 per square km and well densities increased from 0.77 per square km to 2.82 per square km. Also changes occurred in migration when road and well pad densities increased. Based on this , we recommend that road densities in big game migration routes be maintained at less than or equal to 1.5 per square km and well pad densities be maintained at less than or equal to 1.86 per square km.	This study occurred in a different habitat and was limited to only 2-3 years worth of data. More studies are necessary. In addition, there is already heavy development in the CD-C project area which in most ways precludes the ability to limit road densities. Most of the major road networks have already been constructed in the project area and additional roads would consist of short access roads to individual well pads.
WL	Sage-Grouse	O03	5	Additional analyses are needed for Greater Sage-Grouse, as examination of disruptions to leks, seasonal habitats, and predicted mortalities were not performed for the alternatives. Impacts of intensified development in non-core must also be examined for core area populations.	The site-specific locations of proposed wells are not known. Sage-Grouse protective measures found in BLM IM WY-2012-19 and EO 2015-4 will be followed to minimize impacts to the species.
WL	Sage-grouse	In04	3	The Draft EIS does not provide sufficient information about how mitigation for sage grouse will align with Wyoming's Sage Grouse Conservation Strategy and Executive Order. The ROD should reflect that strategy and, therefore, the Final EIS should provide a thorough discussion of the development limitations that would be imposed in core and non-core areas.	Please see **Section 2.2.7.9** of the Final EIS for a description of Greater Sage-Grouse management in the CD-C project area. Management of Greater Sage-Grouse under all alternatives will be consistent with the BLM Approved Resource Management Plan Amendments for Greater Sage-Grouse, and the Wyoming Greater Sage-Grouse Conservation Strategy.
WL	Sage-Grouse	In04	26	Page 2-12, first full paragraph. The BLM proposes mitigation measures in Sage-grouse winter concentration areas (WCA's). We are aware that WCA data were collected as part of the EIS project. Please explain why these data are not provided or provide these data and maps and identify these WCA's within the CD-C Project Area.	Neither the BLM nor the WGFD has delineated any winter concentration areas for the CD-C project area. When such areas are delineated within the project area, the BLM will implement prohibitions of surface-disturbing and disruptive activities as described in the Rawlins RMP.
WL	Sage-Grouse	In04	53	Page 4-101, first bullet: This refers to habitat loss from dust settling on vegetation, reducing palatability and production of forbs and shrubs. No studies back up the assertions.	Please refer to the WGFD document referenced, *Recommendations for Development of Oil and Gas Resources within Important Wildlife Habitats.*
WL	Sage-Grouse	In04	54	Page 4-101, third bullet: This describes potential loss of sagebrush and understory due to over-browsing or grazing by wild ungulates, live stock, and wild horses. All three are managed. Please rewrite.	Please see the response to In04-53 above.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
WL	Sage-Grouse	In04	55	Page 4-101, fourth bullet: This needs a rewrite such that the concept becomes clear. Contiguous means: touching or connected. All wells are likely connected by a road system (and associated impact zones) and usually a pipeline (and associated impact zone). When intensity increases such that impact zones overlap, the total impact zone area decreases, it does not increase. This concept is illustrated by a well pad with 6 wells vs. six individual well pads.	Please refer to the WGFD document referenced, *Recommendations for Development of Oil and Gas Resources within Important Wildlife Habitats.*
WL	Sage-Grouse	In04	56	Page 4-101, sixth bullet: Please list these disruptive human activities.	Disruptive human activities refers to activities with a duration, pattern of occurrence, noise level, etc. that cause disruption to wildlife.
WL	Sage-Grouse	In04	57	Page 4-101, all nine bullets: Many of the bulleted items are not consistent with activities that should be allowed in non-core sage grouse areas under the Governor's EO and the Wyoming BLM's IM on sage grouse.	Please see **Section 2.2.7.9** of the Final EIS for a description of Greater Sage-Grouse management in the CD-C project area. Management of Greater Sage-Grouse under all alternatives will be consistent with the BLM Approved Resource Management Plan Amendments for Greater Sage-Grouse, and the Wyoming Greater Sage-Grouse Conservation Strategy.
WL	Sage-Grouse	S01	4	The Draft EIS appears to apply Greater Sage-Grouse habitat protections within non-core areas that are as stringent as those applied by the Governor's sage-grouse policy within core areas. The Rawlins RMP in its exception, modification, and waiver criteria has the authority to alter the constraints on oil and gas development outside the core area.	Please see **Section 2.2.7.9** of the Final EIS for a description of Greater Sage-Grouse management in the CD-C project area. Management of Greater Sage-Grouse under all alternatives will be consistent with the BLM Approved Resource Management Plan Amendments for Greater Sage-Grouse, and the Wyoming Greater Sage-Grouse Conservation Strategy.
WL	Seasonal stipulations	O12/ O13	12	Exemptions to winter range protection stipulations shall not be accepted for any reason. This level of development will have drastic impacts to both mule deer and pronghorn when combined with all other drilling plans in this area (Desolation Flats and Atlantic Rim).	In some situations, exceptions are necessary--for example, fixing erosion and installing new stormwater BMPs. However, all exceptions are looked at by both a BLM biologist and a WGFD biologist, and many factors are taken into account prior to the granting of an exception.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
WL	Stocking rates	O12/ O13	15	Prior to undertaking any water development or range improvements for livestock, especially in CWR, consultation with WGFD must be conducted. By concentrating permitted AUMs due to disturbance caused by development and insufficient reclamation, increased levels of shrub utilization will occur. This will be detrimental to wildlife, particularly PH and MD wintering within the project area. Also by increasing available water on big game winter ranges, there will be increased year round use by both wildlife and livestock, resulting in lower residual vegetation left for wintering animals. Extreme caution must be taken during development to ensure that rangelands that are disturbed and removed from allotments are met with an equal reduction in permitted AUMs to ensure that Rangeland Health Standards can still be met with increased stocking rates.	Range improvements are evaluated on a case-by-case basis by the BLM in consultation with all concerned parties, including the permittees and the WGFD.
WL	Surface disturbance	S04	8	Because of the already heavy development and indirect impacts, we recommend no more than 3% surface disturbance per 640 acres in big game crucial winter range, matching the Atlantic Rim Big Game working group drafted requirement for the east side of Hwy 789. There could be options that allow more disturbance per section if development is consolidated which would be reviewed on a case by case basis.	The Preferred Alternative (Alternative F) incorporates design features that are intended to minimize impacts to identified sensitive resources, in particular impacts to the Muddy Creek and Bitter Creek watersheds. By limiting the number of well pads to eight per section, surface disturbance should be reduced and directional drilling encouraged. A dust control plan (**Appendix P**) has been incorporated as part of Alternative F. Because this is an infill project, most road development will be limited to the construction of resource and/or local roads. The larger arterial roads have already been constructed. To aid in transportation planning, the CD/WII Transportation Plan has been updated and included (**Appendix N**) as part of Alternative F. Specific measures for the Muddy Creek watershed have been incorporated into Alternative F as design features.
WL	Sustain-ability	C03	21	Wildlife Management: Oil and gas developers are encouraged to work with the appropriate agencies to ensure that field development occurs in a manner that sustains Sweetwater County's wildlife resources.	Thank you for your comment.
WL	Wildlife passage-ways	P23	4	Interstate 80 runs through the middle of this project area. Industry could work with the Wyoming Department of Transportation to build wildlife passageways over or under the interstate, which could also benefit livestock.	Thank you for your comment. This concept is beyond the scope of the CD-C EIS.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
WL	Winter concentra-tion areas	In06	5	Page 2-13, first bullet, winter concentration areas. BLM should also provide the winter concentration area data collected during the EIS project or explain why the data was not provided.	Greater Sage-Grouse habitat has been removed from Alternative B. Neither the BLM nor the WGFD has delineated any winter concentration areas for the CD-C project area. When such areas are delineated within the project area, the BLM will implement prohibitions of surface-disturbing and disruptive activities as described in the Rawlins RMP.
WR-G	Baseline data	F01	6	The EPA recommends that the Final EIS identify the location of source water protection zones, sensitive aquifers, and recharge areas.	**Section 3.4.3.8** was added to discuss aquifer sensitivity and **Map 3.4-3** has been added to indicate aquifer sensitivity within the CD-C project area. Aquifer recharge is discussed in **Section 3.4.3.3**, including areas of recharge. These zones, aquifers, and areas could be affected by drilling operations or spills, which are thoroughly discussed in **Sections 4.4.2.2 and 4.4.4.1**.
WR-G	Baseline data	F01	7	Federal regulations define a USDW as an aquifer at 40 CFR Section 144.3. EPA recommends that the Final EIS identify USDWs based on this definition.	The definition of a USDW at 40 CFR Section 144.3 is used in the Draft EIS in the first paragraph of **Section 3.4.3.7** and that is the definition relied on throughout the Draft EIS. Portions of **Section 3.4.3.7** were revised to more clearly indicate that some aquifers in the project area qualify as USDWs, but may not be used as such due to their depth and the low population density within the area.
WR-G	Baseline data	F01	8	To evaluate the potential impacts of extracting gas from the Almond Formation on drinking water resources withdrawn from the Wasatch Formation, the EPA recommends that the BLM identify: the lower extent of the Wasatch formation; the distance between the Wasatch formation and the Almond formation; and any confining layers between them.	**Section 4.4.4.1, Drilling Operations**, has been revised to include a discussion which identifies the extents of the Wasatch and Almond formations as well as confining layers present between the formations.
WR-G	Injection wells	In05, In08	62	BLM indicates that there are 5 classes of injection wells permitted by EPA under its underground injection control program. BLM should update its information as EPA has recently authorized Class VI injection wells for carbon dioxide sequestration.	**Sections 3.4.4 and 4.4.4.1** have been revised to indicate six classifications for injection wells.
WR-G	Mitigation	P20	2	"Make sure that groundwater samples are collected before development begins so there is at least a baseline for comparison down the road. In my opinion we should stop drilling in the Red Desert but if the project does proceed, at least do it right."	Thank you for your comment.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
WR-G	Mitigation	F01	9	Six wells supply the Wamsutter public water system. There are also 1,081 groundwater wells in the area. To minimize the potential for impacts to drinking water, we recommend the following mitigation measures: 1) site gas wells at least 0.5 mile from any public water supply wells; and 2)site gas wells at least 500 feet from domestic water wells.	Within the Wamsutter drinking water source area, the BLM is aware of the locations of Wamsutter's drinking wells and considers this when reviewing APDs in the area. All public drinking water and domestic wells are considered when conducting the onsite inspection.
WR-G	Mitigation	F01	10	The EPA recommends that the BLM consider including the following measures in the Final EIS to further ensure that BLM's Onshore Oil and Gas Order No.2 protects groundwater resources: 1) a well design requirement to set surface casing and cement to a specific formation and/or depth if there are underlying USDWs; 2) a requirement for an intermediate string of casing and cement if very deep aquifers are encountered; and 3) a requirement for completion of a cement bond log on the surface and any intermediate casing for each well to verify the cement job.	Onshore Order #2 already requires that surface casing be set to a depth necessary to protect useable ground water (<10000TDS), and the RFO enforces this. Cementing is required to be run on the surface casing top to bottom. In the event that cement does not circulate to surface during the pumping job, then Cement Evaluation Logs (CELs) may be required to be run and cement remediation occur prior to beginning to drill the next section of the well. Intermediate casing (IC) is required to protect the well mechanically from deeper high pressure intervals, lost circulation intervals, and/or to protect deeper usable water aquifers. Cement circulated to surface (on surface casing cementing jobs) has been proven to be adequate indication of a good cement job. In the event that fall back occurs or cement is not observed at surface, then on an individual well basis, a remediation plan is developed with the well operator that may include CELs. This current practice is also in line with proposed rules regarding well design as related to the proposed Federal hydraulic fracturing rule. On intermediate casing cement, an operator has and will continue to be required to run CELs on the intermediate string unless cement of the intermediate casing is performed top to bottom and full cement returns are seen at the surface (no different that surface casing cementing) during the pumping of the cement job.
WR-G	Mitigation	F01	11	The EPA recommends that: 1) the BLM strongly encourage closed loop or pitless drilling of the production hole to avoid the need for injection wells and additional evaporation ponds; 2) the BLM encourage recycling and reuse of mud products and production water; and the BLM could consider requiring completion and stimulation fluids returned to the surface to be contained in tanks to avoid the need for pits.	The Preferred Alternative has identified sensitive areas that include the Muddy Creek and Bitter Creek watersheds. The use of closed-loop or pitless drilling would be required in the sensitive areas unless justification is provided by the Operator detailing why closed-loop or pitless drilling is not a feasible option. Exceptions would be granted on a case-by-case basis. Examples of exceptions include that the Operator is technologically incapable of completing a closed-loop or pitless drilling program or the target resource is not amenable to a closed loop or pitless drilling program (i.e. CBM).

Category	Sub-Category	Comment		Comment	Response
		Code	No		
WR-G	Plan of Develop-ment	P05	1	"How will the thousands of gallons of water needed for the fracking process be disposed of?"	The majority of fracking fluids are recovered and disposed of in injection wells per the requirements of Onshore Order #7. This has been added to the Final EIS.
WR-G	Usable water	S03	3	Page 2-2, Section 2.2.1.2: With respect to the reference to *usable water* in Federal Onshore Oil and Gas Order #2, the WQD would like to clarify that all water zones or aquifers in Wyoming are considered Groundwaters of the state and should be protected and isolated using proper casing and cementing procedures.	WDEQ's comment has been noted. The term "usable water" is a direct quote from the Onshore Oil and Gas Order #2 and it cannot be changed. **Section 4.4.4.1**, Drilling Operations defines usable water and states that "To comply with the order, wells must be completed using state-of-the-art techniques, such as cementing and other proven technologies, such that usable water and unusable water do not mix.
WR-G, WR-S	Manage-ment Plan	O10	2	Trout Unlimited recommends that BLM should develop a Water Management Plan for the CD-C project that includes requirements for pre-drilling ground water surveys and surface water monitoring.	Thank you for your comment. The **Muddy Creek Watershed Monitoring Plan (Appendix O**) has been included for surface water quality monitoring. The Wyoming Oil and Gas Conservation Commission requires pre-drilling testing and the EPA and the BLM are currently formulating rules that would govern pre-drilling testing as well.
WR-S	Appendix F	S03	8	**Table F-1.** The title should be changed from *BLM range gage* to *BLM rain gage*.	The title of **Table F-1** has been changed from BLM **range** gage to BLM **rain** gage.
WR-S	Bitter Creek monitoring	In07	9	Page 4-93, Fish, third bullet. A monitoring plan for the extremely large Bitter Creek watershed appears excessive when only a very small portion of this watershed at its extreme eastern edge has the potential to be affected.	The monitoring plan for the Bitter Creek watershed applies only to the portion of the Bitter Creek watershed within the CD-C project area.
WR-S	Bitter Creek protections	C03	18	In addition, the proposed development will occur partially within the upper Bitter Creek Watershed. Since the Bitter Creek runs through the City of Rock Springs and empties into the Green River, it is important that development properly manages drainage and run off to protect water quality for the Bitter Creek's downstream users and neighbors. Also, it is important to note that the City of Rock Springs and the Sweetwater County Conservation District have been granted funds to study, restore and enhance Bitter Creek through the City of Rock Springs. These improvements emphasize the need to ensure that development within the Bitter Creek drainage addresses proper run off control and maintenance of water quality.	**Section 3.4.2.1** references the work done by the SWCCD.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
WR-S	Buffer	O10	3	Trout Unlimited requests that BLM increase the avoidance buffer for riparian areas to no less than one-quarter of a mile and for ephemeral streams to a minimum of 500 feet to minimize selenium and sediment loading and to protect riparian values, particularly those related to wildlife.	Thank you for your comment. This is analyzed as part of Alternative B. In the Preferred Alternative, the Muddy Creek watershed and Bitter Creek watershed are designated as sensitive areas that would require additional mitigation measures.
WR-S	CBNG Produced Water	S03	4	Page 2-5, CBNG produced water disposal, first paragraph: Please note that any NEPA review for future surface disposal of CBNG produced water will need to consider the 303(d) listed segments of Muddy Creek.	Any future NEPA analysis of surface disposal of CBM-produced water would include the 303(d) listed segments of Muddy Creek that are part of or downstream from the CD-C project area.
WR-S	Editorial	S03	6	Page 4-24, Discharges/Spills: Change the word *authorized* to *unauthorized.*	The referenced word as written was the intent of the BLM. The discussion indicates that both the authorized discharge of hydrostatic test water, as well as the unauthorized (accidental) discharge of fluids could result in impacts to surface waters. In order to clarify this discussion, minor grammatical revisions were made to this paragraph.
WR-S	Editorial	S03	7	Page 4-25, first paragraph: Please note that Road Application Permits and Land Application Permits may also be used to permit discharge of hydrostatic test water. Please clarify what is referred to in the reference to the CWA required plan of development.	**Section 4.4.4.1** has been revised to include the additional permits which may be used to discharge hydrostatic test water. In addition, language has also been clarified with respect to CWA reference.
WR-S	Hydrostatic testing	In07	8	Page 4-24, Surface Water Impacts, paragraph 2. Authorized release of hydrostatic test water is indicated as a *main* impact; this is incorrect given the BLM authorization requirements for releases. The BLM would not allow releases that could adversely affect surface water.	The purpose of an EIS is to disclose all of the potential impacts of an action. The surface discharge of water would likely result in impacts and should be evaluated. **Section 4.4.4.1** states that the magnitude of those impacts depends on several factors, including water quality and quantity and the distance from a regulated water. **Section 4.4.4.2** states that no test water would be discharged unless such water meets State water-quality standards. As such, the authorized discharge would not likely result in significant impacts to surface water. No text was changed in response to this comment.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
WR-S	Impact analysis	In04	43	Page 4-25, 4.4.3.1. Surface Disturbance/Sediment Loading, second paragraph: Matherne (2006) noted increased sediment production from well pad locations and confirmed that roads and well pads can provide conditions for focusing runoff and locally increasing erosion. Based on field observations, Matherne found that roads on side slopes facilitate the erosional process in three ways: (1) they cut across and collect runoff from previously established drainages; (2) where they are cut into hillsides or into the land surface, roads provide focal points for the initiation of erosion; and (3) they provide conduits for sediment transport. This study was conducted in Largo Canyon of northwest New Mexico. Drawing conclusions from the Matherne study and applying these to CD-C area is not justified.	While the Matherne study was conducted in New Mexico, the three ways that roads facilitate erosion are general in nature and are valid for the CD-C area. However, the text in **Section 4.4.4.1** has been revised to more accurately reflect the Matherne study by replacing "roads on side slopes" with "roads aligned parallel to contour".
WR-S	Impact analysis	F01	1	The Draft EIS does not appear to analyze existing data from surface water samples collected in and near the project area. The EPA recommends that the BLM discuss in the Final EIS the current water quality conditions for each water body, comparing existing conditions to existing water quality standards or other reference conditions, and presenting associated water quality trends.	Water quality and trend analysis of surface water samples taken in and near the project area are discussed in **Section 3.4.2.3** of the EIS. A discussion on the existing conditions compared to current WDEQ surface water standards has been added to **Section 3.4.2.3**, and **Tables F-7 and F-8** in Appendix F have been updated to show WDEQ surface water standards where applicable. In addition, a piper diagram showing the variations in major ion chemistry of the samples has been added to Appendix F.
WR-S	Impact analysis	F01	2	The EPA recommends that the Final EIS identify each water body within and adjacent to the project area and indicate whether WDEQ has assessed its water quality condition, and if so, summarize the results of that assessment.	**Table F-6** in Appendix F has been updated to indicate which water bodies have been assessed by WDEQ in their biennial water quality assessment reports required by the CWA. A discussion of assessment results has been included in **Section 3.4.2.4**.
WR-S	Impact analysis	F01	5	Erodible soils represent a significant source of pollutants in the project area. The EPA recommends that the Final EIS include an estimate of erosion rates for each alternative. For example, using the Water Erosion Prediction Project model (WEPP).	An erosion estimate analysis using the WEPP model was conducted for the Proposed Action as well as for each alternative. **Section 4.4.4.1** has been updated with a description of the analysis, and Appendix F presents results from the analysis as well as more detailed information on the model and site-specific inputs.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
WR-S	Mitigation	P10	3	• Require water well monitoring before, during and after drilling activity. Dedicated monitoring wells should be put into place. • Require surface water monitoring before, during and after activity. • Establish buffers around natural stationary and running water. • Monitor all water wells within a mile radius of a gas well. • Establish strict produced water storage and transport guidelines. • Do not allow any evaporation ponds.	Thank you for your comment.
WR-S	Mitigation	F01	3	The Draft EIS states, Under the Proposed Action and Alternative A, total surface disturbance would be great enough that existing protection and mitigation measures would not necessarily prevent exceedance of significance levels for [degradation of water quality and potential soil loss]. In light of the existing impaired water quality and the potential for long-term sediment loading, the EPA recommends that the Final EIS and ROD discuss what will be required to assure water quality is not further impaired.	The Preferred Alternative attempts to address the unresolved resource conflicts associated with the other Alternatives. The design features of the Preferred Alternative identify the Muddy Creek and Bitter Creek watersheds as sensitive areas that would be afforded additional protections. Prior to the approval of any surface-disturbing activity, site visits will be conducted and appropriate stipulations will be required.
WR-S	Mitigation	F01	4	The EPA recommends that BLM require the following mitigation measures in the Preferred Alternative: set-back distances of 0.25 mile for springs, wells and wetlands and 0.5 mile for perennial streams within the Muddy Creek watershed; and the additional enhanced resource protection measures for the Muddy Creek watershed included as part of Alternative B.	The BLM would be unable to enforce a 0.25-mile setback on private lands adjacent to Muddy Creek. Therefore, the effectiveness of implementing such a setback on federal surface would be doubtful, as the majority of the project area is located within checkerboard, and the majority of Muddy Creek is bordered by private land. If the BLM were to require the 0.25-mile setback on BLM-administered lands, the potential for increased disturbance on private lands bordering Muddy Creek could increase. The Operators were asked for a voluntary commitment to remain at least 0.25 miles away from the edge of Muddy Creek, even on private lands. However, the Operators did not agree to this request; therefore, the ability of the BLM to locate development 0.25 miles from the edge of Muddy Creek is limited.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
WR-S	Monitoring	S04	19	The Preferred Alternative should include expansion of the current monitoring on upper Muddy Creek to lower Muddy Creek. This requirement would bring lower Muddy Creek into conformance with the monitoring being done for lower upper Muddy Creek and other drainages within the Atlantic Rim project area. If the monitoring showed impacts to sensitive fish habitat, the BLM and an interagency CD-C consultation group would determine whether habitat-improvement projects should be implemented. The ROD should define who participates in the interagency CD-C consulting group. A similar monitoring plan for Bitter Creek watershed should be designed by the RFO and the interagency CD-C consulting group.	The Preferred Alternative incorporates design features that are intended to minimize impacts to identified sensitive resources, in particular impacts to the Muddy Creek and Bitter Creek watersheds. By limiting the number of well pads to eight per section, surface disturbance should be reduced and directional drilling encouraged. A dust control plan has been incorporated as part of the preferred. Because this is an infill project, most road development will be limited to the construction of resource and/or local roads. The larger arterial roads have already been constructed. To aid in transportation planning, the CD/WII Transportation Plan has been updated and included (**Appendix N**) as part of the Preferred Alternative. Specific measures for the Muddy Creek watershed have been incorporated into the preferred as design features.
WR-S	Monitoring, Muddy Creek	S03	5	Page 2-7, Enhanced Resource Protection: The WQD supports expansion of the monitoring program in upper Muddy Creek to lower Muddy Creek, notes that monitoring of erosion BMPs can clarify responsibility for any channel changes, and suggests that BLM take responsibility for the monitoring.	Thank you for your comment. A monitoring plan for the Muddy Creek watershed has been designed and is incorporated as part of the Agency Preferred Alternative as **Appendix O**.
WR-S	Muddy Creek	O04	43	BLM argues that Alternative B would not result in significant impacts to salt loading, while Alternatives C and D would exceed significance criteria for this analysis (Draft EIS at 4-37); this assertion is worthy of greater scrutiny, as Alternative B would disturb a significantly greater acreage in soils that are saline than Alternative D. We recommend adoption of a modified version of Alternative D that incorporates the stream and floodplain setbacks in Alternative B, potentially rendering such a modified Alternative D of lower impact to surface waters than the current Alternative B.	Alternative B would result in less salt loading of Muddy Creek and Red Wash, the principal contributors to the Colorado River system, because the avoidance area on federal minerals under this alternative would be increased from 500 feet to 0.25 miles, or in some cases to 0.5 miles. Surface-disturbing activity would thus be 2.5 to 5 times the distance from the water courses.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
WR-S	Muddy Creek	In05, In08	61	WDEQ had identified a portion of Muddy Creek, west of Highway 789 as a threatened waterway pursuant to section 305 (b) of the CWA. A potentially contributing factor has been identified by WDEQ as O&G, particularly coalbed natural gas development. WDEQ apparently believes that CBNG [CBM] development is likely to increase in the area. Given current gas prices and the discontinuous nature of coal formations within the project area, we believe it is very unlikely there will be increased [CBM] development in the vicinity of Muddy Creek within the project area. Most operators are focusing on oil and liquids-rich gas development. BLM should update its assumptions in conjunction with WDEQ.	This EIS must adhere to existing WDEQ watershed designations and cannot make changes to those designations. It is outside the scope of this document to predict whether CBM development will occur or not; as part of the Proposed Action, the impacts associated with CBM development are discussed, regardless of its likelihood of occurring.
WR-S	Muddy Creek	In05, In08	80	The BLM indicates that WDEQ's impairment determination for the middle portion of Muddy Creek is due to livestock grazing exacerbated by accelerated oil and gas erosion associated with oil and gas activities. CD-C Draft EIS, pg. 4-23. The BLM should clarify whether the adverse impacts associated with Muddy Creek are the result of operations in the CD-C Project Area or operations in the Atlantic Rim Project Area. In recent years Devon understands there has been more oil and gas development in the Atlantic Rim Project Area near Muddy Creek than the portion of the CD-C Project Area near Muddy Creek.	The text in **Section 4.4.4.1** has been revised to add a discussion of the oil and gas development associated with the Atlantic Rim natural gas project.
WR-S	Muddy Creek	In05, In08	88	The BLM indicates that the current monitoring on the Upper Muddy Creek would be extended to the Lower Muddy Creek in the CD-C Project Area. CD-C Draft EIS, pgs. 4-92 -4-93. The BLM does not explain how or what type of monitoring is required in the Muddy Creek Area. As such, we cannot provide meaningful input or comments. The BLM has not explained who would pay for the additional monitoring requirements, how it would be administered by the BLM, or how the BLM could ensure the monitoring requirements are equitably distributed to all oil and gas operators within the Project Area. The BLM's description of Alternative B and the potential impacts are unreasonably vague.	A Muddy Creek/Bitter Creek monitoring plan has been included as **Appendix O**, which outlines the monitoring that will be undertaken by the BLM.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
WR-S	Muddy/Bitter Creek	S04	15	Plans for development within the Muddy Creek and Bitter Creek watersheds should include, at a minimum, the following additional road/pipeline requirements: detailed development plans; transportation support systems; reclamation plans, including road design, culvert placement, steep slopes, etc.; design of improvements to existing roads or construction of new roads to minimize hydrologic alteration; if appropriate, decommission/reclamation of BLM roads; no new road crossings of Muddy Creek; development of specific road design criteria based upon site-specific review and including a combination of mitigation options.	Reclamation plans, road design, planned culvert placement, steep slopes, and construction of roads to minimize hydrologic alteration are already required by the Rawlins RMP and other regulations. All roads and location placements are based on site-specific review by BLM specialists, including a soil scientist, hydrologist, and civil engineer. No new road crossings of Muddy Creek is an element of Alternative B. Potential for road closure and/or reclamation is examined on a case-by-case basis, and is detailed in the Transportation Planning Technical Support Document of **Appendix N**.
WR-S	Opinion	P15	2	"Fracking has also been shown to damage water ways in contiguous and downstream areas and could easily cause harm to WY's residents."	The majority of fracking fluids are recovered and disposed of in injection wells per the requirements of Onshore Order #7. This has been added to the Final EIS.
WR-S	Plan of Development	P07	2	"...it takes thousands and thousands of gallons of water to drill each well and there are no surface streams or ponds in the Red Dessert large enough to support such a huge demand for water.	Please see **Section 2.2.7.2, Well Construction, Drilling and Completion Activities, and Section 4.4.4.1, Surface Water Use**, which state that no water would be withdrawn from surface waters of the project area for drilling wells in the CD-C project area.
WR-S	Reclamation	O10	5	With the potential for 600 wells a year, long-term reduction in productivity, and the loss of habitat, Trout Unlimited suggest that the Final EIS include a stronger reclamation analysis and that BLM find creative and substantial reclamation practices, such as a higher shrub ratio near drainages, to minimize erosion and sedimentation and assure that the area's function as habitat will not be lost forever.	Thank you for your comment. Reclamation requirements will be specified on a case-by-case basis and in sensitive areas may include more intensive requirements.
WR-S	Reserve pits	S04	20	The Preferred Alternative should require that reserve pits in the Muddy Creek and Bitter Creek watersheds be lined with BLM-approved materials.	All APDs that require BLM approval are required to incorporate pit liners into the plan of development. All pits on BLM surface ownership and BLM mineral estate that have the potential for hazardous fluids (including reserve pits) are required to be lined. Please see WY IM-2012-007 for more information on pits and pit liners.
WR-S	Selenium and salinity	S04	21	The Preferred Alternative should require no surface discharge of produced waters within the Muddy Creek and Bitter Creek watersheds to diminish loading of selenium and salinity.	No surface discharge of produced waters is anticipated in the project area. If the BLM receives a proposal for surface discharge, then it will be considered in a separate NEPA analysis. Please see updated text for clarification on treatment of produced waters.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
WR-S	Significance criteria	In07	7	Pages 4-22 to 4-23, Surface Water Significance Criteria. Given the extremely low thresholds for significance criteria 2 & 6, they should be removed. Significant impacts would occur under these thresholds with any (regardless how small) increase in disturbance or runoff.	The significance criteria presented in the EIS are criteria that were used in the RMP to assess significance of impacts. Therefore, they cannot be changed.
WR-S	Surface discharge	In05, In08	78	The BLM notes that WDEQ and EPA have certain authority over the discharge of water pursuant to the CWA. CD-C Draft EIS, pg. 4-20. In the CD-C Final EIS, the BLM needs to appropriately recognize that the State of Wyoming has primacy over water quality standards, enforcement, and remediation within the State of Wyoming. The BLM should recognize that erosion and stormwater runoff are regulated by the EPA through its National Pollutant Discharge Elimination System (NPDES) program under the CWA, which is administered by the State of Wyoming. See 33 U.S.C. § 1342; 40 C.F.R. parts 122, 123. The BLM should also recognize the State of Wyoming's stormwater regulations that already require full stormwater pollution prevention plans for disturbances over one acre in size. WDEQ Rules, Chapter 2, Section 6.	The text in **Section 4.4.1** has been revised to include a discussion of water quality regulation and stormwater discharge permits.
WR-S	Water quality monitoring	C02	45	The Draft EIS should also recognize local government efforts in monitoring surface-water quality in and around the project area. CD-C Draft EIS at 3-36. LSRCD has developed and implemented a watershed plan for Muddy Creek, which includes an extensive monitoring program...The LSRCD monitors for physical, chemical and biological parameters and stream discharge at stations along the Muddy Creek, Savery Creek, and Loco Creek watersheds.	The LSRCD and its role in improvement of the Muddy Creek watershed is cited numerous times in **Section 3.4, Water Resources**.
WR-S	Water quality monitoring	C02	46	SWCCD has also developed a watershed plan, which includes a similar monitoring program to address the Bitter Creek. Bitter and Killpecker Creeks Watershed Management Plan, at 16 (June 2006) (See Attachment 3). The SWCCD watershed plan calls for monitoring and credible data collection of the water to see the effects of implementation of the plan and to focus on impacts that ground water has on bacteria and chloride levels in the Bitter Creek. Id. The watershed plan also includes a Milestone Table that sets out when certain actions will be completed as it pertains to monitoring, data collection, and other activities such as supporting soil surveys and grazing best management practices.	The text has been revised to reference the work done by the SWCCD.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
WR-S	Water quality monitoring	C02	47	Not only should the Draft EIS recognize these watershed plans, it should also ensure that the Proposed Action is consistent with the plans since they were developed by local Conservation Districts.	Please see the responses to C02-45 and 46. Alternative F, the Agency Preferred Alternative, calls for intensive management of both the Muddy Creek and Bitter Creek watersheds.
WR-S	Surface discharge, produced water	C02	44	BLM does not have the authority to regulate the surface discharge of produced waters. See CD-C Draft EIS at 2-16, 4-93, 4-103, 5-32. ("No surface discharge of produced waters within the Muddy Creek and Bitter Creek watersheds." Id. at 2-16, 4-93.) That authority rests with the EPA and the WDEQ pursuant to the Clean Water Act, 33 U.S.C. §1342, and the NPDES permit program in the regulations, 40 C.F.R. §122.1 et seq.	Reference to surface discharge of produced water has been removed from Alternative B in the Final EIS.
WR-S, WR-G	Mitigation	F01	12	The EPA recommends that the BLM consider requiring water quality monitoring prior to, during, and after the project to detect and prevent impacts to both groundwater and surface water.	On November 12, 2013 the WOGCC adopted a rule change (Chapter 3, Section 46) requiring groundwater monitoring of water sources within a 0.5-mile radius of a proposed gas well. Effective April 1, 2014, all operators are required to submit a groundwater baseline sampling, analysis, and monitoring plan with an APD. Surface water quality information is available within and near the project area from stations on the Little Snake River, four Muddy Creek locations, Lower Barrel Springs Draw, Bitter Creek, Fillmore Creek, the Chain Lakes, and Separation Creek).
WR-S, WR-G	Mitigation	F01	13	The EPA recommends that BLM identify a Preferred Alternative that includes these BLM identified measures to reduce impacts to air and water resources: 1) directional drilling (Alt. D); 2) limitations on surface disturbance (Alt. C); 3) uniform application of dust-abatement procedures during construction and drilling operations (Alt. B); 4) cluster development of production facilities (Alt. B); 5) minimize construction of new roads (Alt. B); 6) road design that minimizes surface disturbance (Alt. B); 7) reclamation of roads once production starts (Alt. B); 8) pipelines for transporting liquids offsite or installation of larger-capacity storage tanks (Alt. B); 9) improvements to existing roads or construction of new roads to minimize hydrologic alteration (Alt. B); 10) no new road crossings of Muddy Creek (Alt. B); and 11) enhanced resource protection measures for the Muddy Creek and Bitter Creek corridors/Watersheds (Alt. B).	The Preferred Alternative (Alternative F) incorporates design features that are intended to minimize impacts to identified sensitive resources, in particular impacts to the Muddy Creek and Bitter Creek watersheds. By limiting the number of well pads to eight per section, surface disturbance should be reduced and directional drilling encouraged. A dust control plan **(Appendix P**) has been incorporated as part of Alternative F. Because this is an infill project, most road development will be limited to the construction of resource and/or local roads. The larger arterial roads have already been constructed. To aid in transportation planning, the CD/WII Transportation Plan has been updated and included (**Appendix N**) as part of the Preferred Alternative. Specific measures for the Muddy Creek watershed have been incorporated into Alternative F as design features.

Table L-3. Comments and Responses, Air Quality

Category	Sub-Category	Comment		Comment	Response
		Code	No		
AQ	Ambient Analysis	F02	11	This section talks only briefly about mid-field modeling; there should be a heading and detailed discussion of it in the Draft EIS and Air Quality Technical Support Document (AQTSD).	The discussion of mid-field modeling has been expanded and clarified in the Final EIS and the revised AQTSD.
AQ	Ambient Analysis	F02	24	Paragraph 1 requires a more complete explanation for the use of the Bulk Richardson approach to AERMOD meteorological data preparation.	Text has been added to the revised AQTSD to explain the use of the Bulk Richardson approach for AERMET.
AQ	Ambient Analysis	F04	5	Page 2, paragraph 4. Relative to previous modeling studies, CAMx simulated ozone for the CD-C analysis appears quite small given the magnitude of future estimated NOx emissions from the proposed development.	Comment noted.
AQ	Ambient Analysis	IN01	10	This incorrectly states that there are short-term 100-meter receptor grid 1-hour NO_2, 24-hour $PM_{2.5}$ and 24-hour PM_{10} exceedances. However, according to Table 4.5-12, there are only 1-hour NO_2 exceedances. This should be corrected to reflect the data in Table 4.5-12.	Modeling analyses and impacts discussions have been revised in the Final EIS.
AQ	Ambient Analysis	IN01	11	This states that there are short-term 100-meter receptor grid 1-hour NO_2, 24-hour $PM_{2.5}$, and 24-hour PM_{10} exceedances. However, the tables show that the referenced exceedances did not occur for every alternative. This should be corrected to reflect the actual data presented in the tables.	Modeling analyses and impacts discussions have been revised in the Final EIS.
AQ	Ambient Analysis	IN02	1	The near field modeling should be refined to address physical emission characteristics (stack parameters and source separation), rather than using a screening level approach that assumes that all emissions were collocated and released at grade with no plume rise. When the actual source configuration is accounted for in the modeling, predicted impacts will be substantially reduced.	Near-field modeling scenarios have been revised for the Final EIS.
AQ	Ambient Analysis	IN03	13	Page 9, paragraphs 2-5. It is recommended that BLM define ambient air based on receptor locations starting 100 meters from the edge of the drill pad and concurrently drop the 250 meter receptor network. Figure 3-1 in the comment letter presents an example of a plot plan for an 8-well pad and provides justification for the suggested approach.	Near-field modeling scenarios have been revised for the Final EIS.
AQ	Ambient Analysis	IN03	14	When considering drilling impacts followed by production impacts, establishing receptors closer than those identified for drilling (i.e., closer than 100 meters from the edge of the well pad) do not have any meaning in the context of the multi-year NO2 standard.	Near-field modeling scenarios have been revised for the Final EIS.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
AQ	Ambient Analysis	IN03	15	Page 11, paragraphs 2-6. It is very important for BLM to continue to address near field modeling impacts relative to the form of the 1-hour NO_2 NAAQS (National Ambient Air Quality Standards) which is expressed as the 3-year average of the 98th percentile (8th highest concentration) of the daily maximum 1-hour concentration.	Thank you for your comment.
AQ	Ambient Analysis	IN03	16	Page 11, paragraph 7 through page 14. The selection of AERMOD OLM Group ALL was an appropriate modeling method for the assessment of potential NO_2 impacts from production activities and BLM should maintain it usage.	Thank you for your comment.
AQ	Ambient Analysis	IN03	17	Page 14, paragraph 3 through page 15. BLM should retain the concept of modeling a “patch of wells” to evaluate near field air quality impacts.	Thank you for your comment.
AQ	Ambient Analysis	IN03	18	Page 15, paragraph 4 through page 20. The modeling approach for estimating NO_2 impacts from production equipment needs to be refined to better describe source characteristics in the modeling. Heaters should be modeled as a point source.	Near-field modeling scenarios have been revised for the Final EIS.
AQ	Ambient Analysis	IN03	19	Page 20, paragraph 5 through page 28. BLM needs to refine the modeling of drilling impacts followed by production impacts consistent with the form of the NAAQS.	Thank you for your comment. Near-field modeling scenarios have been revised for the Final EIS.
AQ	Ambient Analysis	IN03	20	Page 29, paragraphs 2-5. It is recommended that the comparison of particulate matter (PM) construction impacts (temporary emission sources) be deleted from the EIS. This is because the PM standards are statistically based multi-year standards.	Thank you for your comment.
AQ	Ambient Analysis	IN03	21	The document needs to be updated indicating the WAAQS (Wyoming Ambient Air Quality Standards) are now equivalent to the NAAQS.	The document has been updated as recommended.
AQ	Ambient Analysis	IN05	5	BLM suggests that it conducted "reasonable but conservative" air quality modeling. The BLM used extraordinarily conservative, virtually worst-case, modeling assumptions for the CD-C Draft EIS. In many cases, the BLM actually modeled a level of oil and gas development not contemplated by or proposed by the operators which is a significant mistake.	Thank you for your comment. Revised modeling analyses have been performed for the Final EIS.
AQ	Ambient Analysis	IN05	16	The BLM appropriately utilized AERMOD model to evaluate the near-field air quality impacts of the CD-C Project. CD-C Draft EIS, pg. 4-39.	Thank you for your comment.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
AQ	Ambient Analysis	IN05	17	Source characterizations are important to evaluating impacts and should be explained in more detail in the AQTSD, including actual input data.	Revised modeling analyses have been performed for the Final EIS. Additional text has been added to the revised AQTSD to describe source parameters.
AQ	Ambient Analysis	IN05	20	The BLM indicates that it will be utilizing the applicable PSD (prevention of significant deterioration) increments to determine significance criteria. As already discussed, the BLM has no authority over PSD increments. This is recognized in the MOU which states that BLM NEPA documents will only identify PSD increment consumption for informational purposes only.	Your comment is accurate. The BLM's analysis of increment consumption is for informational and disclosure purposes only. Determination of adverse impacts based on exceedances of the increment is determined by the WDEQ-AQD.
AQ	Ambient Analysis	IN05	26	The assumptions for drill rig operations in the near-field modeling analyses are unreasonable. The BLM analyzed as many as 73 individual wells in a single section in a two-year period. The operators have not sought, or could they possibly drill, that amount. The BLM should not have modeled more than 16 wells in any section, consistent with WOGCC spacing regulations. That 16 wells per section assumes no existing wells have previously been drilled, as is the case in a vast majority of sections within the PA.	The near-field modeling analysis has been revised for the Final EIS. The maximum development scenario is up to 16 wells per section.
AQ	Ambient Analysis	IN05	27	The analysis is absurd because drilling operations could not and would not occur consistently for an entire 17,520 hours within a two-year period. Drilling rigs would be stopped for maintenance operations and operations would necessarily pause between each well drilled on a single location as the drilling rig is moved and retooled.	Thank you for your comment. The analysis presented provides a conservative estimate of the potential 1-hour NO_2 impacts from drilling emissions. The assumption of operating for a two-year period was used to estimate the maximum 1-hour NO_2 impacts that could occur in each year (of a two-year period), assuming a drill rig could operate on the same pad, for a period, in two different years.
AQ	Ambient Analysis	IN05	28	In section 4.5.6.1, why didn't BLM include Rocky Mountain National Park as a Class I area analyzed in the CD-Draft EIS? A CD-C-EIS map indicates that a portion of Rocky Mountain National Park is within the 4km modeling grid for the CD-C Draft EIS. The BLM must make its reasons for excluding RMNP available to the public.	AQ and AQRV impacts at RMNP have been evaluated in the Final EIS.
AQ	Ambient Analysis	IN05	29	The BLM must update/correct the information regarding the NAAQS for PM_{10} annual throughout chapter 4 of the Draft EIS. In multiple tables the BLM incorrectly suggests that the PM_{10} 24-hour standard not the annual PM_{10} standard was revoked.	This change has been made in the revised AQTSD and in the Final EIS.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
AQ	Ambient Analysis	IN05	30	BLM should clarify why the $PM_{2.5}$ concentrations are based on the maximum when the standard refers to the 98th percentile of the highest values, or correct the footnote if 98th percentile values were used.	This change has been made in the revised AQTSD and in the Final EIS.
AQ	Ambient Analysis	IN05	31	The BLM's near-field modeling is absolutely inaccurate and must be either completely redone and new text developed, or the BLM must clearly explain that its analysis is not an accurate description of potential development scenarios within the CD-C Project Area.	The near-field modeling analysis has been revised for the Final EIS.
AQ	Ambient Analysis	IN05	32	The BLM must explain its decision to utilize both the 250-meter receptor distance and the 150-meter receptor distance in the near-field modeling. As far as Devon is aware, there are no regulatory requirements relating to receptor distances in near-field modeling. The BLM must justify its decision to utilize both the 250 and 150 meter receptor distance.	The near-field modeling analysis has been revised for the Final EIS.
AQ	Ambient Analysis	IN05	33	The BLM must revise its near-field modeling scenarios when both drilling and construction operations are modeled. Near-field modeling assumes that up to 73 wells would be drilled consecutively within the single section over a three-year period. When two or even four rigs are analyzed, the results become even more absurd with up to 292 wells being drilled within a single section while at the same time construction and production operations are on-going. The BLM' s modeling, thus, shifts from reasonable but conservative to absolutely ridiculous. It would be virtually impossible for operators to develop 292 wells within the single section when only 16 wells can be permitted under existing WOGCC spacing requirements.	The near-field modeling analysis has been revised for the Final EIS. The maximum development scenario is up to 16 wells per section.
AQ	Ambient Analysis	IN05	34	Given the overly conservative nature of the BLM's modeling, it is inappropriate to suggest that there have been any potential violations of the NAAQS for NO_2 or PM_{10}. It is even more inappropriate for the BLM to suggest that additional mitigation measures will be necessary in order to demonstrate there will not be future exceedances. The BLM's modeling is so inaccurate it does not merit the imposition of additional mitigation measures. The BLM should not have modeled such "worst case" scenarios.	Thank you for your comment. The near-field modeling analysis has been revised for the Final EIS.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
AQ	Ambient Analysis	IN05	35	The BLM should review the language on page 4-65 regarding modeled impacts at 100-meter receptor distances. The text indicates that short-term concentrations were predicted to be above the one-hour N02 NAAQS, the 24-hour $PM_{2.5}$ NAAQS, and the 24-hour PM_{10} NAAQS. This information is not supported by the information in Table 4.5-14A which indicates there were no modeled exceedances for either PM_{10} or $PM_{2.5}$.	The near-field modeling analysis has been revised for the Final EIS.
AQ	Ambient Analysis	IN05	36	Formaldehyde from compressors and a gas plant are estimated, and the MEI is defined as an individual who lives 100 or 200 meters from a gas plant his full life. This is completely unrealistic, as is even the MLE with a nine-year exposure at this distance. This factor should be emphasized and not utilized to justify additional mitigation.	Thank you for your comment. The analysis is required for disclosure purposes.
AQ	Ambient Analysis	IN05	37	Flaring emissions for the 16-well production pad formaldehyde for cancer risk assessment should be labeled as very conservative, and information about the uncertainty of these emissions should be included. The BLM needs to more clearly explain the conservatisms.	The near-field modeling analysis has been revised for the Final EIS.
AQ	Ambient Analysis	IN05	38	The BLM should revise its modeling assumptions given the fact that green completions will generally be required under NSPS Subpart OOOO and flaring will be minimized. This will significantly reduce the amount of flaring which will reduce already conservatively calculated formaldehyde emissions. The overall well decline should include an estimate or correction for reduced VOC emissions, flaring, etc.	The CD-C project emission inventory was evaluated and found to be compliant with OOOO. No changes to the project emission inventory were needed as a result of the promulgation of OOOO.
AQ	Ambient Analysis	IN05	39	Formaldehyde impacts are based on compounded conservative assumptions, which include an admitted gross estimate of emissions from flaring, an overly conservative production scenario and continual flaring data, conservative modeling assumptions, a conservative distance to nearby receptors, and MLE and MEI which may not be representative of any site within one mile of the proposed sources. Some sense of the compounded conservative assumptions should be provided.	The near-field modeling analysis has been revised for the Final EIS.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
AQ	Ambient Analysis	IN05	40	Section 4.5.9 draws conclusions that mitigation will be a required condition based on the impacts; however, any results that point to mitigation should not be based on such conservative analyses but rather more accurate and representative analyses. Given the potential operational impact of mitigation, it would be important to investigate the impacts in more detail.	Additional mitigation measures that may be warranted will be discussed and addressed with the Operator group.
AQ	Ambient Analysis	IN05	41	The BLM must include more specific information regarding the various alternatives discussed in Draft EIS Ch. 4 to be scenarios modeled in the AQTSD. It appears the AQTSD was written entirely separate, and it is virtually impossible to clearly identify specific alternative modeling with scenarios in the AQTSD. BLM should correct this error in the Final EIS and clearly identify this.	The Final EIS text includes a discussion of which alternatives have been modeled as well as a summary of the impacts by alternative and associated compliance demonstrations.
AQ	Ambient Analysis	IN05	44	The BLM should highlight in the CD-C Final EIS the determination that the CD-C Project does not contribute to exceedances of any NAAQS, WAAQS, or CAAQS (Colorado Ambient Air Quality Standards).	Thank you for your comment.
AQ	Ambient Analysis	IN08	4	BLM suggests that it conducted "reasonable but conservative" air quality monitoring. In Samson's opinion the BLM used extraordinarily conservative, virtually worst-case, modeling assumptions for the CD-C Draft EIS. In many cases, the BLM actually modeled a level of oil and gas development not contemplated by or proposed by the operators which is a significant mistake.	A number of revisions and adjustments to modeling assumptions were made for the Final EIS revised modeling analysis to address incorrect assumptions or information.
AQ	Ambient Analysis	IN08	9	The BLM appropriately utilized AERMOD model to evaluate the near-field air quality impacts of the CD-C Project. CD-C Draft EIS, pg. 4-39.	Thank you for your comment.
AQ	Ambient Analysis	IN08	11	The BLM indicates that it will be utilizing the applicable PSD increments to determine significance criteria. As already discussed, the BLM has no authority over PSD increments. This is recognized in the MOU which states that BLM NEPA documents will only identify PSD increment consumption for informational purposes only.	The BLM does not enforce or regulate PSD increment consumption. The analysis included in the Draft EIS and Final EIS is for informational and disclosure purposes only.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
AQ	Ambient Analysis	IN08	14	The assumptions for drill rig operations in the near-field modeling analyses are unreasonable. The BLM analyzed as many as 73 individual wells in a single section in a two-year period. The operators have not sought, or could they possibly drill, that amount. The BLM should not have modeled more than 16 wells in any section, consistent with WOGCC spacing regulations. That 16 wells per section assumes no existing wells have previously been drilled, as is the case in a vast majority of sections within the PA.	The near-field modeling analysis has been revised for the Final EIS. The maximum development scenario is up to 16 wells per section.
AQ	Ambient Analysis	IN08	15	The analysis is absurd because drilling operations could not and would not occur consistently for an entire 17,520 hours within a two-year period. Drilling rigs would be stopped for maintenance operations and operations would necessarily pause between each well drilled on a single location as the drilling rig is moved and retooled.	Thank you for your comment. The analysis presented provides a conservative estimate of the potential 1-hour NO_2 impacts from drilling emissions. The assumption of operating for a 2-year period was used to estimate the maximum 1-hour NO_2 impacts that could occur in each year (of a two-year period), assuming a drill rig could operate on the same pad, for a period, in two different years.
AQ	Ambient Analysis	IN08	16	In section 4.5.6.1, why didn't BLM include Rocky Mountain National Park as a Class I area analyzed in the CD-Draft EIS? A CD-C-EIS map indicates that a portion of Rocky Mountain National Park is within the 4km modeling grid for the CD-C Draft EIS. The BLM must make its reasons for excluding RMNP available to the public.	AQ and AQRV impacts at RMNP have been evaluated in the Final EIS.
AQ	Ambient Analysis	IN08	17	The BLM must update/correct the information regarding the NAAQS for PM_{10} annual throughout chapter 4 of the Draft EIS. In multiple tables the BLM incorrectly suggests that the PM_{10} 24-hour standard not the annual PM_{10} standard was revoked.	This has been corrected in the Final EIS.
AQ	Ambient Analysis	IN08	18	The BLM's near-field modeling is absolutely inaccurate and must be either completely redone and new text developed, or the BLM must clearly explain that its analysis is not an accurate description of potential development scenarios within the CD-C Project Area.	The near-field modeling analysis has been revised for the Final EIS.
AQ	Ambient Analysis	IN08	19	The BLM must explain its decision to utilize both the 250-meter receptor distance and the 150-meter receptor distance in the near-field modeling. As far as Samson is aware, there are no regulatory requirements relating to receptor distances in near-field modeling. The BLM must justify its decision to utilize both the 250 and 150 meter receptor distance.	The near-field modeling analysis has been revised for the Final EIS.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
AQ	Ambient Analysis	IN08	20	The BLM must revise its near-field modeling scenarios when both drilling and construction operations are modeled. Near-field modeling assumes that up to 73 wells would be drilled consecutively within the single section over a three-year period. When two or even four rigs are analyzed, the results become even more absurd with up to 292 wells being drilled within a single section while at the same time construction and production operations are on-going. The BLM' s modeling, thus, shifts from reasonable but conservative to absolutely ridiculous. It would be absolutely impossible for operators to develop 292 wells within the single section when only 16 wells can be permitted under existing WOGCC spacing requirements.	The near-field modeling analysis has been revised for the Final EIS.
AQ	Ambient Analysis	IN08	21	Given the overly conservative nature of the BLM's modeling, it is inappropriate to suggest that there have been any potential violations of the NAAQS for N02 or PM_{10}. It is even more ridiculous for the BLM to suggest that additional mitigation measures will be necessary in order to demonstrate there will not be future exceedances. The BLM's modeling is so inaccurate it did not merit inclusion in the EIS and certainly does not merit the imposition of additional mitigation measures. The BLM should not have modeled such "worst case" scenarios.	Thank you for your comment. The near-field modeling analysis has been revised for the Final EIS.
AQ	Ambient Analysis	IN08	22	The BLM should review the language on page 4-65 regarding modeled impacts at 100-meter receptor distances. The text indicates that short-term concentrations were predicted to be above the one-hour N02 NAAQS, the 24-hour $PM_{2.5}$ NAAQS, and the 24-hour PM_{10} NAAQS. This information is not supported by the information in Table 4.5-14A which indicates there were no modeled exceedances for either PM_{10} or $PM_{2.5}$.	The near-field modeling analysis has been revised for the Final EIS.
AQ	Ambient Analysis	IN08	25	The BLM should highlight in the CD-C Final EIS the determination that the CD-C Project does not contribute to exceedances of any NAAQS, WAAQS, or CAAQS.	Thank you for your comment.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
AQ	Ambient Analysis	O15	2	Comment Attachment, pages 4-16. BLM's Analysis Predicts Significant Air Quality Impacts. Ozone, NO_2, particulate matter, HAPs, Visibility, and Ecosystem impacts from the proposed development are significant.	The Final EIS includes a revised modeling analysis for both the near-field and far-field impacts. Air quality impacts from the CD-C project that are deemed to be adverse or significant as determined by technical experts from the EPA, USFS, NPS, and Wyoming Department of Environmental Quality – Air Quality Division (WDEQ-AQD) will be addressed and appropriate mitigation will be determined for inclusion in the ROD.
AQ	Ambient Analysis	O15	3	Comment Attachment, pages 16-18. BLM's air quality modeling analysis does not assure the Prevention of Significant Deterioration (PSD) air quality requirements are met.	The CD-C project is not subject to PSD air quality requirements. A PSD analysis was performed for informational purposes only and showed that the PSD increments were not exceeded at any Class I or sensitive Class II area within the 4 km domain. PSD air quality regulations are administrated by the WDEQ-AQD. The applicability of and compliance with these regulations are assessed by that agency prior to development.
AQ	Ambient Analysis	O15	5	Comment Attachment, pages 24-26. The approach used to determine short term NO_2 and $PM_{2.5}$ impacts is flawed.	Thank you for your comment.
AQ	Ambient Analysis	O15	6	Comment Attachment, pages 26-27. The NO_2 and $PM_{2.5}$ background concentrations used in the Draft EIS are not representative.	Background concentrations used were developed in coordination with WDEQ-AQD and other stakeholders, and were intended to reflect pollutant concentrations not impacted by regional industrial activity, since that activity was being explicitly modeled in the analysis.
AQ	Ambient Analysis	O15	7	Comment Attachment, pages 27-29. The Draft EIS fails to consider secondary formation of $PM_{2.5}$.	The Draft EIS does consider secondary formation of $PM_{2.5}$. The far-field analysis used the CAMx air quality model, which explicitly simulates the formation of $PM_{2.5}$ from its precursors (i.e. secondary $PM_{2.5}$) as well as the transport and fate of $PM_{2.5}$. See http://www.camx.com for a complete description of the model.
AQ	Ambient Analysis	O15	9	Comment Attachment, page 30. Upper air sounding data used as input to the AERMOD modeling analysis may not be representative of conditions in the project area.	The Riverton Wyoming upper air sounding data are representative for the project area. The Riverton site is the closest site to the project area and was deemed acceptable by members of the interagency review team during development of the analysis.
AQ	Ambient Analysis	O15	12	Comment Attachment, pages 38-39. The far-field modeling should include additional designated wilderness areas that could be affected by the proposed development.	In the final CAMx modeling, air quality and AQRV impacts were evaluated at all Class I/sensitive Class II areas within a 200 km radius of the CD-C project area.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
AQ	Ambient Standards	IN01	5	On December 19, 2012, the Wyoming Ambient Air Quality Standards (WAAQS) were revised to be identical to the National Ambient Air Quality Standards (NAAQS). Tables throughout Chapters 3 and 4 of the Draft EIS and Chapter 3 of the Air Quality TSD should be revised to reflect this change. Pages 4-46 through 4-65 of the Draft EIS and pages ES-11 and 3-9 through 4-27 of the TSD should be revised to include the term WAAQS in the 1-hour NO_2 and 24-hour $PM_{2.5}$ discussions, and remove all WAAQS 24-hour PM_{10} discussions.	This has been corrected in the revised AQTSD and Final EIS.
AQ	Analysis Area	O10	4	Assessments from air quality emissions must include the outlying ecosystems which will be affected by increased emissions. Populations of Colorado River cutthroat trout exist within higher elevations and in isolated outreaches of the Muddy Creek watershed and in the Medicine Bow National Forest in Class I air sheds east of the CD-C project location. The Final EIS must include a more comprehensive and cumulative impact analysis that includes this information.	Thank you for your comment.
AQ	Analysis Area	O11	1	Using the area identified on the Draft EIS project map as the “Central Area” as the center of project air emissions, the line-of-sight distances from that center to communities included in the analysis – Green River (84 mi) and Rock Springs (66 mi) – are greater than or equal to Encampment/Riverside and Saratoga (56 and 63 mi, respectively) which are not included. Our communities are downwind and located in the first low-lying valley where atmospheric inversions could develop, potentially trapping and concentrating hazardous air pollutants.	This has been corrected in the revised AQTSD and Final EIS.
AQ	Analyzed Scenarios	F01	5	In order to understand the impacts of the alternatives evaluated in the EIS, the Final EIS should identify which modeled scenarios represent which of the alternatives. Several of the operating scenarios predict exceedances of the NAAQS ($PM_{2.5}$, PM_{10}, and NO_2), and it is not clear within the Draft EIS and AQTSD how those scenarios relate to the Proposed Action and other action alternatives.	The Final EIS text includes a discussion of which alternatives have been modeled and also includes a summary of the impacts by alternative and associated compliance demonstrations.
AQ	Analyzed Scenarios	F01	6	The modeling analysis for any scenarios that would be part of the Preferred Alternative should demonstrate that adverse air quality impacts can be avoided.	Mitigation measures will be identified and included in the ROD based on impacts disclosed for the air quality analysis in the FEIS.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
AQ	Analyzed Scenarios	F01	7	The gas plant and compressor station were modeled individually. The Final EIS should explain that these sources will not be collocated, and therefore, there will not be overlapping impacts associated with these two facilities.	Text has been added to the revised AQTSD to describe that these sources would not be constructed in close proximity to each other. The Final EIS explains that the gas plant and compressor station are not collocated and were modeled independently.
AQ	ANC	F02	4	Decreasing ANC reported in the cumulative analysis is presented as an improvement in the lakes' condition, when in fact a reduction in ANC causes deterioration of a lake's chemistry.	Language regarding acid neutralizing capacity (ANC) impacts has been corrected and clarified in the Final EIS and revised AQTSD.
AQ	ANC	F02	5	The Draft EIS discussion of changes in ANC is inconsistent, with ANC interpreted differently at various points in the text.	Language regarding ANC impacts has been corrected and clarified in the Final EIS and revised AQTSD.
AQ	ANC	F02	9	In paragraph 4, the definition for change of very sensitive lakes is not correct; it should say that a change in ANC of > 1 ueq/l is not acceptable. This applies throughout the analysis.	Language regarding ANC impacts has been corrected and clarified in the Final EIS and revised AQTSD.
AQ	ANC	F02	13	Paragraph 2 is not consistent with AQTSD Table 4-93. Also, the limit of acceptable ANC change is no more than 1 ueq/l for very sensitive lakes.	This change has been made in the revised AQTSD.
AQ	ANC	F02	14	Paragraph 4 is not consistent with AQTSD Table 4-93.Also, the limit of acceptable ANC change is no more than 1 ueq/l for very sensitive lakes.	This change has been made in the revised AQTSD.
AQ	ANC	F02	15	Paragraph 5 is not consistent with AQTSD Table 4-93. Also, the limit of acceptable ANC change is no more than 1 ueq/l for very sensitive lakes.	This change has been made in the revised AQTSD.
AQ	ANC	F02	16	Paragraph 4 is not consistent with AQTSD Table 4-93. Also, the limit of acceptable ANC change is no more than 1 ueq/l for very sensitive lakes.	This change has been made in the revised AQTSD.
AQ	ANC	F02	18	Paragraph 3 is not consistent with AQTSD Table 4-93. Also, the limit of acceptable ANC change is no more than 1 ueq/l for very sensitive lakes.	This change has been made in the revised AQTSD.
AQ	ANC	F02	21	Referenced section in AQTSD cannot be found. Also, the statement in paragraph 1 is not reflective of Table 4-93 which shows five lakes with more than 10% change, and the two very sensitive lakes with changes of -3.37 to -5.57 ueq/l. Decreasing ANC is not a good thing.	Language regarding ANC impacts has been corrected and clarified in the Final EIS and revised AQTSD.
AQ	ANC	F02	33	The definition for the very sensitive lakes threshold is correct here, but elsewhere in the Draft EIS and AQTSD it is incorrect; see comment 13 on Draft EIS.	Language regarding ANC impacts has been corrected and clarified in the Final EIS and revised AQTSD.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
AQ	ANC	F02	34	Contrary to paragraph 2, a negative change in ANC is not an improvement and a change of > 1 ueq/l is not acceptable in very sensitive lakes. Please revisit this analysis.	Language regarding ANC impacts has been corrected and clarified in the Final EIS and revised AQTSD.
AQ	ANC	F02	35	Table 4-92 and 4-93. ANC decreasing is not a positive thing. The equation in paragraph 1 is not correctly stated, and indicates that projected changes in ANC would exceed the limit of acceptable change.	Language regarding ANC impacts has been corrected and clarified in the Final EIS and revised AQTSD.
AQ	ANC	F02	36	Thresholds are misinterpreted in the last paragraph; the limit of acceptable change for sensitive lakes is 1 ueq/L, a change of < 1 ueq/l is considered to be acceptable.	Language regarding ANC impacts has been corrected and clarified in the Final EIS and revised AQTSD.
AQ	ANC	F02	37	See comment 36.	Language regarding ANC impacts has been corrected and clarified in the Final EIS and revised AQTSD.
AQ	ANC	F02	42	For lakes with ANC values of 25 ueq/l and less the threshold of acceptable change is 1 ueq/l, not "no further decrease".	Language regarding ANC impacts has been corrected and clarified in the Final EIS and revised AQTSD.
AQ	Applicable Regulations	IN01	6	Page 3-52 contains a bulleted list of regulations and standards that are relevant to the project air impact analysis. APC requests that Chapter 6 of the Wyoming Air Quality Standards and Regulations (WAQSR) and National Emission Standards for Hazardous Air Pollutants (NESHAPS) are added to the list of relevant standards and regulations.	These have been added to the list of relevant standards and regulations.
AQ	Applicable Regulations	IN01	7	APC requests that the bullet list be revised to include Subpart OOOO – Standards of Performance for Crude Oil and Natural Gas Production, Transmission, and Distribution.	NSPS, Subpart OOOO has been added to the list of NSPS.
AQ	Applicable Regulations	IN01	9	Please add to the discussion that the WDEQ-AQD regulates emissions through the Oil and Gas Permitting Guidance that emissions are also regulated through WAQSR Chapter 5, Section 2: Construction Permits.	WAQSR Chapter 5 is entitled “National Emissions Standards: and Chapter 2 incorporates by reference federal NSPS. A reference to that WAQSR section has been added in the discussion of NSPS in Draft EIS Chapter 3, Section 3.5.2.4. Construction permitting regulated through WAQSR Chapter 6 Section 2 is described in Draft EIS Section 3.5.2.
AQ	Applicable Regulations	IN05	13	BLM has failed to identify 40 CFR 60 Subpart OOOO. Not only should BLM identify this regulation, they must include in all of its future modeling the reductions in emissions that will be implemented as a result of this rule.	NSPS, Subpart OOOO was promulgated after the Draft EIS and AQTSD were written. OOOO has been added to the listed of NSPS in the final version of the document. No changes were required to the CD-C Project inventory as a result of OOOO.
AQ	Applicable Regulations	IN05	14	The text on page 3-58 of the CD-C Draft EIS duplicates for JJJJ the text regarding subpart KKKK.	This change has been made in the Final EIS.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
AQ	Applicable Regulations	IN10	3	In 2012 EPA promulgated New Source Performance Standard, Subpart OOOO – Standards of Performance for Crude Oil and Natural Gas Production, Transmission and Distribution. Subpart OOOO should be added to the list of applicable NSPS. Also, it should be noted NSPS ARE applicable to the CD-C project, rather than POTENTIALLY applicable.	NSPS, Subpart OOOO has been added to the list of NSPS.
AQ	AQTSD	IN01	1	The Draft EIS states that more than 4,400 wells have already been drilled in the CD-C project area. However, pages ES-1 and 1-1 of the Air Quality Technical Support Document (TSD) states that there were 2,454 existing wells in 2008. A consistent and accurate statement is needed in both places.	This has been corrected in the Final EIS and AQTSD.
AQ	AQTSD	IN05	45	Devon recognizes and appreciates the substantial amount of technical work and collaborative deliberation that BLM, WDEQ, and stakeholders have put into the AQ effort.	Thank you for your comment.
AQ	AQTSD	IN05	46	The near-field modeling should be withdrawn, recharacterized with a thorough understanding of the compound conservative assumptions, or further analyzed. The adverse results depicted in the modeling analysis should not be used to require mitigation efforts without additional clarification or refinement of the emissions, more accurate modeling, and establishing threshold that have been adopted for evaluation.	The near-field modeling analysis has been revised for the Final EIS.
AQ	AQTSD	IN05	47	The BLM should correct the information included throughout the AQTSD regarding proposed CBNG wells. The BLM continues to suggest that up to 900 CBNG wells may be developed, despite the fact the operators reduced the number of CBNG wells from 900 to 500 in 2007.	CNBG well projections have been revised in the Final EIS.
AQ	AQTSD	IN05	48	Devon appreciates that the BLM partially recognizes that the WDEQ has authority over air quality emissions related to oil and gas development.	Thank you for your comment.
AQ	AQTSD	IN05	49	The BLM should more clearly explain to members of the pubic, in language the public will understand, the conservative nature of the modeling performed by the BLM for the CD-C Project Area. Devon encourages the BLM to explain throughout the air quality analysis that the estimated impacts from the CD-C Project are likely extraordinarily overestimated because of BLM's "conservative" analysis. However, much of the BLM's analysis ceases to be "conservative" and is simply unsupportable.	Thank you for your comment.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
AQ	AQTSD	IN05	50	In order to ensure future defensibility, the BLM should specifically identify each of the stakeholders and clearly state in the AQTSD that every stakeholder had an opportunity to review and approve the modeling assumptions and decisions made throughout this document. In past litigation, the involvement of the AQ stakeholders has been critical to a reviewing court's deference to the BLM's analysis.	Members of the Interagency Review Team (air quality stakeholders group) are identified in the revised AQTSD. The revised AQTSD describes that each stakeholder had an opportunity to review and comment on the methodologies and modeling results.
AQ	AQTSD	IN05	51	The BLM should replace Figure 1-1 in the AQTSD with Map 1-1 from the CD-C Draft EIS because Figure 1-1 in the AQTSD is actually a map of the BLM's proposed Alternative C.	This has been corrected in the final version of the document.
AQ	AQTSD	IN05	52	In section 1.1.2 of the AQTSD, the BLM incorrectly suggests that the Great Divide Resource Management Plan from 1990 still governs operations within the CD-C Project Area. The BLM issued a new RMP for the Rawlins Field Office in December 2008, and this should be corrected in the Final EIS.	This has been corrected in the final version of the document.
AQ	AQTSD	IN05	53	The BLM appropriately utilized AERMOD model to evaluate the near-field air quality impacts of the CD-C Project.	Thank you for your comment.
AQ	AQTSD	IN05	54	The BLM notes that in April of 2009 that Governor of Wyoming recommended to the EPA that Sublette County and portions of Lincoln and Sweetwater Counties, Wyoming be designated as non-attainment areas. The BLM should indicate that EPA finalized this designation in April and May 2012.	This has been updated in the Final EIS.
AQ	AQTSD	IN05	55	The BLM partially acknowledges the conservative nature of its modeling and its lack of clear scientific consensus on the formaldehyde emissions from oil and gas flares. Devon encourages the BLM to determine whether a more appropriate standard exists. The BLM should far more clearly and adequately explain that the BLM's modeling assumptions extraordinarily overestimate potential impacts to ozone and the near-field estimates of formaldehyde concentrations and cancer risks given the overly conservative nature of the BLM's modeling.	The assumption of 20 percent by weight formaldehyde (from the EPA Speciate database), although likely a conservative value, was used in lieu of any representative field specific data. The near-field modeling has been revised for the Final EIS.
AQ	AQTSD	IN05	56	BLM should also not attempt to impose mitigation measures or other controls on future operations within the CD-C Project Area given the overly conservative nature of its modeling.	Thank you for your comment.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
AQ	AQTSD	IN05	57	VOC emissions in particular are likely overly conservative given EPA's recent New Source Performance Standards for oil and gas operations. These standards will significantly reduce future VOC and NOx emissions by requiring low-bleed pneumatics, green completions, and other controls on oil and gas operations.	NSPS, Subpart OOOO was promulgated after the Draft EIS and AQTSD were written. OOOO has been added to the list of NSPS in the final version of the document. No changes were required to the CD-C project inventory as a result of OOOO.
AQ	AQTSD	IN05	58	The BLM should also consider the new emission standards for Reciprocating Internal Combustion Engines that were issued in January of this year.	All applicable new emissions standards have been considered in the project emissions inventory.
AQ	AQTSD	IN05	59	For the regional emission inventories, condensate and gas production for existing wells declined by about 70 percent in 2037 but the number of wells declined by only about 26 percent. The methodology calculates future VOC emissions and emissions from venting and pneumatics based on the number of wells, or 26 percent reduction; and the VOC emissions from dehydrating units declines by about 40 percent. The conservative nature of this well VOC calculation should be emphasized because any wells that are re-worked or modified through additional completions or hydraulic fracturing operations would trigger additional controls for compliance with WY BACT and NSPS OOOO.	The RFD documentation section has been revised. RFD emissions have been updated for the Final EIS modeling.
AQ	AQTSD	IN05	60	The BLM must explain why the VOC emission inventory developed for this project was arbitrarily increased by the WDEQ by 3 percent. The BLM and the WDEQ must have a scientifically valid and justified reason for this arbitrary increase. Absent such information, the increase appears arbitrary and undermines the quality of the analysis contained in the Draft EIS.	During development of the 2005, 2006, and 2008 Southwest Wyoming Oil and Gas emissions inventories, VOC emissions were adjusted to account for working and breathing losses from well site tanks. This adjustment is valid, as these emissions were not accounted for in early versions of the inventories, and it resulted in an approximate 3% increase in VOC emissions.
AQ	AQTSD	IN05	61	The BLM must provide significant additional information justifying the RFD emissions for the 4km grid for 2022 as the projects identified by the BLM are not consistent with the rest of the RFD projects identified in Table 5.0-1 of the Draft EIS. The BLM should simply explain its rationale if there is a justifiable reason. This is particularly important because the BLM identifies all these natural gas projects in chapter 5 of the Draft EIS.	The RFD documentation section has been revised. RFD emissions have been updated for the Final EIS modeling.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
AQ	AQTSD	IN05	62	The BLM elected to evaluate drilling rigs with EPA Tier 0, Tier 2 and Tier 4 engines. The BLM's model included Tier 0 engines despite the fact the operators agreed to utilize only Tier 2 drilling rigs or better. Analyzing and presenting information regarding activities that are inconsistent with the Proposed Action is not only a waste of BLM's time and resources. It also may serve to confuse the public. The BLM should not have modeled actions that are inconsistent with future development plans.	At the time of the Draft EIS modeling there was no commitment by operators to not use Tier 0 rigs. The Final EIS modeling has been revised to include Tier 2 and Tier 4 engines.
AQ	AQTSD	IN05	63	The BLM should justify, and provide scientific information supporting, its decision to analyze receptors at both the 100 meter and 200 meter positions. The BLM's analysis at the 250 meter location did not identify potential NAAQS violations while the 100 meter receptor modeling did.	The near-field modeling analysis has been revised for the Final EIS.
AQ	AQTSD	IN05	64	An accurate characterization of the Proposed Action including the most dense development that is proposed, needs to be modeled as accurately as it can be represented, and stack and source parameters included as accurately as possible.	The near-field modeling analysis has been revised for the Final EIS.
AQ	AQTSD	IN05	65	It would not be reasonable or appropriate for the BLM to utilize a distance less than 100 meters from an active drilling operation. Devon and other operators have strict safety protocols that prohibit members of the public from entering the actual drilling location or the area within 100 to 200 meters of the drilling location.	The near-field modeling analysis has been revised for the Final EIS.
AQ	AQTSD	IN05	66	The drilling scenarios description and figures appear to be inconsistent and mislabeled. The detailed data in Appendix L used to develop modeling results, should reflect exactly which scenarios are being modeled. It is virtually impossible for even experienced AQ experts and NEPA practitioners to understand the analysis. BLM should identify each drilling scenario so they may be understood by the public.	The near-field modeling analysis has been revised for the Final EIS.
AQ	AQTSD	IN05	67	The near-field modeling analyses for construction and drilling operations are entirely unsupportable and must be completely revised by the BLM. There is no justifiable reason to model a multi-well pad with 32 wells in production or provide results for a drilling scenario that is not reasonably foreseeable.	The near-field modeling analysis has been revised for the Final EIS. The maximum development scenario is up to 16 wells per section.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
AQ	AQTSD	IN05	68	The assumption for drill rig operations in the near-field modeling analysis is unreasonable. The BLM modeled a drill rig for a full 8,760 hours per year for a combined total of 17,520 hours in each of the modeled scenarios. 73 individual wells drilled within a two year period is unreasonable because no more than 16 wells can be drilled in an entire section. Further, could not occur consistently for an entire 17,520 hours within a two year period; rather they would be stopped for maintenance operations and in between individually drilled wells. BLM also assumed that construction operations and existing wells could be producing at the same time 73 new wells are drilled. Such a level of development is just not possible.	Thank you for your comment. The analysis presented provides a conservative estimate of the potential 1-hour NO_2 impacts from drilling emissions. The assumption of operating for a two-year period was used to estimate the maximum 1-hour NO_2 impacts that could occur in each year (of a two-year period), assuming a drill rig could operate on the same pad, for a period, in two different years.
AQ	AQTSD	IN05	69	The BLM analysis effectively assumes that 292 wells could be drilled in a single section within a three-year period. That would effectively require operators to develop one well every 2.19 acres, a level of development not contemplated or experienced anywhere within North America, and certainly not in the CD-C Project Area. The BLM's near-field analysis exceeds reasonable development by such a degree that Devon believes the BLM must eliminate all of the scenarios in which more than 16 wells could be drilled in a single section.	The near-field modeling analysis has been revised for the Final EIS. The maximum development scenario is up to 16 wells per section.
AQ	AQTSD	IN05	70	The suggestion that additional mitigation must be required from the operators in order to prevent the modeling exceedances demonstrated by the BLM's ridiculous modeling scenarios is unsupported. Additional mitigation should only be required if reasonable drilling scenarios demonstrate potential exceedances, which is not the case for the CD-C Project.	Thank you for your comment. The near-field modeling analysis has been revised for the Final EIS.
AQ	AQTSD	IN05	71	The assumption that construction operations would continue for two full years is unsupportable. The average well pad and access road requires only three to seven days depending on topography. Even if 16 well pads were constructed in the same year within any particular section, at most construction operations would require approximately 112 days. Further, construction operations do not occur 24-hours a day as construction does not occur after dark. Once again the BLM's modeling has passed from "reasonable but conservative" to wildly outrageous.	The near-field modeling analysis has been revised for the Final EIS. The Draft EIS modeling and the Final EIS modeling assume that well pad and access road construction occur during daytime hours only.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
AQ	AQTSD	IN05	72	The hazardous air pollutants impact assessment is overly conservative, modeling a scenario where up to 32 wells would be located on a single pad within a single section. This level of development had neither been requested by the operators nor authorized by the WOGCC. As such, the scenario is not reasonable and it was inappropriate for the BLM to analyze this level of development or present information in the EIS.	The near-field modeling analysis has been revised for the Final EIS. The maximum development scenario is up to 16 wells per section.
AQ	AQTSD	IN05	73	The use of overly conservative modeling assumptions should not be utilized to justify additional HAP mitigation measures.	The near-field modeling analysis has been revised for the Final EIS. The maximum development scenario is up to 16 wells per section.
AQ	AQTSD	IN05	74	The BLM should add additional language to clarify the information presented in Figure 4-5 which indicates an increase in 1-hr NO_2 within the Project Area. The AQTSD indicates this is due to EGUs and oil and gas sources; however, EGU and trona emissions are likely to be reduced to regional haze controls. As a result, 1-hr NO_2 and N deposition model results are overestimated.	Thank you for your comment.
AQ	AQTSD	IN05	75	Ozone modeling discussion is generally excellent and the BLM's own analysis demonstrates that the CD-C impacts itself are very low, and are particularly low on days that have the higher background related to non-CD-C Project impacts. The analysis needs to emphasize that impacts to the Jonah Pinedale non-attainment area are negligible.	The analysis in the AQTSD describes that impacts to the Sublette County, which includes the JPAD area, are minimal.
AQ	AQTSD	IN05	76	The visibility analysis indicates that the CD-C Project will have virtually no impact on visibility within the region. All impacts are less than 1 dv under the FLAG analysis and only 1 dv above the 1.0 dv using the BLM' s analysis. The BLM should not attempt to impose mitigation measures in order to protect visibility within the area.	Thank you for your comment.
AQ	AQTSD	IN05	77	The analysis assumes there is virtually unlimited ammonia in the atmosphere to convert SO3 and NO3 ions into sulfate and nitrate. The analysis should use/reference CAMx ammonia levels, especially for winter months. BLM should note that degradation because of sulfate and nitrate ions are not always completely neutralized by ammonia.	Unlike CALPUFF, CAMx does not use reference levels for ammonia, but predicts ammonia concentrations for each grid cell. An ammonia emission inventory was prepared as an input to CAMx, and the model explicitly simulates the transport, chemical transformation and fate of ammonia. Although CAMx does explicitly model ammonia, there is considerable uncertainty in the emissions and modeled values, so we assume complete neutralization.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
AQ	AQTSD	IN05	78	The BLM has not adequately explained its description of potential mid-field impacts. There is almost no detail how the mid-field impacts were calculated or what they represent. What information is the BLM trying to convey with the mid-field analyses? How is it defined? What standards were utilized? As far as Devon is aware there are no mid-field modeling requirements or standards that have been developed by the EPA or WDEQ. The BLM should clearly define where the mid-field receptors were located and why such information may be important to the public.	The discussion of mid-field modeling has been expanded and clarified in the Final EIS and the revised AQTSD.
AQ	AQTSD	IN08	26	The BLM should correct the information included throughout the AQTSD regarding proposed CBNG wells. The BLM continues to suggest that up to 900 CBNG wells may be developed, despite the fact the operators reduced the number of CBNG wells from 900 to 500 in 2007.	CBNG well projections have been revised in the Final EIS.
AQ	AQTSD	IN08	27	Samson appreciates that the BLM partially recognizes that the WDEQ has authority over air quality emissions related to oil and gas development.	Thank you for your comment.
AQ	AQTSD	IN08	28	The BLM should more clearly explain to members of the pubic, in language the public will understand, the conservative nature of the modeling performed by the BLM for the CD-C Project Area. Samson encourages the BLM to explain throughout the air quality analysis that the estimated impacts from the CD-C Project are likely extraordinarily overestimated because of BLM's "conservative" analysis. However, much of the BLM's analysis ceases to be "conservative" and is simply unsupportable.	Thank you for your comment.
AQ	AQTSD	IN08	29	In order to ensure future defensibility, the BLM should specifically identify each of the stakeholders and clearly state in the AQTSD that every stakeholder had an opportunity to review and approve the modeling assumptions and decisions made throughout this document. In past litigation, the involvement of the AQ stakeholders has been critical to a reviewing court's deference to the BLM's analysis.	Members of the Interagency Review Team (air quality stakeholders group) are identified in the revised AQTSD. The revised AQTSD describes that each stakeholder had an opportunity to review and comment on the methodologies and modeling results.
AQ	AQTSD	IN08	30	The BLM should replace Figure 1-1 in the AQTSD with Map 1-1 from the CD-C Draft EIS because Figure 1-1 in the AQTSD is actually a map of the BLM's proposed Alternative C.	This figure has been replaced in the revised AQTSD.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
AQ	AQTSD	IN08	31	In section 1.1.2 of the AQTSD, the BLM incorrectly suggests that the Great Divide Resource Management Plan from 1990 still governs operations within the CD-C Project Area. The BLM issued a new RMP for the Rawlins Field Office in December 2008, and this should be corrected in the Final EIS.	This change has been made in the revised AQTSD.
AQ	AQTSD	IN08	32	The BLM appropriately utilized AERMOD model to evaluate the near-field air quality impacts of the CD-C Project.	Thank you for your comment.
AQ	AQTSD	IN08	33	The BLM notes that in April of 2009 that Governor of Wyoming recommended to the EPA that Sublette County and portions of Lincoln and Sweetwater Counties, Wyoming be designated as non-attainment areas. The BLM should indicate that EPA finalized this designation in April and May 2012.	This has been updated in the Final EIS.
AQ	AQTSD	IN08	34	The BLM partially acknowledges the conservative nature of its modeling and its lack of clear scientific consensus on the formaldehyde emissions from oil and gas flares. Samson encourages the BLM to determine whether a more appropriate standard exists. The BLM should far more clearly and adequately explain that the BLM's modeling assumptions extraordinarily overestimate potential impacts to ozone and the near-field estimates of formaldehyde concentrations and cancer risks given the overly conservative nature of the BLM's modeling.	The assumption of 20 percent by weight formaldehyde (from the EPA Speciate database), although likely a conservative value, was used in lieu of any representative field specific data to support use of a different value. The near-field modeling has been revised for the Final EIS.
AQ	AQTSD	IN08	35	BLM should also not attempt to impose mitigation measures or other controls on future operations within the CD-C Project Area given the overly conservative nature of its modeling.	Thank you for your comment.
AQ	AQTSD	IN08	36	VOC emissions in particular are likely overly conservative given EPA's recent New Source Performance Standards for oil and gas operations. These standards will significantly reduce future VOC and NOx emissions by requiring low-bleed pneumatics, green completions, and other controls on oil and gas operations.	The CD-C project emission inventory was evaluated and found to be compliant with OOOO. No changes to the project emission inventory were needed as a result of the promulgation of OOOO.
AQ	AQTSD	IN08	37	The BLM should also consider the new emission standards for Reciprocating Internal Combustion Engines that were issued in January of this year.	All applicable new emissions standards have been considered in the project emissions inventory.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
AQ	AQTSD	IN08	38	For the regional emission inventories, condensate and gas production for existing wells declined by about seventy percent in 2037 but the number of wells declined by only about 26 percent. The methodology calculates future VOC emissions and emissions from venting and pneumatics based on the number of wells, or 26 percent reduction; and the VOC emissions from dehydrating units declines by about 40 percent. The conservative nature of this well VOC calculation should be emphasized because any wells that are re-worked or modified through additional completions or hydraulic fracturing operations would trigger additional controls for compliance with WY BACT and NSPS OOOO.	The regional emission inventory has been adjusted for well decline and abandonment. The conservative nature of the inventory with respect to rework/recompletion has been noted.
AQ	AQTSD	IN08	39	The BLM must explain why the VOC emission inventory developed for this project was arbitrarily increased by the Wyoming Department of Environmental Quality (WDEQ) by 3 percent. The BLM and the WDEQ must have a scientifically valid and justified reason for this arbitrary increase. Absent such information, the increase appears arbitrary and undermines the quality of the analysis contained in the Draft EIS.	During development of the 2005, 2006, and 2008 Southwest Wyoming Oil and Gas emissions inventories, VOC emissions were adjusted to account for working and breathing losses from well site tanks. This adjustment is valid, these emissions were not accounted for in early versions of the inventories, and it resulted in an approximate 3% increase in VOC emissions.
AQ	AQTSD	IN08	40	The BLM must provide significant additional information justifying the RFD emissions for the 4krn grid for 2022 as the projects identified by the BLM are not consistent with the rest of the RFD projects identified in Table 5.0-1 of the Draft EIS. The BLM should simply explain its rationale if there is a justifiable reason. This is particularly important because the BLM identifies all these natural gas projects in chapter 5 of the Draft EIS.	RFD sources have been updated for the Final EIS modeling.
AQ	AQTSD	IN08	41	The BLM elected to evaluate drilling rigs with EPA Tier 0, Tier 2 and Tier 4 engines. The BLM's model included Tier 0 engines despite the fact the operators agreed to utilize only Tier 2 drilling rigs or better. Analyzing and presenting information regarding activities that are inconsistent with the Proposed Action is not only a waste of BLM's time and resources. it also may serve to confuse the public. The BLM should not have modeled actions that are inconsistent with future development plans.	At the time of the Draft EIS modeling there was no commitment by operators to not use Tier 0 rigs. The Final EIS modeling has been revised to include Tier 2 and Tier 4 engines.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
AQ	AQTSD	IN08	42	The BLM should justify, and provide scientific information supporting, its decision to analyze receptors at both the 100 meter and 200 meter positions. The BLM's analysis at the 250 meter location did not identify potential NAAQS violations while the 100 meter receptor modeling did.	The near-field modeling analysis has been revised for the Final EIS.
AQ	AQTSD	IN08	43	It would not be reasonable or appropriate for the BLM to utilize a distance less than 100 meters from an active drilling operation. Samson and other operators have strict safety protocols that prohibit members of the public from entering the actual drilling location or the area within 100 to 200 meters of the drilling location.	The near-field modeling analysis has been revised for the Final EIS.
AQ	AQTSD	IN08	44	The near-field modeling analyses for construction and drilling operations are entirely unsupportable and must be completely revised by the BLM. There is no justifiable reason to model a multi-well pad with 32 wells in production or provide results for a drilling scenario that is not reasonably foreseeable.	The near-field modeling analysis has been revised for the Final EIS. The maximum development scenario is up to 16 wells per section.
AQ	AQTSD	IN08	45	The assumption for drill rig operations in the near-field modeling analysis is unreasonable. The BLM modeled a drill rig for a full 8,760 hours per year for a combined total of 17,520 hours in each of the modeled scenarios. 73 individual wells drilled within a two year period is unreasonable because no more than 16 wells can be drilled in an entire section. Further, could not occur consistently for an entire 17,520 hours within a two year period; rather they would be stopped for maintenance operations and in between individually drilled wells. BLM also assumed that construction operations and existing wells could be producing at the same time 73 new wells are drilled. Such a level of development is just not possible.	Thank you for your comment. The analysis presented provides a conservative estimate of the potential 1-hour NO_2 impacts from drilling emissions. The assumption of operating for a two-year period was used to estimate the maximum 1-hour NO_2 impacts that could occur in each year (of a two-year period), assuming a drill rig could operate on the same pad, for a period, in two different years.
AQ	AQTSD	IN08	46	The BLM analysis effectively assumes that 292 wells could be drilled in a single section within a three-year period. That would effectively require operators to develop one well every 2.19 acres, a level of development not contemplated or experienced anywhere within North America, and certainly not in the CD-C Project Area. The BLM's near-field analysis exceeds reasonable development by such a degree that Samson believes the BLM must eliminate all of the scenarios in which more than 16 wells could be drilled in a single section.	The near-field modeling analysis has been revised for the Final EIS. The maximum development scenario is up to 16 wells per section.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
AQ	AQTSD	IN08	47	The suggestion that additional mitigation must be required from the operators in order to prevent the modeling exceedances demonstrated by the BLM's ridiculous modeling scenarios is unsupported. Additional mitigation should only be required if reasonable drilling scenarios demonstrate potential exceedances, which is not the case for the CD-C Project.	The near-field modeling has been revised for the Final EIS. The potential for additional mitigation to prevent exceedances will be based on an evaluation of the revised results presented in the Final EIS.
AQ	AQTSD	IN08	48	The assumption that construction operations would continue for two full years is unsupportable. The average well pad and access road requires only three to seven days depending on topography. Even if 16 well pads were constructed in the same year within any particular section, at most construction operations would require approximately 112 days. Further, construction operations do not occur 24-hours a day as construction does not occur after dark. Once again the BLM's modeling has passed from "reasonable but conservative" to wildly outrageous.	The near-field modeling analysis has been revised for the Final EIS. The Draft EIS modeling and the Final EIS modeling assume that well pad and access road construction occur during daytime hours only.
AQ	AQTSD	IN08	49	The hazardous air pollutants impact assessment is overly conservative, modeling a scenario where up to 32 wells would be located on a single pad within a single section. This level of development had neither been requested by the operators nor authorized by the WOGCC. As such, the scenario is not reasonable and it was inappropriate for the BLM to analyze this level of development or present information in the EIS.	The near-field modeling analysis has been revised for the Final EIS. The maximum development scenario is up to 16 wells per section.
AQ	AQTSD	IN08	50	The use of overly conservative modeling assumptions should not be utilized to justify additional HAP mitigation measures.	Thank you for your comment. The near-field modeling analysis has been revised for the Final EIS.
AQ	AQTSD	IN08	51	Ozone modeling discussion is generally excellent and the BLM's own analysis demonstrates that the CD-C impacts itself are very low, and are particularly low on days that have the higher background related to non-CD-C Project impacts. The analysis needs to emphasize that impacts to the Jonah Pinedale (JPAD) non-attainment area are negligible.	The analysis in the AQTSD describes that impacts to Sublette County, which includes the JPAD area, are minimal.
AQ	AQTSD	IN08	52	The visibility analysis indicates that the CD-C Project will have virtually no impact on visibility within the region. All impacts are less than 1 dv under the FLAG analysis and only 1 dg above the 1.0dv using the BLM' s analysis. The BLM should not attempt to impose mitigation measures in order to protect visibility within the area.	Thank you for your comment.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
AQ	AQTSD	IN08	53	The BLM has not adequately explained its description of potential mid-field impacts. There is almost no detail how the mid-field impacts were calculated or what they represent. What information is the BLM trying to convey with the mid-field analyses? How is it defined? What standards were utilized? As far as Samson is aware there are no mid-field modeling requirements or standards that have been developed by the EPA or WDEQ. The BLM should clearly define where the mid-field receptors were located and why such information may be important to the public.	Text has been added to the revised AQTSD and Final EIS describing mid-field modeling and impacts.
AQ	Cancer Risk Assessment	F01	11	If additional formaldehyde modeling continues to predict elevated cancer risk, the Final EIS should include a discussion of how the elevated risk compares to the Superfund 1 x 10-6 threshold and identify measures to reduce formaldehyde emissions to acceptable cancer risk levels.	Formaldehyde concentrations have been compared to the Superfund threshold. Potential measures for reducing formaldehyde to acceptable risk levels have been discussed. Note that, as discussed in AQTSD Section 2.1.3.4, "...the estimates of formaldehyde emissions from flaring are likely to be conservative (i.e., likely overstate the amount of formaldehyde from flaring). This will lead to conservatism in the estimates of CD-C Project ozone impacts as well as in the near-field estimates of formaldehyde concentrations and cancer risk."
AQ	Cancer Risk Assessment	F01	12	Please clarify which of the NOx mitigation options listed in the Draft EIS will reduce formaldehyde from production sources.	See response to previous comment. Mitigation measures will be addressed and included in the Record of Decision (ROD).
AQ	Class I Areas	F02	7	Air quality discussion "… Category I air sheds" is not the proper terminology, please use "PSD Class I areas" instead.	Language in the Final EIS has been changed as recommended.
AQ	Climate Change	O15	13	Comment Attachment, pages 39-44. The Draft EIS does not sufficiently address greenhouse gas emissions and climate change impacts from the proposed development.	CD-C project greenhouse gas (GHG) emissions were inventoried and their magnitude is disclosed Given the global and complex nature of climate change, it is not possible to attribute a particular climate impact in any given region to GHG emissions from a particular source. GHGs were not modeled in either the near-field or far-field impact analyses, but the GHG inventory is presented for informational purposes and is compared to other U.S. GHG emission inventories in order to provide context for the CD-C project GHG emissions. The FEIS includes a more detailed discussion on GHG emissions and climate change including a discussion of the Council on Environmental Quality's (CEQ) recent (2014) draft guidance for federal agencies on consideration of GHGs and the effects of climate change in NEPA documents.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
AQ	Climate change	P28	4	"Climate change considerations have turned maximally urgent since 2005." BP proposes up to 500 coalbed methane wells. The wastewater, however stored in future, would remain at the sites for centuries."	Thank you for your comment.
AQ	Controls	IN10	1	WDEQ-AQD (Air Quality Division) requires the control of air emissions from hydrocarbon storage tanks. Usually the only available control device for these emissions is a high-profile combustion unit (20 to 30 feet tall). As such, Yates requests the BLM be aware of these requirements and adopt a flexible approach to authorizing the placement of high-profile structures when those structures are required by the WDEQ-AQD.	Comment noted. Thank you.
AQ	Controls	IN10	2	New Source Performance Standard, Subpart OOOO – Standards of Performance for Crude Oil and Natural Gas Production, Transmission and Distribution includes air quality regulations and standards that are more stringent than those required by the WDEQ, and which have not yet been adopted by the WDEQ. It should be noted that BLM approved energy development projects must comply with EPA regulations and standards as well as WDEQ regulations and standards.	The CD-C project emission inventory was evaluated and found to be compliant with OOOO. No changes to the project emission inventory were needed as a result of the promulgation of OOOO.
AQ	Cumulative air quality impacts	C01	14	Carbon County residents are very concerned about potential air quality degradation, visual haze and the resulting impacts on health and the tourism and recreation economy. AQ modeling and mitigation should address cumulative impacts in the project area and in the region with strict adherence to Best Available Control Technology.	Section 5.5 of the DEIS and the FEIS discuss the assessment of cumulative air quality impacts associated with the proposed CD-C project and other past, present, and reasonably foreseeable future activities. Section 5.5.2 of the FEIS concludes that … "The results of the cumulative modeling showed that there were no exceedances of the NAAQS, WAAQS, or CAAQS for ozone or any other criteria pollutant within the study area that were related to CD-C project emissions." Cumulative Visibility impacts are discussed in Section 5.3.3 of the DEIS and the FEIS. Significant visual haze impacts are not anticipated as indicated by the modeling results.
AQ	Cumulative Analysis	F04	3	It is unclear whether a requisite level of assessment was included for federal oil and gas plans in other states such as Utah and Colorado. A comprehensive review of all federal actions affecting this park may be necessary to address the existing air quality situation, as it is a significant cumulative issue.	Reasonably foreseeable development emissions for the Final EIS modeling have been updated to include emissions in Utah, Colorado, and Wyoming.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
AQ	Cumulative Emissions Inventory	IN05	43	The BLM indicates that it modeled the Moxa Arch Preferred Alternative for air quality purposes. However, the BLM did not identify a Preferred Alternative for the Moxa Arch Area Infill Gas Development Project when it was issued in October of 2007.	Information for a Preferred Alternative development scenario was provided by the BLM Kemmerer Field Office during the development of a revised Draft EIS for the Moxa Arch Infill Drilling Project during 2010-2012. This revised Draft EIS is not yet completed and the project is currently on hold.
AQ	Cumulative Emissions Inventory	IN08	24	The BLM indicates that it modeled the Moxa Arch Preferred Alternative for air quality purposes. However, the BLM did not identify a Preferred Alternative for the Moxa Arch Area Infill Gas Development Project when it was issued in October of 2007.	Information for a Preferred Alternative development scenario was provided by the BLM Kemmerer Field Office during the development of a revised Draft EIS for the Moxa Arch Infill Drilling Project during 2010-2012. This revised Draft EIS is not yet completed and the project is currently on hold.
AQ	Deposition	F02	1	We are concerned about nitrogen deposition at Mt. Zirkel, Rawah, and Savage Run Wilderness areas, which from the CD-C Project alone is shown to be as high as 3 to 4 times the DAT.	The BLM intends to apply mitigation measures to reduce the future impacts to cumulative nitrogen deposition at Forest Service wilderness areas. These mitigation measures will be included in the ROD.
AQ	Deposition	F02	2	We are concerned about the cumulative deposition impacts of this project when added to the impacts of the many other current and future development projects in proximity to these Class I areas.	See response to F02-1 above. Also, the FEIS modeling results have been compared to updated cumulative deposition threshold values provided by the National Park Service.
AQ	Deposition	F02	3	The cumulative analysis in the Draft EIS suggests that N deposition levels at Mt. Zirkel and Rawah may remain above 1.5 kg/ha/yr and as high as 5 kg/ha/yr, compared to nearby Rocky Mountain NP critical load of 1.5 kg/ha/yr. Buffalo Pass wet deposition of inorganic nitrogen already ranges from 1.5 to 4 kg/ha/yr.	See response to F02-1 above. Also, the FEIS modeling results have been compared to updated cumulative deposition threshold values provided by the National Park Service.
AQ	Deposition	F02	17	Paragraph 2 deposition impacts contain a reference to Section 4.6.2 in the AQTSD that can't be found because the AQTSD does not have section numbers.	Section 4.6.2 is labeled in the AQTSD. No change required.
AQ	Deposition	F02	19	Table 5.5-6 shows the N and S deposition for 2022, but doesn't indicate what baseline was used. Were they taken from the Pinedale and Centennial data on page 3-64? Also, baseline data is not in the AQTSD.	No baseline value was used. The photochemical model simulated the emission, transport, and fate of all sources of emissions throughout the modeling domain; therefore, no baseline values were required to calculate impacts. The model predicted deposition impacts that were directly compared to the BLM thresholds of concern.
AQ	Deposition	F02	20	Table 5.5-7 shows cumulative N and S deposition will decrease from 2008-2022, yet Table 4.93 in the AQTSD shows ANC will further decrease over that time. This does not seem right, please explain.	Language regarding ANC impacts has been corrected and clarified in the Final EIS and revised AQTSD.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
AQ	Deposition	F02	31	Table 4-84 does not show baseline for sensitive areas; see Draft EIS comment 19.	There is no separate threshold for sensitive areas. No baseline value was used. Deposition impacts were compared to critical load values for Class I areas in the vicinity of the project.
AQ	Deposition	F02	32	Tables 4-84 through 4-87; it is not clear why there is an "average" that is different from the "maximum" since annual total deposition from all sources should be a single number for each year.	Please see AQTSD Section 4.6.2.1, which discusses this issue. "The maximum annual S and N deposition values from any grid cell that intersects a Class I or Class II receptor area were used to represent deposition for that area, in addition to the average annual deposition values of all grid cells that intersect a Class I or Class II receptor area are also presented. Maximum and average predicted S and N deposition impacts were estimated for existing emissions sources within the CD-C project area and for the cumulative effects of all sources in the region.
AQ	Deposition	F02	38	In paragraph 1, DAT exceedances were downplayed and should be explained more fully in the conclusion section.	Language regarding the DATs has been revised.
AQ	Deposition	F02	41	Project-only deposition impacts should be compared to the DAT, not to a critical load value. Critical loads apply to total deposition from all sources, wet and dry, and it is not meaningful to compare project-only impacts as they will always be well below critical load.	The revised AQTSD and Final EIS include comparisons of project-level deposition impacts to the DATs and cumulative impacts to critical load values established by the federal land managers (FLMs).
AQ	Deposition	F04	6	Deposition results including maximum modeled deposition for each Class I and sensitive Class II area should be included in Chapter 4 of the Draft EIS.	Deposition results have been included in Chapter 4 of the Final EIS.
AQ	Deposition	F04	7	Page 3, paragraphs 2 and 3. Maximum CD-C project deposition impacts are predicted to be almost two and a half times greater than the NPS DAT. The maximum modeled cumulative future deposition in Dinosaur NM from the CD-C Project is predicted to be up to 6.02 kg/ha/yr, double the critical load value reported in a recent scientific study (Pardo et al. 2011). This is a significant concern. Please include this information, as described in section V.E.6 of the AQ MOU, in the deposition impacts discussions provided in Chapters 4 and 5 of the Draft EIS.	The CD-C project contributions to nitrogen deposition are identified in Chapter 4 of the Final EIS. NPS concerns regarding nitrogen deposition at Dinosaur NM from all regional sources are addressed in Chapter 5.
AQ	Deposition	F04	8	Chapter 5 of the Draft EIS should clarify that regardless of projected future decreases, total cumulative nitrogen deposition may still exceed critical loads in many of the Class I and sensitive Class II areas, indicating harm to those sensitive ecosystems.	The Final EIS includes this information.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
AQ	Deposition	F04	9	Chapter 5 of the Draft EIS should acknowledge that these decreases are due to regional reductions in NOx from various regulatory programs. The Wyoming BLM's proposed oil and gas development in the region will continue to increase the deposition load, and offset regional reductions, despite these regional trends.	The Final EIS includes additional explanation for reductions in future year regional emissions.
AQ	Deposition	F04	10	We would like to point out that a critical load represents a cumulative threshold; it is not meaningful to compare project only results to a cumulative threshold.	The revised AQTSD and Final EIS include comparisons of project-level deposition impacts to the DATs and cumulative impacts to threshold values established by the FLMs. The National Park Service has provided updated deposition threshold values for comparison with modeled FEIS cumulative deposition impacts.
AQ	Deposition	F04	11	Page 46, paragraph 2. The statement: "...[NPS] suggests that critical load values above 3 kg/ha/yr may result in moderate impacts" misstates our Technical Guidance.	This language has been revised in the Final EIS.
AQ	Deposition	IN02	2	Page 7, paragraph 2. FLAG 2010 Guidance recommends the use of the 0.005 kg/ha/yr threshold that was established by the NPS and the USFWS to determine significance. The proponents question the legality of this significance guidance for CD-C sources as well as possible mitigation implications from having model predictions above this threshold.	The DAT is not a threshold of significance. It is a level below which project impacts are not deemed adverse and above which a more refined analysis may be required or mitigation may be necessary depending on where the impacts are occurring.
AQ	Deposition	IN10	4	In Atmospheric Deposition Impacts - This should read "Table 5.5-6 shows: Estimated sulfur deposition impacts would be above the 3.0 kg/ha/yr threshold at all areas except for the Bridger Wilderness area and the Savage Run Wilderness area."	This has been corrected in the Final EIS. The FEIS modeling results have been compared to updated cumulative deposition threshold values provided by the National Park Service.
AQ	Deposition	IN10	5	EPA has not established that 100-meters is an acceptable distance for gauging the health impacts from exposure to model-predicted, short-term concentrations that could occur from 1-hour to 24-hours therefore; Yates feels it is unjustifiable and unreasonable to consider the 100-meter distance in this analysis. Yates urges the BLM to remove the 100-meter distance from consideration in the CD-C Draft EIS and subsequent Final EIS. It is anticipated that the 100-meter impact distance will unnecessarily trigger mitigation requirements that are unworkable and detrimental to oil and gas operations in the project area.	The near-field modeling analysis has been revised for the Final EIS.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
AQ	Deposition	O05	2	The Draft EIS is inconsistent in some of its air quality findings. For example, it is stated on page 10 of the Executive Summary that there would be no nitrogen and sulfur deposition impacts that exceed BLM critical load values at any Class I or sensitive Class II area. Yet, on page 4-100 of the AQTSD, far-field modeling predicts that the project contribution to N deposition will exceed the DAT at the Savage Run, Rawah, and Mount Zirkel Wilderness Areas, with contributions at the Class I Savage Run Wilderness area exceeding the DAT by three or four times.	The revised AQTSD and Final EIS include comparisons of project-level deposition impacts to the DATs and comparisons of cumulative impacts to critical load values established by the FLMs. The FEIS modeling results have been compared to updated cumulative deposition threshold values provided by the National Park Service.
AQ	Deposition	O05	3	Page 1, paragraph 3 through page 2. We emphasize this inconsistency because such depositions could increase mountain stream acidity and have serious detrimental effects on local trout populations. We request that the BLM more thoroughly assess the modeled significant deposition impacts on fishery resources. The results of this more thorough assessment will likely show that an enforceable mitigation strategy is required to eliminate or mitigate those impacts.	The BLM addresses potential mitigation measures in the Final EIS.
AQ	Deposition	O10	3	Air quality emissions can directly and indirectly impact watersheds, especially those at high elevations and in nearby Class I regions. Deposition loading to plants and water affect aquatic fish and insects. Sensitive species such as Colorado River cutthroat trout inhabit these areas and deposition loading into snow and streams will impact these populations as well as endangered fish species downstream of the project area. The Final EIS must include a more comprehensive and cumulative impact analysis that includes this information.	Thank you for your comment.
AQ	Deposition/ Mitigation	IN03	27	Page 36, paragraph 2 through page 49. The deposition modeling results indicate that predicted deposition in sensitive areas is minimal and does not merit additional mitigation.	Thank you for your comment.
AQ	Deposition/ Mitigation	IN03	28	Page 44, paragraph 4 through page 45. Mitigation measures are unnecessary to address nitrogen deposition impacts.	Thank you for your comment.
AQ	Deposition/ Mitigation	IN03	29	Page 45, paragraph 5 through page 47. The DAT is a conservative screening tool that does not represent a threshold for adverse impacts.	Thank you for your comment.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
AQ	Deposition/ Mitigation	IN03	30	Page 47, paragraph 2 through page 48. The BLM should be relying on a critical load threshold of between 3 kg/ha/yr and 5 kg/ha/yr of total deposition for a refined/cumulative effects analysis.	Thank you for your comment. The FEIS modeling results have been compared to updated cumulative deposition threshold values provided by the National Park Service.
AQ	Deposition/ Mitigation	IN03	31	Page 48, paragraph 4 through page 49. BLM's analysis does not support an adverse impact determination or imposition of mitigation.	Thank you for your comment.
AQ	DEQ role in regulation	C03	9	Sweetwater County strongly recommends that guidance and enforcement for further air quality issues related to the CD-C and other oil and gas developments, such as Hiawatha, NPL, Large Platform, be deferred to the WDEQ rather than the Environmental Protection Agency (EPA).	The WDEQ-AQD is responsible for regulating emissions from oil and gas sources through their Oil and Gas Permitting Guidance. Oil and gas developments must comply with EPA regulations and standards as well as WDEQ regulations and standards.
AQ	Emissions Inventory	IN01	12	The AQTSD lists source categories that require emission controls and should be amended to include completions subject to green completion control. The WDEQ guidance requires green completions be performed in the concentrated development area, which is a type of control. Blow downs and venting should be removed from the list because they do not require controls. Listing blow downs and venting as having emissions controls is confusing and infers false presumptions.	The source category list shows all source categories and merely states whether controls are applied or not. Text in the AQTSD notes that green completions are required in concentrated development areas and additional information on green completions in the CD-C project area is provided in Appendix K of the AQTSD.
AQ	Emissions Inventory	IN01	13	Add pneumatic devices to #3 of the source category list. APC also suggests revising 3(c) to read “tanks: flashing, working and breathing losses” rather than just flashing to more accurately portray what was included in the analysis.	The source category list has been amended as recommended.
AQ	Emissions Inventory	IN03	1	Page 3, paragraph 3-4. The emissions from the production flaring on the tab “Prod Flaring” of the Environ spread sheet for VOCs were incorrectly calculated. Furthermore the calculations are not in compliance with the WYDEQ’s “Oil and Gas Production Facilities Chapter 6, Section 2 Permitting Guidance". Please see Attachment A of the original comment letter (August 2011) for proper emissions calculations. The calculations in the record need to be changed, however, the photochemical grid modeling does not need to be updated for these small changes.	The calculation is correct as it stands.
AQ	Emissions Inventory	IN03	6	Page 4, paragraph 3. CD-C operators are requesting that 98 percent destruction efficiency be applied to the emissions calculated for storage tanks, dehydration units and pneumatic pumps for the flare control. See Table 2.1. of comment letter for test results.	VOC emissions and control estimates were calculated using a total hydrocarbon (THC) based methodology. Generally this method results in a higher control efficiency.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
AQ	Emissions Inventory	IN03	7	Page 5, paragraph 1. It should not be assumed that any of the emissions from the flares are 20 percent by weight formaldehyde. Also see comment 22.	This assumption of 20 percent by weight formaldehyde (from the EPA Speciate database), although likely a conservative value, was used in lieu of any representative field-specific data.
AQ	Emissions Inventory	IN03	8	Page 7, paragraph 1. BLM also calculated the methane emissions from the flares incorrectly by using the AP-42 emission factor for methane instead of basing the emissions on the uncombusted methane portion of the waste gas going to the flare. Please see Attachment A of the comment letter for proper emissions calculations. The calculations in the record need to be changed, however, the photochemical modeling does not need to be updated for these small changes.	The calculation is correct as it stands.
AQ	Emissions Inventory	IN03	9	Page 8, paragraphs 1-3. The evaporation pond emissions were improperly applied on a per well basis and the emission calculations need to be revised; however, the photochemical grid modeling does not need to be updated.	Evaporation pond emissions have been corrected and the corrected emission inventory has been used in the CAMx modeling for the Final EIS.
AQ	Emissions Inventory	IN05	15	Future operations both within the proposed action as well as any RFD oil and gas and other regional developments would need to comply with NSPS Subpart OOOO, and the EIS should at least explain how this rule would affect emissions incorporated in the RFD sources.	A discussion of this rule has been added to the revised AQTSD and Final EIS.
AQ	Emissions Inventory	O10	1	The impact from almost 9,000 natural gas wells and their intensive infrastructure will have an impact on air quality. Methane emissions alone will elevate air quality to hazardous levels.	This air quality analysis has shown that the CD-C project will have impacts on air quality that are too small to constitute a health hazard to the general public. Methane emissions were quantified, but air quality impacts of methane were not evaluated, as the U.S. EPA does not consider methane to be either a hazardous air pollutant or a criteria pollutant.
AQ	Emissions Inventory	O15	10	Comment Attachment, pages 30-36. The emissions inventories underestimate emissions and therefore the modeled impacts are likely also underestimated.	In the development of the emission inventories for the CD-C project and for the surrounding region, conservative assumptions were made throughout; these emission inventories are far more likely to overestimate emissions than underestimate them.
AQ	General	F04	1	The NPS is concerned about the potential impacts to Dinosaur NM's air quality and AQRVs, particularly nitrogen deposition. The severity of these impacts are not adequately disclosed in the Draft EIS (i.e., the document provides little information), and the analysis should be updated to reflect the nature of these impacts.	See response to previous comments regarding nitrogen deposition at Class I and sensitive Class II areas.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
AQ	General	F04	2	Given predicted impacts to Dinosaur NM, including nitrogen deposition, a rigorous suite of NOx mitigation measures should be incorporated into the final decision including consideration of Tier II drill rigs with selective catalytic reduction, or Tier IV drill rigs.	Mitigation measures to address nitrogen deposition impacts will be identified and included in the ROD.
AQ	General	F04	4	Extensive information regarding the air quality modeling assessments is included in the Air Quality Technical Support Document (AQTSD), however, very little of this information is provided in Chapter 4 of the Draft EIS. Chapter 4 air quality sections should be expanded to include appropriate explanatory information. For instance, the summary discussion of the ozone modeling results could be expanded by including TSD tables and graphics.	References to specific sections, tables, and results included in the revised AQTSD will be included in the Final EIS to enable the reader to more easily locate the supporting data for the results presented in the Final EIS.
AQ	General	O04	1	Air quality concerns in this area may affect both public recreation (through haze from ozone-related smog) in Adobe Town Very Rare or Uncommon Area and other neighboring recreation lands, and may also affect the health and viability of wildlife that inhabit the Project Area and surrounding lands. The BLM should be expected to adequately address this issue so that air quality remains below all Clean Air Act thresholds.	The BLM addresses potential mitigation measures in the Final EIS from project-related impacts. However, the air quality modeling analysis indicates there will be no violations of any National Ambient Air Quality Standard.
AQ	General	O05	1	We are concerned that the Draft EIS identifies a number of significant direct and cumulative ecosystem impacts upon air quality, including excessive cumulative visibility, ozone, NO_2 and PM impacts. It is our understanding, given requirements of the Clean Air Act and BLM's own National Environmental Policy Act (NEPA) guidelines, the analysis is incomplete until it presents project actions that will be taken to eliminate or reduce those impacts to non-significant levels. This is a pervasive deficiency throughout the air quality analysis that in our opinion needs to be corrected.	The BLM is not required by NEPA to reduce impacts to a level of "not significant." Appropriate mitigation for the project's impacts will be included in the ROD if the project's impacts are deemed to be significant or adverse. Cumulative impacts, which accounts for impacts from all regional sources, are outside of the BLM's authority to regulate.
AQ	General	O15	1	Comment Attachment, pages 1-3. BLM's own assessment indicates the proposed development will have adverse impacts on air quality and therefore the Draft EIS, which does not fully acknowledge such impacts, does not satisfy the requirements of the National Environmental Policy Act and the Federal Land Policy and Management Act.	The Final EIS includes a revised modeling analysis for both the near-field and far-field impacts. Air quality impacts from the CD-C project that are deemed to be adverse or significant as determined by technical experts from the EPA, USFS, NPS, and Wyoming Department of Environmental Quality – Air Quality Division (WDEQ-AQD) will be addressed and appropriate mitigation will be determined for inclusion in the ROD.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
AQ	General	O15	14	Comment Attachment, pages 44-49. BLM must include adequate plans to protect air quality in the area as part of this Draft EIS.	A determination of adverse impacts must be made first. The Draft EIS must only disclose the impacts. The Final EIS discusses which impacts have been deemed to be adverse or significant based on the assessment of technical experts from EPA, USFS, NPS and WDEQ-AQD.
AQ	General	O15	15	Comment Attachment, page 49-50. Overall, the BLM has not adequately evaluated the air quality impacts from the CD-C project and has not proposed adequate enforceable mitigation measures to assure no adverse impacts on air quality will occur in the affected area. BLM must meet its statutory obligation to provide for compliance with the CAA and related laws and, more fundamentally, to ensure air resource protection throughout the project area and all other affected areas in the region.	Enforceable mitigation measures are included in the ROD only. The BLM will ensure that appropriate mitigation measures are included to ensure compliance with the CAA and the NAAQS.
AQ	GHGs	IN01	8	The EPA requires a greenhouse gas permit with a Prevention of Significant Deterioration (PSD) threshold. APC requests that discussion regarding this permit condition is added to Sections 3.5.2.7 and 4.5.4 of the Draft EIS and Section 2.1.1.4 of the TSD.	A discussion of the permit condition has been added.
AQ	HAPs	IN03	22	Page 29, paragraph 8 through page 31. It is recommended that BLM refine the emission calculations and modeling used to estimate risk from formaldehyde impacts from the combustion stack.	Near-field modeling scenarios have been revised for the Final EIS.
AQ	HAPs	IN03	23	Regarding formaldehyde modeling, it is also important to place the MEI risk calculation into the context of exposure. The MEI presents an incremental risk based on an individual being exposed constantly at the location of maximum impact for a period of 70 years.	Thank you for your comment. The analysis is required for disclosure purposes.
AQ	HAPs	IN03	24	It is recommended that concentration isopleth plots of annual average formaldehyde and MEI incremental risk be developed to illustrate the changes in concentration and incremental risk over larger distances.	Thank you for your comment.
AQ	HAPs	O15	8	Comment Attachment, pages 29-30. The Hazardous Air Pollutant analysis in the Draft EIS is not sufficient to assess all of the potential health impacts from the proposed development.	Thank you for your comment. The analysis presented provides a conservative estimate of the potential impacts from HAP emissions.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
AQ	Impact Analysis	F01	8	If the impacts from revised modeling performed prior to issuance of the Final EIS are substantially different than those predicted in the Draft EIS, the BLM should prepare a supplement to the Draft EIS to provide the public with an opportunity to understand those results and evaluate whether further comments should be provided.	Revised modeling results have not been deemed to be substantially different as to require a supplement.
AQ	Impact analysis	O11	2	We note that the BLM's own air quality modeling analyses predict the following significant impacts, but offer no plans to mitigate them. These include significant direct and cumulative ecosystem impacts, fails to assure the prevention of significant deterioration of air quality as required by the Clean Air Act, significant ozone, NO_2 and PM impacts, unacceptable health risks associated with hazardous air pollutant impacts, and significant cumulative visibility impacts.	The revised modeling analysis completed for the Final EIS indicates there are no violations of any ambient air quality standards and negligible visibility impacts. Mitigation measures to address cumulative nitrogen deposition, short-term PM exceedances, and hazardous air pollutants are discussed in the Final EIS and final mitigation measures will be included in the ROD.
AQ	Impact analysis	P08	1	"There are no acceptable plans for mitigation for the significant ozone, NO_2, and PM impacts. "	Thank you for your comment.
AQ	Management Objectives	IN05	21	The Management Objectives in Section 4.5.2 state that BLM is "maintaining concentrations of PSD pollutants in compliance with applicable increment". Given the BLM's limited authority over air quality, this is a wholly inappropriate objective, and may interfere with WDEQ responsibilities. The statement of this objective clearly misleads the public in understanding how the AQ analyses will be conducted. Devon encourages the BLM to withdraw or re-characterize this objective.	The BLM does not enforce or regulate PSD increment consumption. The analysis included in the Draft EIS and Final EIS is for informational and disclosure purposes only.
AQ	Maps	F02	8	Map 3.5-1 displays the Gros Ventre Wilderness area as being within the analysis area, but there is no analysis for this area in the document. Please edit the map or explain why this area was not analyzed. The AQTSD has been revised to exclude this wilderness area.	In the final CAMx modeling that is reported in the Final EIS, impacts at the following additional areas has been evaluated: Gros Ventre, Flat Tops, Eagles Nest, and Rocky Mountain National Park. Map 3.5-2 (renumbered from 3.5-1) has been adjusted to show the additional areas.
AQ	Maps	F02	10	Paragraph 5 discusses the non-attainment area and refers to Map 3.5-1.That map does not show the non-attainment area, and it would be helpful if it was displayed there.	The non-attainment area boundary has been added to Map 3.5-2 in the Final EIS.
AQ	Maps	F02	22	Map 3.5-1 displays the Gros Ventre Wilderness area as being within the analysis area, but there is no analysis for this area in the document. Please edit the map or explain why this area was not analyzed. The AQTSD has been revised to exclude this wilderness area.	In the final CAMx modeling that has been reported in the Final EIS, impacts at the following additional areas has been evaluated: Gros Ventre, Flat Tops, Eagles Nest and Rocky Mountain National Park. Map 3.5-2 has been adjusted to show the additional areas.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
AQ	Mitigation	F01	1	Page 2, paragraphs 2 and 3. BLM commits to mitigating impacts to "demonstrate compliance with the NAAQS." Mitigation required only if a violation of the NAAQS is predicted is problematic because exceedances of the NAAQS can occur without triggering a violation of the NAAQS. BLM's intended approach is to prevent exceedances of the NAAQS and EPA understands that will be clarified in the final EIS. The comment letter provides specific interpretation.	The BLM will address appropriate mitigation measures to avoid exceedances of the NAAQS in the FEIS in addition to working with the Inter-Agency Review Team to develop the final mitigation measures and implementation timeline to be included in the ROD.
AQ	Mitigation	F01	9	The BLM should require in the Final EIS and ROD all mitigation used in the emission inventory for operating scenarios under the Preferred Alternative or, alternatively, require mitigation with equivalent air quality benefits if those given by BLM are not viable.	All required mitigation and operator-committed measures will be identified in the ROD.
AQ	Mitigation	F01	10	Page 3, paragraph 7 and page 4, paragraphs 1-3. Additional mitigation measures for NOx and PM, beyond those identified in the Draft EIS, may be necessary to meet the BLM's commitment to prevent exceedances of the NAAQS. Mitigation options for NOx and PM should be added as outlined.	Mitigation options for exceedances of the NO_2 and PM standards are addressed in the Final EIS.
AQ	Mitigation	F02	6	The agency is concerned about adverse nitrogen impacts from the project on PSD Class I areas they oversee. Consider requiring a liquids gathering system, and either Tier II/SCR or Tier III drill rigs.	Mitigation measures to address nitrogen deposition impacts will be identified in the ROD.
AQ	Mitigation	F04	15	The Draft EIS did not include any specific Conditions of Approval (COA) for Air Quality. A suite of mitigation measures was incorporated into the CAMx modeling analysis. At a minimum, these measures should be incorporated as COAs into the final decision, otherwise the impact predictions are not meaningful and the air quality is not protected.	COAs and required mitigation will be described in the ROD. The ROD is the only enforceable document for requiring mitigation measures for the project.
AQ	Mitigation	IN02	3	Cumulative deposition levels are predicted to be above the nitrogen critical load threshold of 1.5 kg/ha/yr for all areas evaluated. It is recommended that the evaluation of the 1.5 k/ha/yr simply be disclosed and no action regarding additional mitigation in the Final EIS and in the ROD be taken because the cumulative nature of the emissions is well beyond the CD-C project.	Mitigation measures will only be developed to address impacts from CD-C project sources and activities. The FEIS modeling results have been compared to updated cumulative deposition threshold values provided by the National Park Service.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
AQ	Mitigation	IN02	4	The proponents are concerned that additional NOx mitigation may be proposed to reduce perceived impacts. Any additional mitigation should be evaluated based on environmental benefits, cost to control and technical feasibility.	The BLM intends to discuss mitigation measures with the proponents to identify reasonable and technically feasible options.
AQ	Mitigation	IN02	5	Page 8, paragraphs 1-3. Model predictions must be placed in proper perspective before any policy decisions are made for inclusion into the Final EIS and ROD. A number of technical issues have been identified regarding deposition analyses. DC deposition should be considered a screening level analysis that has compounding levels of conservatism and does not justify additional mitigation until more detailed analyses are conducted.	Thank you for your comment.
AQ	Mitigation	IN03	32	Page 49. With corrections to the near field modeling recommended, the NOx concentrations fall below the NO_2 1-hr NAAQS. NOx emissions mitigation for the NO_2 1-hr NAAQS will not be needed.	Thank you for your comment.
AQ	Mitigation	IN03	33	Page 49. The PM impacts from well pad construction would not exceed the $PM_{2.5}$ NAAQS since the construction activity is temporary (only occurs for 49 days) and the form of the standard is the average over 3 years. There would be no way that the particulate emissions would exceed the standard when averaged over 3 years. Based on corrected air quality analysis, no further mitigation is warranted.	Thank you for your comment.
AQ	Mitigation	IN03	34	Page 49. With the recommended corrections contained in these comments to the HAPS, the risk will be reduced by over 50% removing the concerns over the impacts from HAPS. Based on corrected air quality analysis, no further mitigation is warranted.	Thank you for your comment.
AQ	Mitigation	IN03	35	Page 49. The impacts from deposition to not warrant further NOX controls.	Thank you for your comment.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
AQ	Mitigation	O11	3	It is our understanding that under the Clean Air Act, if the BLM identifies potentially significant impacts, the agency is required to identify the specific measures it intends to take in order to eliminate or mitigate those impacts to acceptable levels. The Draft EIS fails to specifically address the potential for impacts to the UNPV. This should be done for our communities including mitigation measures to be taken. If the requested information can be made available and additional time for consideration and comment can be allowed, VofV can then facilitate public response to that information from the UNPV.	The revised modeling analysis completed for the Final EIS indicates there are no violations of any ambient air quality standards and negligible visibility impacts. Mitigation measures to address nitrogen deposition, short-term (1-hour) NO_2 and (24-hour) PM exceedances, and hazardous air pollutant impacts are discussed in the Final EIS.
AQ	Mitigation	P10	4	• Require air quality monitoring before, during, and after all activity. Use a mix of stationary monitoring stations and mobile monitoring. • Require companies to comply to DEQ ozone action days when necessary. • Require ongoing leak detection and repair. • Make all monitoring results and reports easily available to the public.	Thank you for your comment.
AQ	NAAQS	F01	3	Include the predicted NAAQS exceedances within the air quality impacts section so that the Final EIS fully discloses the project's impacts.	This information is included in the revised AQTSD and a section number reference is provided in the Final EIS.
AQ	NAAQS	F01	4	To assure impacts and exceedances are accurately disclosed, add the background concentrations to this table and to modeling results given in the Final EIS.	Background values have been added to the results shown in the Final EIS for comparison to NAAQS.
AQ	NAAQS	IN05	9	Table 3.5-4 footnote 6, compliance with the 24-hour standard is based on the 3-year average of the 98th percentile 24-hr level, not the maximum.	This change has been made in the revised AQTSD and in the Final EIS.
AQ	NAAQS	IN05	10	Table 3.5.8, footnote 6, incorrectly states the SO_2 NAAQS as the 98th percentile. The standard is the 99th percentile.	This change has been made in the revised AQTSD and in the Final EIS.
AQ	NAAQS	IN05	11	Clarify why the 24-hour PM_{10} value is the maximum value noted at Wamsutter, rather than the second highest.	The values presented in Table 3.5-8 were designated by WDEQ-AQD as most representative background values for the region.
AQ	NAAQS	IN05	12	Clarify that the estimates of background SO_2 and $PM_{2.5}$ are from remote sites and may be less representative than conditions in the project area, and therefore the results that are evaluated with these data need to be interpreted carefully.	WDEQ-AQD considers these sites to represent background conditions for the modeled region.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
AQ	NAAQS	F01	2	Near field air quality impacts are averaged over a three year period. This does not disclose the project's potential for short term impacts. The 4th maximum 24-hour value for PM_{10}, the 8th maximum 1-hour N02 value, and the 8th maximum 24-hour value for $PM_{2.5}$ from each of the three modeled years should be presented to provide a more informative impact evaluation.	For the Final EIS, the maximum second-high 24-hr PM_{10} values and maximum eighth-high 24-hr $PM_{2.5}$ values for any of the years are reported. The maximum eighth-highest 1-hour NO_2 concentrations for any of the three years modeled, for modeling scenarios involving drilling activities, are provided in the revised Air Quality Technical Support Document (AQTSD) and a page reference is provided in the Final EIS.
AQ	Operations Data	IN01	2	This indicates that drilling each well would take 7-20 days. In 2007 drill time was changed to 7-10 days. This appears correct in the emissions inventory, but not throughout the Draft EIS. Drilling time needs to be consistently referenced throughout the document as 7-10 days.	Drilling times have been corrected in the Final EIS.
AQ	Operations Data	IN01	3	States that the “completions and testing operations typically require 10 to 20 (up to 30) days to perform.” This was revised by the operators in 2007 to 10 to 20 days. This appears correct in the emissions inventory, but not throughout the Draft EIS. Completion and testing times need to be consistently referenced throughout the document as 10-20 days.	Completion times have been corrected in the Final EIS.
AQ	Ozone	F02	12	Paragraph 1 discusses ozone in ppb, and Table 4.5-10 shows ozone in µg/m3; please display both units or provide conversion factor as a footnote.	Expressed units have been made consistent or a conversion factor has been provided.
AQ	Ozone	IN03	25	The MATS results for ozone indicated that the 75 ppb ozone NAAQS was attained throughout the 4 km grid except near Boulder. The CD-C project’s contribution was less than 0.04 ppb which is consistent with the terrain and meteorology for the area reducing any impacts. In fact, the maximum impact future design value is less than or equal to only 0.8 ppb in the rest of the modeling domain showing insignificant impacts from the project to ozone.	The magnitude of the impacts is correctly stated.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
AQ	Ozone	O15	4	Comment Attachment, pages 18-24. BLM's air quality analysis likely underestimates air quality impacts. The ozone analysis for the Draft EIS underestimates impacts and fails to address wintertime ozone impacts.	The BLM has completed a revised modeling analysis for the Final EIS. Data used and assumptions made throughout the emissions inventory and ambient impact analysis cumulatively result in a conservative representation of impacts from the Proposed Action and Alternatives. The winter ozone season was excluded from the analysis due to the inability of the model to accurately replicate the unique conditions under which wintertime ozone is formed. The exclusion of the winter ozone season was recommend by the WDEQ-AQD and was not modified for the Final EIS.
AQ	Plan of Development	IN01	4	The AQTSD states that approximately 500-900 of the proposed wells would be CBM. In a 2007 change to the Plan of Development, this number was changed to "up to 500 wells." The Draft EIS should consistently reference 500 wells.	This has been corrected in the revised AQTSD and Final EIS.
AQ	Proposed Action and Alternatives	O10	2	By implementing phased development with directional drilling options, a stronger management direction is employed that minimizes air pollution in addition to minimizing a host of other impacts.	Thank you for your comment.
AQ	Regional Emissions Inventory	IN05	23	The BLM should explain that its regional emission inventory is extremely conservative, if not bordering on, a "worst-case" scenario. Rather than developing a likely future emissions scenario, the BLM developed an extraordinarily conservative set of assumptions.	The description of the regional emission inventory and its inherent conservatism has been explained in the AQTSD.
AQ	Regional Emissions Inventory	IN05	24	BLM should clarify and explain some key assumptions included in Appendix F of the AQTSD, including the issues of the WRAP Phase III emissions inventory not being used, and spatial depictions of emissions. Determining the relative portion of the key emissions (VOC NOx) attributable to area sources may help interpret results.	The RFD emissions have been updated for the Final EIS modeling.
AQ	Regional Emissions Inventory	IN05	25	Emissions from EGUs modeled should be adjusted to account for any reduction in NOx emissions under the Regional Haze Rule.	The WRAP PRP18b were the most recent projections of future year available at the time of the inventory development and reflect BART controls anticipated at the time the inventory was compiled. EGU emissions were not updated for the Final EIS CAMx model runs.
AQ	Regional Emissions Inventory	IN08	13	The BLM should explain that its regional emission inventory is extremely conservative, if not bordering on, a "worst-case" scenario. Rather than developing a likely future emissions scenario, the BLM developed an extraordinarily conservative set of assumptions.	Language stating that "the assumption that all RFD sources are fully developed during the maximum year of CD-C project development results in conservatism in the cumulative impact analysis" is included in the revised AQTSD and Final EIS.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
AQ	Regional Emissions Inventory	O15	11	Comment Attachment, pages 36-38. The Draft EIS does not include a comprehensive regional inventory for use in determining existing and reasonably foreseeable cumulative air quality impacts.	The Draft EIS uses the most complete and technically rigorous inventories that are available for southwest Wyoming and the western U.S. The regional emissions inventory is based on Western Regional Air Partnerships emission inventories, data from the State of Wyoming, and EPA's Acid rain database. There are no better sources of emissions data available. The RFD inventory has been updated for the final CAMx modeling to give a more complete accounting of Colorado RMP sources.
AQ	Regulations	IN08	7	BLM has failed to identify 40 CFR 60 Subpart OOOO. Not only should BLM identify this regulation, they must include in all of its future modeling the reductions in emissions that will be implemented as a result of this rule.	NSPS, Subpart OOOO was promulgated after the Draft EIS and AQTSD were written. OOOO has been added to the list of NSPS in the final version of the document. No changes were required to the CD-C project inventory as a result of OOOO.
AQ	Regulations	IN08	8	The text on page 3-58 of the CD-C Draft EIS duplicates for JJJJ the text regarding subpart KKKK.	This correction has been made in the Final EIS.
AQ	Regulatory Authority	IN05	1	Devon encourages the BLM to add a statement in the CD-C Draft EIS clarifying the scope of the BLM's authority as defined by the IBLA. The BLM does not have the authority to impose regulations or mandate control measures on emission sources, including oil and gas operations, within Wyoming.	The BLM has the responsibility and authority under FLPMA to mitigate adverse impacts from its management actions.
AQ	Regulatory Authority	IN05	2	The BLM has recognized its inability to impose air quality mitigation in the original ROD for the Continental Divide/Wamsutter II project. The BLM should not arbitrarily modify its previous recognition regarding the State of Wyoming's primacy to regulate air quality in Wyoming.	The BLM has the responsibility and authority under FLPMA to mitigate adverse impacts from its management actions.
AQ	Regulatory Authority	IN05	3	The BLM has no authority over air quality and cannot impose emissions restrictions, either directly or indirectly, on natural gas operations in Wyoming, particularly if the overall goal is to reduce potential visibility impacts	The BLM has the responsibility and authority under FLPMA to mitigate adverse impacts from its management actions.
AQ	Regulatory Authority	IN05	4	The BLM should also recognize that the agency does not have the authority to implement, regulate, or enforce the PSD increment. The BLM's lack of authority of PSD increment was recently recognized in the MOU issued by the Department of the Interior, Department of Agriculture, and the EPA which indicates that BLM NEPA documents relating to oil and gas activities will model PSD increment consumption for informational purposes only.	Your comment is accurate. BLMs analysis of increment consumption is for informational and disclosure purposes only. Determination of adverse impacts based on exceedances of the increment is determined by the WDEQ-AQD.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
AQ	Regulatory Authority	IN08	1	Samson encourages the BLM to add a statement in the CD-C Draft EIS clarifying the scope of the BLM's authority as defined by the IBLA. The BLM does not have the authority to impose regulations or mandate control measures on emission sources, including oil and gas operations, within Wyoming.	The BLM has the responsibility and authority under FLPMA to mitigate adverse impacts from its management actions.
AQ	Regulatory Authority	IN08	2	The BLM has no authority over air quality and cannot impose emissions restrictions, either directly or indirectly, on natural gas operations in Wyoming, particularly if the overall goal is to reduce potential visibility impacts	The BLM has the responsibility and authority under FLPMA to mitigate adverse impacts from its management actions.
AQ	Regulatory Authority	IN08	3	The BLM should also recognize that the agency does not have the authority to implement, regulate, or enforce the PSD increment. The BLM's lack of authority of PSD increment was recently recognized in the MOU issued by the Department of the Interior, Department of Agriculture, and the EPA which indicates that BLM NEPA documents relating to oil and gas activities will model PSD increment consumption for informational purposes only.	The BLM does not enforce or regulate PSD increment consumption. The analysis included in the Draft EIS and Final EIS is for informational and disclosure purposes only.
AQ	Regulatory Status	IN05	18	The BLM should update the Final EIS to acknowledge the current non-attainment status for portions of southwestern Wyoming for ozone.	The Final EIS has been updated to reflect current ozone non-attainment status.
AQ	Regulatory Status	IN05	19	There is no clear definition of what receptor groups make up the mid-field grid. The regional extent of the mid-field grid should be identified, and BLM should explain how this pattern of emissions and impacts would not represent impacts near a specific source or group of sources. It is not clear that mid-field impacts play any role in the impact evaluation conducted in the EIS.	Text has been added to the revised AQTSD and the Final EIS describing mid-field modeling and impacts.
AQ	Regulatory Status	IN08	10	The BLM should update the Final EIS to acknowledge the current non-attainment status for portions of southwestern Wyoming for ozone.	This section has been updated in the Final EIS.
AQ	RFD	F02	23	Eagle Prospect was bought out and will not be developed.	Eagle Prospect has been removed from the reasonably foreseeable development (RFD) emission inventory for the Final EIS CAMx modeling.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
AQ	RFD	IN03	10	The TSD and the EIS should acknowledge that the cumulative RFD emissions are very speculative in both timing and actual emissions. It is also important to note that none of the RFD projects have been approved by BLM and as a result of the EIS process emissions may change before a ROD is issued. It is recommended that the EIS documents list the assumptions made regarding RFD sources so that cumulative emissions and resulting air quality impacts can be placed into proper perspective.	Language stating that "the assumption that all RFD sources are fully developed during the maximum year of CD-C project development results in conservatism in the cumulative impact analysis" is included in the revised AQTSD and Final EIS.
AQ	RFD	IN03	11	Page 8, paragraph 5. Based on a review of the RFD inventories it is not possible to determine if production decline of proposed and existing sources has been included in the calculation of RFD emissions. If decline is not included in the RFD inventories, the document should state that because decline is not accounted for in the RFD sources, that the inventory is conservative.	The RFD documentation section has been revised. RFD emissions have been updated for the Final EIS modeling.
AQ	RFD	IN03	12	Project proponents are simply recommending that the assumptions of RFD sources be listed and no changes in the actual inventories are being recommended.	The RFD documentation section has been revised. RFD emissions have been updated in the Final EIS modeling.
AQ	RFD	IN05	42	It does not appear the BLM used the same set of reasonably foreseeable projects when developing its RFD Scenario emissions for air quality as are contained in Table 5.0-1. The BLM should ensure that it utilizes a consistent set of RFD Scenarios for air quality and other cumulative impacts analyzed to avoid future challenges. The BLM should identify the reasons for excluding certain oil and gas development projects from the air quality modeling,	The RFD documentation section has been revised. RFD emissions have been updated for the Final EIS modeling.
AQ	RFD	IN08	23	It does not appear the BLM used the same set of reasonably foreseeable projects when developing its RFD Scenario emissions for air quality as are contained in Table 5.0-1. The BLM should ensure that it utilizes a consistent set of RFD Scenarios for air quality and other cumulative impacts analyzed to avoid future challenges. The BLM should identify the reasons for excluding certain oil and gas development projects from the air quality modeling,	The RFD documentation section has been revised. RFD emissions have been updated for the Final EIS modeling.
AQ	Visibility	F02	25	Please include an explanation of the term "bPMC" used in the equation for extinction.	bPMC (extinction from coarse particulate matter) has been relabeled bCM and an explanation has been added to the revised AQTSD.
AQ	Visibility	F02	26	Please verify the equation for the BLM delta-deciview calculation method is correct.	The equation is correct.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
AQ	Visibility	F02	27	In Table 4-20 through 4-27; 4-44 through 4-51; and 4-61 through 4-64, please explain the table heading "b_scr"; it does not seem to be defined in the text.	b_src has been defined in the revised AQTSD. It is the extinction due to CD-C project area emissions sources.
AQ	Visibility	F02	28	In paragraph 1, please clarify the differences between visibility method 1 and visibility method 2. Specifically, a) the term "all sources total" for method 1 while method 2 adds RFD, and b) the term "PSAT" in CAMx/PSAT which is not defined or known if it was used for method 2.	In the final CAMx modeling that has been reported in the Final EIS, a new cumulative visibility impact method developed by the U.S. Fish & Wildlife (USFWS) and U.S. Forest Service (USFS) has been used. Neither method 1 nor method 2 has been used, so discussion of these methods has been replaced with a description of the new method. PSAT is defined in section 4.4.2 of the AQTSD.
AQ	Visibility	F02	29	In paragraph 1, line 2, change "FLAG 201" to "FLAG 2010".	This has been corrected in the final version of the document.
AQ	Visibility	F02	30	Table 4-73; there is concern for the increase in number of days of visibility impairment >1 dv by 2022 from cumulative sources. Though this project does not have a large impact from the project alone, the decision maker should consider the projected increase in cumulative visibility impairment in making responsible decisions.	The cumulative visibility analysis has been revised in the Final EIS. Mitigation measures identified in the Final EIS to address NOx emissions will also decrease the visibility impairment from project-related activities.
AQ	Visibility	F02	39	The last paragraph has an expression for bother that includes the term "bPMC" that is not explained in the text.	bPMC (extinction due to coarse PM) has been relabeled bCM and has been defined along with the other components of extinction in the revised AQTSD.
AQ	Visibility	F02	40	Please explain the heading "b_src" in Tables 3-8 to 3-11; it is not defined in the text.	b_src has been defined in the revised AQTSD. It is the extinction due to CD-C Project Area emissions sources.
AQ	Visibility	F04	12	Include the results from the three methods of cumulative visibility analysis into the Draft EIS cumulative visibility section. Little of this information was included in Chapter 5, the detail provided in the AQTSD should be included in Chapter 5.	In the final CAMx modeling that has been reported in the Final EIS, a new cumulative visibility impact method developed by the USFWS and USFS has been used. Cumulative visibility impacts have been reported in Chapter 5.
AQ	Visibility	F04	13	When considering how to disclose the cumulative visibility impacts, the most weight should be given to Method 3.	See response to F04-12 above. In addition, the Final EIS has reported cumulative visibility impacts for this new method alone.
AQ	Visibility	F04	14	The EIS should disclose the cumulative visibility impacts in the context of the overarching CAA visibility goals, and clarify in the EIS that the results of the analysis do not represent a regulatory regional haze analysis.	Cumulative visibility impacts have been disclosed according to the method proposed by the USFWS and USFS.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
AQ	Visibility	F04	16	Page 5, paragraph 3. We continue to believe that additional NOx reductions from the CD-C project are warranted. We do not have recommendations for specific NOx mitigations at this time; rather, we would like to establish an ongoing discussion within the stakeholder group to identify a NOx reduction target that may be achieved through a suite of agreed upon mitigation measures, with specific recommendations coming from a collaborative process.	The BLM intends to work with stakeholders to address mitigation of adverse impacts from the CD-C project. Mitigation measures will ultimately be included in the ROD.
AQ	Visibility	IN03	26	Page 32, paragraph 4 through page 36. The visibility analysis is conservative and indicates no degradation in visibility as a result of the proposed development. The CD-C visibility modeling indicates that modeled visibility is conservative and over estimates the number of days in excess of 0.5 dv and 1.0 dv. In addition, the cumulative modeling indicates that visibility will improve between 2008 and 2022.	The visibility analysis is conservative because the model performance evaluation showed that the model tends to overestimate visibility impacts. This is shown in the visibility model performance evaluation documented in AQTSD Appendix A.
AQ	Visibility	IN05	7	Devon does not believe that the 0.5 dv standard is scientifically justifiable. The BLM must demonstrate its justification for utilizing the 0.5 dv standard. The BLM appears to rely upon the Federal Land Managers Air Quality Values Workgroup ("FLAG") report from 2010 as a source for its decision to utilize the 0.5 dv standard. It is important to remember that BLM was not a signatory to the FLAG report and, thus, its reliance on this source is not appropriate.	Per the National Air Quality MOU, the BLM is required to assess visibility impacts to USFS and NPS lands using the FLAG method. 0.5 dv is not the criterion for determining significance or requiring mitigation, but is necessary for disclosure purposes.
AQ	Visibility	IN05	8	A summary of the Regional Haze Rule along with NOx emissions reductions at major sources in the region, and how the implementation of the rule and added controls will positively impact visibility and deposition should be added. The public should understand how these will improve conditions.	Thank you for your comment. Discussion of the RHR has been provided in the revised AQTSD and Final EIS along with description of the new method for cumulative visibility analysis.
AQ	Visibility	IN05	22	There are no formal visibility impairment standards that have been adopted by the BLM as it is not a signatory to the FLAG guidance document, and as discussed earlier in these comments, the BLM should specifically explain why it departed from its previously used standard of 1.0dv as a significance criterion and instead utilized a 0.5dv standard. Absent this explanation, the BLM's decision appears to be arbitrary and capricious and wholly unsupported by the record.	Per the National Air Quality MOU, the BLM is required to assess visibility impacts to FS and NPS lands using the FLAG method. 0.5 dv is not the criterion for determining significance or requiring mitigation, but is necessary for disclosure purposes.

Category	Sub-Category	Comment		Comment	Response
		Code	No		
AQ	Visibility	IN08	6	Samson does not believe that the 0.5 dv standard is scientifically justifiable. The BLM must demonstrate its justification for utilizing the 0.5dv standard. The BLM appears to rely upon the Federal Land Managers Air Quality Values Workgroup ("FLAG") report from 2010 as a source for its decision to utilize the 0.5dv standard. It is important to remember that BLM was not a signatory to the FLAG report and, thus, its reliance on this source is not appropriate.	Per the National Air Quality MOU, the BLM is required to assess visibility impacts to USFS and NPS lands using the FLAG method. 0.5 dv is not the criterion for determining significance or requiring mitigation, but is necessary for disclosure purposes.
AQ	Visibility	IN08	12	There are no formal visibility impairment standards that have been adopted by the BLM as it is not a signatory to the FLAG guidance document, and as discussed earlier in these comments, the BLM should specifically explain why it departed from its previously used standard of 1.0dv as a significance criterion and instead utilized a 0.5dv standard. Absent this explanation, the BLM's decision appears to be arbitrary and capricious and wholly unsupported by the record.	Per the National Air Quality MOU, the BLM is required to assess visibility impacts to USFS and NPS lands using the FLAG method. 0.5 dv is not the criterion for determining significance or requiring mitigation, but is necessary for disclosure purposes.
AQ	Visibility	IN05	6	Devon objects to the BLM's decision to utilize the 0.5 deciview standard. The BLM in Wyoming has long utilized a 1.0 dv standard for visibility impacts in EISs. The BLM must justify its decision to depart from its long-established practice and procedure. Absent such justification, the BLM's decision appears arbitrary. It is not clear why maximum delta deciview values should be used for evaluation; the BLM should provide further justification.	Per the National Air Quality MOU, the BLM is required to assess visibility impacts to FS and NPS lands using the FLAG method. 0.5 dv is not the criterion for determining significance or requiring mitigation, but is necessary for disclosure purposes.
AQ	Visibility	IN08	5	Samson objects to the BLM's decision to utilize the 0.5 deciview standard. The BLM in Wyoming has long utilized a 1.0 dv standard for visibility impacts in EISs. The BLM must justify its decision to depart from its long-established practice and procedure. Absent such justification, the BLM's decision appears arbitrary.	Per the National Air Quality MOU, the BLM is required to assess visibility impacts to FS and NPS lands using the FLAG method. 0.5 dv is not the criterion for determining significance or requiring mitigation, but is necessary for disclosure purposes.

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APPENDIX M: INTERIM ROLLOVER OBJECTIVE (IRO) FOR ALTERNATIVE C

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INTRODUCTION

This appendix includes two documents:

- **Proposed Interim Rollover Objective for the Continental Divide-Creston Natural Gas Project Environmental Impact Statement and Record of Decision (February 25, 2011)**. This document was developed by the CD-C Reclamation Work Group, an ad hoc group focused on improving reclamation in the CD-C project area. The document was intended to provide flexibility for industry, while maintaining healthy, desirable vegetation within the project area. The group, including representatives of industry, state agencies, the University of Wyoming, local governments, and the BLM, worked for two years to develop the document. The document provided the framework in which the *BLM Rollover Criteria, Continental Divide–Creston EIS* (description follows) was developed.
- **BLM Rollover Criteria, Continental Divide–Creston EIS**. The criteria described in this document are formally incorporated as an element of *Alternative C: Surface Disturbance Cap—High and Low Density Development Areas.* For the purposes of the CD-C EIS, the standards and guidance contained in the Rawlins RMP Appendix 36 and the Wyoming State Reclamation Policy, IM-WY-2012-032, apply to the Proposed Action and the other action alternatives. However, a specific exception is made with regard to *rollover* credits involved with *Alternative C. Rollover* credits exist in the context of a cap on the amount of surface disturbance generated by natural gas development. They refer to the process by which acreage that counted against a surface disturbance cap when natural gas facilities were initially constructed could be successfully reclaimed and *rolled over*, meaning counted again as undisturbed acreage. When a natural gas well pad and its associated road and pipeline are constructed, the initial disturbance is much larger than what is needed for the long term. After the well has been completed, the area that was initially disturbed but is no longer needed, perhaps 60 percent of the total, undergoes *interim reclamation.*[1] With a surface disturbance cap in place, this portion of the initial disturbance acreage can be *rolled over* when the BLM determines that it has been successfully reclaimed.

  In some cases, for example in the neighboring Atlantic Rim Natural Gas Project, the success criteria applied for rollover credits are the same as the final reclamation standard, in other words, the RMP Appendix 36 performance criteria: establishment of 80 percent of pre-disturbance ground cover; 90 percent dominant species; no noxious weeds; and erosion features equal to or less than surrounding area. For the CD-C Alternative C, however, the RFO has defined *Reclamation Rollover Criteria* as follows:
    - The area is re-vegetated with a stable, approved plant community;
    - Vegetative cover is sufficient to maintain a healthy, biologically active topsoil;
    - Erosion is controlled;
    - Habitat, visual and forage loss is minimized; and
    - No noxious weeds are present.

[1] As defined in IM WYD- 03-2011-02, "*interim reclamation* is used to restore vegetation, and scenic and habitat resources while a well continues to produce energy. With interim reclamation, all areas not needed for the production of oil and gas are reclaimed, that is, reshaped, covered with topsoil, and reseeded with native plants. Interim reclamation also refers to the stabilization of soil by revegetation on sites that will likely be further disturbed in the future. This includes sites where recontouring is needed where periodic disturbance may occur due to operation and maintenance activities." *Interim reclamation* can be contrasted with *final reclamation*, which is "reclamation of an area that is not planned for further disturbance including recontouring, stabilization of soil by re-vegetation and restoring the ecosystem function originally found at the site." It normally occurs after a well is plugged and abandoned.

There is no requirement that pre-disturbance ground cover or the dominant species match a specified percentage. Once these criteria have been satisfied in the judgment of the RFO, the affected acreage would be *rolled over* and the cap would increased by that amount.

The 2015 Approved Resource Management Plan Amendment for Greater Sage-Grouse (ARMPA, BLM 2015b) calls for separate reclamation guidance in Priority Habitat Management Areas (PHMAs). Reclamation in the 160,000-acre PHMA within the CD-C project area under Alternative C, the Proposed Action, and the other alternatives will be guided by the Reclamation Plan found in Appendix M of the ARMPA. It can be accessed at: https://eplanning.blm.gov/epl-front-office/projects/lup/9153/63202/68444/015_Wyoming_ARMPA_Appendix_M_Reclamation-Plan.pdf

Proposed Interim Rollover Objective for the Continental Divide-Creston Natural Gas Project Environmental Impact Statement and Record of Decision

February 25, 2011

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PROPOSED INTERIM ROLLOVER OBJECTIVE FOR THE CONTINENTAL DIVIDE-CRESTON NATURAL GAS PROJECT ENVIRONMENTAL IMPACT STATEMENT AND RECORD OF DECISION

There were numerous industry/state agency conversations concerning some type of phased or consolidated development for the Continental Divide-Creston (CD-C) Environmental Impact Statement (EIS). Unfortunately the complexity of the lease pattern and the number of leases made this effort extremely challenging. Conversations led to trying to create language for authorizations, waivers, modifications and exceptions to the Bureau of Land Management (BLM) Rawlins Resource Management Plan (RMP) to provide rollover criteria that would contain more flexibility for industry, while maintaining healthy, desirable vegetation within the field.

An ad hoc group came together to see if such an opportunity for additional rollover criteria might exist. The following outlines the framework for the discussion:

1. Provide a scientifically sound framework to minimize initial disturbance and return disturbed areas as quickly and effectively as possible to an ecologically stable or to pre-disturbance condition(s).
2. Identify important interim reclamation practices that are required to ensure initial and continuing interim rollover objectives (IRO).

The group is recommending that the rollover criteria as outlined below be considered as an alternative to the current RMP rollover criteria, provided that all the pre and post disturbance activities as outlined in Sections A through D are implemented.

Proposed IRO reclamation rollover criteria

The current Rawlins RMP Criteria for Reclamation Success are based in part on pre-disturbance surveys or surveys of adjacent undisturbed natural ground cover and species composition or eighty percent of pre-disturbance ground cover and ninety percent dominant species.

Notwithstanding the provisions of the RMP, it is our recommendation to provide an alternative to the above language and have revegetation cover be 70 percent of reference area cover to meet interim reclamation criteria. All of this 70 percent must be desirable perennial species as represented by the seed mix or background species. Items A, B, C, and D would also need to be completed as part of the interim reclamation criteria.

The group understands that the BLM will require a comprehensive reclamation and weed management plan within the CD-C project boundary as well as site-specific reclamation plans. It is understood that many of the items we are recommending may appear duplicative to the existing Wyoming BLM Reclamation Instructional Memorandum or other Field Office reclamation policy. As part of the more flexible rollover criteria outlined below, we recommend that many of these duplicative practices should be required as part of the rollover criteria and not be optional.

A. PRE-PLANNING AND INVENTORY

Pre-disturbance inventories are used for two main purposes. The first purpose is to use site-specific information (soil inventory and species identification) to develop a site-specific reclamation plan. The second purpose is to identify any issues, such as saline soils, steep topography, or invasive species that will impact successful interim and/or final reclamation. Below are the elements that should be required for a more flexible rollover criteria.

1. Identify significant landscape features and climate issues

a. Climate and physical characteristics of the site are important factors to consider in development of a reclamation plan, particularly in identifying possible problems. For example, a site on a south-facing slope may indicate that more drought tolerant plants should be selected than if the site is on a north-facing slope. Topography (slope and aspect), climate (including postulated microclimate), and parent materials (geological substrates) are additional considerations in site selection and reclamation plan development.

b. Steep topography: Steep slopes greater than 25 percent would often result in site instability and should be avoided.

c. Poor or erodible parent materials, or a rocky surface, or marine shales, clay/siltstone, or selenium-bearing geological substrates at the surface may result in difficult reclamation conditions. Identification of these areas might indicate the need for additional site planning.

2. Conduct a suitable soil inventory

a. Soil characteristics strongly influence reclamation efforts. Fundamental characterization of soils ahead of disturbance can identify potential problems, so they can be addressed during disturbance, soil stockpiling and reclamation.

b. The phrase "suitable soil" is used herein mainly because of confusion over the definition of topsoil. Soil depth, pH, electrical conductivity, texture, surface features (e.g. barren, rocky, crusty, plant litter), and organic matter content are characteristics that may be used to determine if a soil is suitable. Other information may be needed. See "Successful restoration of severely disturbed lands: Overview of critical components," B-1202, (and available for free at http://ces.uwyo.edu/PUBS/B1202.pdf).

c. Soil characteristics that may signal reclamation problems include: pH, electrical conductivity, soil texture, surface/subsurface features, sodium adsorption ratio, and soil compaction. These are detailed below and will be addressed by the Operator in the site-specific reclamation plan in the APD (application to drill) approved by the BLM:

i. Soils with pH 8.4 and higher.

ii. Depth: No suitable soil available or very shallow, less than 75 mm (3 inches).

iii. Soil solutions with an electrical conductivity greater than eight (8) dS/m.

iv. Sodium Adsorption Ratio (SAR) of 13 or higher when pH is greater than 8.4 and EC is greater than 4.0ds/m.

v. Soils having textures of clay, sand or loamy sand.

vi. Surface and subsurface soil in and through the root zone dominated by coarse material greater than 2 mm in diameter and greater than 40 percent in the soil profile.

3. Conduct a vegetation inventory

a. Gathering vegetation data before a site has been cleared for drilling documents pre-disturbance site conditions and in turn guides reclamation decisions.
Seed mixes should be based on desired vegetation that has historically grown on-site and return of cover should be gauged by comparison with actual pre-disturbance site conditions and/or reference areas.

b. The following vegetation characteristics can signal a high probability of reclamation problems:

   i. The presence of Halophytes: e.g. Saltbush

   ii. The presence of Alkali Halophytes: e.g. Greasewood, Halogeton

   iii. The presence of noxious or invasive species: e.g. Cheatgrass, Russian thistle, Russian knapweed, Alyssum, Canadian thistle.

c. The methodologies to be used to determine the information for the vegetation inventory are as follows:

   BLM guidelines for vegetation sampling: Sampling Vegetation Attributes, Interagency Technical Reference (1996) Revised in 1997 and 1999. BLM/RS/ST-96/002+1730. 171 pages. URL for Sampling Vegetation Attributes: http://www.blm.gov/nstc/library/pdf/samplveg.pdf. All BLM technical references: http://www.blm.gov/nstc/library/techref.htm.

4. Select a reference site

a. A reference site is a land unit which is representative, in terms of physiography, soils, vegetation and land use history, of an area to be disturbed. Reclaimed sites are compared to reference sites to determine successful interim and final reclamation.

b. In Wyoming, a site may be composed of multiple ecological communities (e.g. dunes, alkali flats, and sagebrush). Ecological variation at a given site can make it difficult to evaluate which adjacent area should serve as a reference. A reference site should be chosen based upon the pre-disturbance assessment and the identified dominant community on the site. This measure ensures that initial efforts to establish vegetation are consistent with species that naturally occur at that location. A reference site located adjacent to the site to be disturbed, with similar soils, vegetation, and aspect of the site to be disturbed should be chosen.

B. DEVELOP A SITE-SPECIFIC INVASIVE/NOXIOUS (INVASIVE) PLANT MANAGEMENT PLAN FOR CONSTRUCTION AND RECLAMATION ACTIVITIES:

Disturbed sites can provide ideal opportunities for invasive plant species to propagate. An integrated site-specific invasive plant management plan should be developed. The plan should include:

1. Assessment activities for invasive plant species before initiating surface disturbing activities (pre-disturbance), during disturbance (annual monitoring), during interim and final reclamation, and after reclamation is completed.
2. Describe treatments to control invasive plants.
3. Monitor invasive plant species at least annually to evaluate success of invasive plant control treatments and determine if continued invasive plant control is necessary.

C. DEVELOP A SITE-SPECIFIC RECLAMATION PLAN:

Reclamation planning provides a detailed strategy for returning a disturbed site back to a functioning pre-disturbance condition. The site-specific reclamation plan will be made part of the APD by the Operator and BLM and includes the following:

1. **Identify and address any vegetation, climate, landscape or soil issues found in the pre-disturbance inventory.**

2. **Site preparation, storm water, surface stability, and soil management for interim reclamation.**

   Site preparation activities ready a site for revegetation activities and in general include replacement of stockpiled suitable and unsuitable soils, reestablishing a stable subsurface environment, recontouring (reconstruction of landscape), incorporation of soil amendments and primary tillage/ripping to relieve soil compaction prior to spreading suitable soil and secondary tillage.

   a. Proper soil management prevents loss from erosion and preserves its ability to support a productive plant community, the soil biota and their habitat as well as its physical and chemical properties.

   b. The Storm Water Pollution Prevention Plan (SWPPP) as required by Department of Environmental Quality (DEQ) should be followed.

   c. Surface Stability: The following describes considerations for how the Operator could achieve surface stability:

      i. Redistribute soil materials in a manner to optimize revegetation potential.

      ii. Relieve compaction of the redistributed soil (suitable and unsuitable) to an appropriate depth just prior to seeding to accommodate desired plant species germination and sustained growth.

      iii. Preparation of the seedbed includes but not limited to:

         a. Seedbed preparation methods should establish surface conditions to enhance development of diverse, stable, and self-generating vegetation. The methods selected should optimize surface stability and surface roughness using techniques such as furrowing on the contour or surface pitting.

         b. Re-establish slope stability and surface stability.

         c. Reconstruct the landscape to the approximate original contour or a contour consistent with the land use plan.

         d. Maximize geomorphic stability and topographic diversity of the reclaimed topography.

         e. Eliminate high walls, cut slopes, and/or topographic depressions on site, unless otherwise approved.

         f. Reconstruct drainage basins and reclaim impoundments to maintain the drainage pattern, profile, and dimension to approximate the natural features found in nearby naturally functioning basins.

         g. Reconstruct and stabilize stream channels, drainages, and impoundments to exhibit similar hydrologic characteristics found in stable naturally functioning systems.

         h. Minimize wind, sheet and rill erosion on/or adjacent to the reclaimed area.

         i. There should be no evidence of mass wasting, head cutting, large rills or gullies, down cutting in drainages, or overall slope instability on/or adjacent to the reclaimed area. Site selection is the favorable method to avoid these issues.

j. Protect seed and seedling establishment (e.g. erosion control matting, mulching, hydro-seeding, surface roughening, fencing, etc.)

3. Describe soil amendments

a. Soil amendment(s) may be used in reclamation if the soil is lacking the necessary chemical, biological, physical and /or organic materials to support sustaining growth of suitable plant materials.

b. The Operator should state what applying soil amendments is intended to accomplish. Soil amendment plans should be provided, including what amendments will be applied, method of application, and timing relative to other reclamation activities (i.e. stockpiling, seeding, ripping).

c. Soil amendments should be selected based on the undisturbed and/or existing soil characteristics (see A. 2. c. iii) and scientific recommendations so as to provide the most cost efficient and best assurances for successful reclamation.

d. Soil amendments include but are not limited to the following: Certified weed free grass, hay, wood chips or other certified weed free cellulosic materials, gypsum, elemental sulfur, and fertilizers.

4. Describe seeding methods

a. Different plant species may require different conditions (e.g. seeding depth, seed scarification, mixing, and timing) for optimal germination success. Seeding methods should match germination characteristics of species in the seed mix and consider timing of planting to maximize germination and establishment of all reclamation species.

b. The Operator will describe when seeding will occur and specify the methods they will use for seeding, including differential handling for different species (e.g. broadcast, drilling, imprinting), and seeding depth in the site-specific reclamation plan of the APD. Reseeding may need to occur if invasive and/or noxious weeds prevent establishment of the species in the seed mix. See Attachment A for references.

5. Seed mixes

a. Providing multifunctional and sustainable seed mixes for interim and final reclamation is driven by a desire to increase potential for successful and timely revegetation and site stability. Plant diversity and habitat functionality are directly impacted by the seed choices applied to an area slated to be reclaimed or restored. To maintain as much stability and ecological function, this section makes recommendations to specifically aid an operator's selection process. Please see Attachment A for references.

i. Select appropriate native plant materials based on the pre-disturbance plant community composition, site characteristics, and/or ecological site description. Seeds may be obtained from commercial sources of certified weed free seed mixes. Alternatively, local collections may be used provided they are collected in an area without invasive species. Reclamation should succeed using native species if soils are properly managed, precipitation is near average for the region, seed mixes are carefully selected and seeded areas protected from grazing.

ii. Perennial naturalized species may be used when attempts to reclaim using native plants have not succeeded for a minimum of two full growing seasons.

iii. Based upon site-specific conditions, a decision may be made to use naturalized species sooner than identified above and will be used in only unique conditions defined in the site-specific reclamation plan in the APD.

6. Describe if and how irrigation techniques will be used in the reclamation plan.

a. Revegetation success is highly dependent on timing and amounts of precipitation. However, variable weather in Wyoming can limit or delay successful germination and establishment of plants. Irrigation can supplement natural precipitation to insure success of newly seeded sites during the initial growth period of the plant. Irrigation practices should be used carefully and conservatively. Irrigation can be cost prohibitive and should not be a requirement for reclamation but used as a tool to enhance vegetation establishment.

b. Both soil and water samples should be tested before application and water source should meet appropriate limits for SAR and EC. Special consideration of soil chemistry and amendments will be a determining factor for the use of the source water.

c. Water must be utilized from permitted sources (State Engineer's Office) and from sources permitted for irrigation. Produced water, (e.g. coal bed natural gas wells) must adhere to discharge permit requirements.

7. Describe best management practices

a. Best Management Practices (BMPs) are techniques that can be applied to surface disturbance and reclamation actions to aid in reclamation success. Identify the appropriate BMPs during planning and they can guide the surface disturbance and reclamation process. Additionally, documenting BMPs provides opportunities to evaluate success, so BMPs can be modified for future use in similar conditions. Please see Attachment A for recommended BLM and other Best Management Practices.

8. Description of monitoring and reporting protocols for interim reclamation objective.

The purpose of the Interim Reclamation Objective (IRO) is to reconstruct and revegetate the portion of the disturbed land unused for long term production and establish the vegetation cover sufficient to maintain a healthy, biologically active topsoil; control erosion; and minimize habitat, visual and forage loss during the life of the well and/or facilities.

The long-term Final Reclamation Objective (FRO) is to return the land to a condition that which existed prior to disturbance with allowances for an improved and/or stable ecological condition, if possible.

a. Site monitoring is conducted to observe and keep track of environmental conditions on the reclaimed site. Specifically, monitoring is done to document development of the reseeded plant community, identification of problem species, soil stability and assess ecosystem function. Continued characterization after disturbance and during interim reclamation is appropriate for monitoring site maturation and stability, particularly when problematic soil conditions or invasive weeds are identified.

b. Vegetation monitoring and disturbed site evaluation for any component of the reclamation plan applicable to the APD takes place at intervals agreed to by the BLM and the Operator. Generally the intervals for monitoring and reporting will be set annually unless otherwise agreed to as a condition to the reclamation plan. Achievement of the IRO by the Operator may reduce the time of mandatory monitoring and reporting. These changes to monitoring and reporting will be added to the reclamation plan by the BLM. Once the disturbed site achieves the approved IRO, the site will still be subject to all applicable requirements of the reclamation plan until the FRO is achieved by the Operator and approved by the BLM.

c. Monitoring should be designed and implemented by the Operator to document continuing successful reclamation rollover using methodologies approved by BLM.

   i. Once the IRO is achieved and reclamation rollover granted by BLM, the Operator will continue to monitor the condition of the reclamation, document that the revegetation continues to meet IRO.
   ii. During monitoring, the Operator will identify potential problems and recommend appropriate mitigation measures that can be implemented through BLM's adaptive management process.

d. The required elements of monitoring to assess IRO and FRO will be identified and addressed by the Operator in the site-specific reclamation plan. Please see Attachment A for additional information.

D. INDICATORS FOR SUCCESSFUL ACHIEVEMENT FOR THE IRO RESULTING IN RECLAMATION ROLLOVER

1. **Beginning Monitoring.** Monitoring should begin in the first growing season. Rollover evaluation is possible after a minimum of two full growing seasons.
2. **Irrigation and monitoring.** If irrigation is used initially, then the reclamation may be evaluated for interim reclamation success two (2) full growing seasons (or the third growing season) after irrigation ceases to assure that the vegetation can survive without supplemental water.
3. **Monitoring results must be from a standardized cover/species protocol approved by BLM.**
4. **Invasive Plants.** No invasive weeds will be allowed. Invasive species cover no greater than adjacent invasive species cover will be allowed. All other undesirable perennial or annual plants as defined in the site-specific APD should be controlled or eradicated on the disturbed area.
5. **Undesirable/annual plants.** For purposes of successful IRO achievement, the amount of invasive plant species should comply with the site-specific reclamation plan.
6. **Vegetation trend.** If the vegetation trend towards the IRO achievement is not positive within 3 full growing seasons without irrigation or 2 years after irrigation (third growing season) ceases, the BLM and Operator will determine the needs for the disturbed site.
7. **Erosion.** Erosion indicators should be equal to or less than the adjacent reference area.

E. RECLAMATION MONITORING REPORTING DATA RECOMMENDED TO BE OBTAINED AND FILED BY THE OPERATOR (ADAPTED FROM APPENDIX 36 OF THE RAWLINS RMP)

General

WYW# (Oil and Gas Lease or Right-of-Way (ROW))
Project Name:
Project Type (e.g. Well, Access Road, Pipeline, Facility, Wind)
Qtr/Qtr Sec, T, R, County, State (or Lat/Long)

Pre-Disturbance

Location of reference area
Date of reference area inventory/monitoring
Date of pre-disturbance inventory of disturbed site

Name of contractor conducting reference and pre-disturbance inventory/monitoring

Disturbance

Disturbance Dates
Start –End dates of monitoring
Reclamation Type (Interim/Final)
Name of contractor

Reclamation

Earthwork Contractor Name
Earthwork Completion Date
Soil Preparation method and Depth (prior to re-spreading suitable soil)
Soil Amendments Used (Describe)
Area (Acres or Square Feet)
Seeding Contractor Name
Seeding Date
Seedbed/Compaction Release Preparation Methods (Describe -Rip, Disc, Harrow, Parabolic) and Depths
Seeding Method (Drill, Broadcast, Imprint, Depths)
Copy of Seed Tag (Species percent, Purity percent, Germination percent)
Actual Seeding Rate (Pure live seed (PLS) Lbs/Acre of each species)
Area Seeded (Acres or Square Feet)

Noxious/Invasive Plants

Species Treated
Contractor Name
Contractor License #
Treatment Date
Treatment Type (Chemical, Mechanical)
Chemicals Used and Rates Applied
Area Treated (Acres or Square Feet) (GIS Extent and Location)

Monitoring

Inspector's Name and affiliation
Inspection Date
Time after Seeding (which Growing season)
Seedlings/Square Feet or Linear Foot Growing
Percent and Extent of Bare Soil (Describe)
Percent Ground Cover (Describe)
Percent Desirable Species (Describe)
Percent Noxious/Invasive Weeds (Describe)
Describe erosion indicators
Evidence of Livestock Grazing (Describe)
IRO objectives met (Yes/No)
Reference Photos
Close-Up Photos
On-site Photos
Reseeding yes/no, If yes all the above reporting requirements to be filled out.

Reporting

Completed Spreadsheet or Database as defined by BLM
GIS Layer with Attribute Table with Site Data as Detailed
Detail Disturbance Extent and Location
Permanent Photo Reference Point –Describe
Conclusions/Summary

- Weed Control Needed - yes/no and explanation
- Erosion control Needed - yes/no and explanation
- Grazing/Predation Issues - yes/no and explanation
- Other Cultural or Mechanical Needs - yes/no and explanation

Other

Mulching/Erosion Netting/Tackifier used – yes/no and describe
Fenced Location yes/no
Snow Fencing yes/no

ATTACHMENT A

This attachment is designed to provide a very general description of stockpiling suitable soil, irrigation of reclamation sites and monitoring vegetation and soils after reclamation. These are not hard and fast prescriptions but rather they are best management practices that might best be considered as an outline of issues to be considered during reclamation efforts.

A. Suggestions on Stockpiling Suitable and Unsuitable Soils to Maintain Soil Quality

Stockpiled suitable soil should not be piled too deeply or too shallowly. Areas of the site to be covered by stockpiles of unsuitable soils will be stripped of suitable soil prior to their use. The taller or deeper the piles, the more soil is subjected to increasing pressure resulting in compaction. Soil buried deep in the pile also has little exposure to oxygen resulting in anaerobiosis; deeply buried soil also has no organic matter input. Both of these reduce soil quality.

Shallow or small suitable soil stockpiles have large footprints on the land surface with the disadvantage of covering greater areas of undisturbed soil which will, in turn, require revegetation, resulting in a greater overall amount of disturbed soil. Smaller or shallow stockpiles also have a greater surface area per volume of soil stored. This increases exposure of the stockpiled soil to wind and water erosion. The surface of soil stockpiles should always be vegetated to minimize erosion losses.

1. Salvaged stockpiles of suitable soil should normally be no deeper than 4 meters (13 ft) and should be less where possible.
2. Stockpile slopes should not exceed 3:1 angles (20 percent slopes) to allow for seeding and to minimize erosion.
3. Suitable soil stockpiles should be located in areas well enough protected to prevent their disturbance and contamination by well pad activities. They should not be placed in streambeds or ephemeral drainages where they may be washed away. They should be protected from wind erosion. Suitable soil should be put on areas that were not skinned. Unsuitable soil should be put on areas that were ‘skinned’.
4. Consider a perimeter ditch/berm/fencing or other techniques around the stockpile for topsoil conservation and sediment control.
5. All suitable soil stockpiles should be seeded with appropriate vegetation (native locally sourced is preferred) to provide cover and protect them from water and wind erosion. Before seeding, the stockpile may be scarified along contours to minimize wind and water erosion.
6. If soil horizons or layers are to be stratified during soil salvage (stripping) operations, soil maps should be made of the well pad area to identify depths of soil horizons and surface slope. The pad area to be cleared of soils should then be divided into strips the size of the blades or equipment being used for soil removal. The depth of soil removal from each swath should be clearly marked so that equipment operators are removing a uniform layer from each strip. After the suitable soil is removed from the area in this manner, the subsoil can then be removed in the same fashion, strip by strip, each strip at a uniform depth.

B. Suggestions on Supplemental Irrigation

Supplemental irrigation should be scientifically calculated and applied in the initial four to six week period of growth of the seedling plants and then ended. Such determination could be the application of an amount of irrigation water equivalent to the average or average plus 25 percent of the precipitation expected during a given interval.

C. Suggestions on Vegetation and Soil Monitoring

Examples of monitoring components are listed below:

1. Reference: http://agriculture.wy.gov/images/stories/pdf/forms/natres/rangelandmonitoring.pdf
2. Operators should use the same locations and methods used at baseline for repeat photography. Additional locations may be selected to document progress of reclaimed area to demonstrate interim and final reclamation success, and to monitor any identified problems such as erosion. The site should be photographed once every year normally during the same time period, from the same locations and direction so that photographs are repeated through time. Photographs should be taken during the growing season.
3. Weed assessment: Disturbed and reclaimed areas should be evaluated for noxious and invasive plants at least annually. Weed control should be promptly implemented by the Operator once weed species and infestations are identified. Weed control applied at planned chemical rates at times the weed is emerging can have positive impacts in minimizing weed growth through-out the year as well as promoting the growth of grass species. The timing of the control should be determined by the growth habits of the weed species and when they are most effectively assessed. If weeds persist, reseeding the site could be considered as well as the species of grass, forb or shrub.
4. Erosion control/soil stability: The reclaimed area should be evaluated for any signs of erosion problems annually and when the site is subject to erosional events. Identified erosion features should be monitored using repeat photography. Absence of erosion features is a positive indication that the soil is stabilizing.
5. Cover and composition data should be used to document that the plant community continues to trend toward the requirements to achieve interim and final reclamation targets. The data should be used to evaluate if species composition and cover are increasing. These factors should be considered relative to the number of species in the seed mix, the selected reference area, and offsite responses to seasonal growing conditions.
6. Plant community cover and composition measurements: The Operator should start collecting cover and composition data beginning in the first (1st) growing season after disturbance. Data should be collected using repeatable methods approved by the appropriate regulatory authority (BLM) and should be the same methods that were used to describe vegetation for baseline (or reference areas. The same methods should be used each time the vegetation is monitored.
7. Soils should be monitored if reclamation problems suggest that soils might be the problem. Such problems include but are not limited to salt crusts, clay crusts, wind and/or water erosion and rapid changes in pH (up or down). Recommended soil monitoring would include sampling soils and analysis of soil characteristics as described in the main body of Part A, 2 ii. Suitable soil inventory.

D. Web Links

Government Documents

2006 Gold Book:
http://www.blm.gov/wo/st/en/prog/energy/oil_and_gas/best_management_practices/gold_book.html

BLM engineering drawings, roads & fences: http://www.blm.gov/nstc/eng/draw.html

BLM Integrated Vegetation Handbook, 1740-2 is at page:
http://www.blm.gov/wo/st/en/info/regulations/Instruction_Memos_and_Bulletins/blm_handbooks.html

BLM VRM: http://www.blm.gov/wo/st/en/prog/Recreation/recreation_national/RMS.html

BLM New Onshore Order #1, May 7-07:
http://www.blm.gov/wo/st/en/prog/energy/oil_and_gas/Onshore_Order_no1.html

BLM NSTC: http://www.blm.gov/nstc/

EPA: http://www.epa.gov/owow/nps/ and http://www.blm.gov/bmp/

USDA Monitoring Manual for Grasslands, Shrublands and Savanna Ecosystems (quantitative Protocols):
http://usda-ars.nmsu.edu/monit_assess/monmanual_main.php

Wyoming BLM requirements: http://www.blm.gov/wy/st/en/programs/energy/Oil_and_Gas.html

Wyoming Climate Atlas: http://www.wrds.uwyo.edu/sco/climate_office.html

WY DEQ: http://deq.state.wy.us/wqd/watershed/nps/npspg.htm

NRCS fotog: http://efotg.nrcs.usda.gov/treemenuFS.aspx

Journals

American Society of Mining and Reclamation: http://www.asmr.us/

Global Restoration Network: www.globalrestorationnetwork.org

Journal Range Management archives: http://jrm.library.arizona.edu/jrm/

National Roadside Vegetation Management Association: http://www.nrvma.org

Society for Ecological Restoration (SER): http://www.ser.org/

USFS Rocky Mountain Research Station publications: http://www.treesearch.fs.fed.us/pubs/rmrs/

Wyoming Native Plant Society: http://uwadmnweb.uwyo.edu/wyndd/wnps/plant_id.htm

MAPS/GIS

Topo & aerial photos: http://www.usgs.gov/pubprod/aerial.html

NRCS National Water and Climate Center: http://www.wcc.nrcs.usda.gov/wcc.html

Water Erosion Prediction project: http://octagon.nserl.purdue.edu/weppV1/

Wyoming Geographic Information Science Center: http://www.wygisc.uwyo.edu/

Mycorrhizae (Biological Soil Crusts)
http://mycorrhiza.ag.utk.edu/default.html
http://invam.caf.wvu.edu/index.html
http://www.ars.usda.gov/is/pr/2003/030205.htm
http://soilcrust.org

OIL/GAS

Completion and workover wastes: http://www.epa.gov/wastes/nonhaz/industrial/special/oil/wc.pdf

Dust suppression: http://www.oznet.ksu.edu/Stevenson/Dust percent20Manual percent20 percent20102704.pdf

Hydraulic Fracturing (Fracking or Frac Job):
http://test.earthworksaction.org/index.php/issues/detail/hydraulic_fracturing_101
http://www.epa.gov/hfstudy/HF_Study__Plan_110211_FINAL_508.pdf

National LTAP & TTAP Rural Roads: http://www.ltap.org/

Oil & Gas Production wastes: http://www.epa.gov/wastes/nonhaz/industrial/special/oil/

Power lines: http://www.aplic.org/

Produced water: http://www.iogcc.state.ok.us/Websites/iogcc/producedwater/popup.htm

The T^2/LTAP Center University of Wyoming: http://wwweng.uwyo.edu/wyt2/

Western Governors CBM BMPs: http://www.westgov.org/wga/initiatives/coalbed/CoalBedMethane.pdf

Wyoming Oil and Gas Commission requirements: http://wogcc.state.wy.us/

Restoration Handbooks

Bags Quiet Presence NRCS: http://www.wy.nrcs.usda.gov/Plant/tech_notices.html

Dryland pastures: http://msuextension.org/publications/AgandNaturalResources/EB0019.pdf

Handbook of Western Reclamation Techniques:
http://www.techtransfer.osmre.gov/NTTMainSite/Library/hbmanual/westrecl/front-matter.pdf

Restoring Western Ranges and Wild lands: http://www.fs.fed.us/rm/pubs/rmrs_gtr136_3.pdf

Solid Minerals reclamation handbook: http://www.blm.gov/nhp/efoia/wo/fy01/ib2001-081attach.pdf

Scientific Literature

An Introduction to using native plants in Restoration:
http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/plantsanimals/plants/techpub

Geology and Plant life:
http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/plantsanimals/plants/techpub

Managing Arid and semi-arid watersheds: http://www.wy.blm.gov/botany/wyspecies.htm

http://water.epa.gov/lawsregs/lawsguidance/cwa/wetlands/laws_index.cfm

Revegetation Abstracts:
http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/plantsanimals/plants/techpub

Sagebrush: http://sagemap.wr.usgs.gov/SagebrushAssessment.aspx

Salt tolerant plants: http://www.ussl.ars.usda.gov/pls/caliche/Halophyte.query

USDA Plant database: http://plants.usda.gov/

Wyoming Natural Diversity Database: http://uwadmnweb.uwyo.edu/wyndd/

Wyoming Plant Materials Technical notes:
http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/plantsanimals/plants/techpub

Wyoming Reclamation and Restoration Center: http://uwadmnweb.uwyo.edu/WRRC/

Educational Opportunities and Workshops

Wyoming Reclamation and Restoration Center: http://uwadmnweb.uwyo.edu/WRRC/

Seed sources

Guidebook to Great Basin seeds:
http://www.blm.gov/id/st/en/info/publications/technical_bulletins/TB05-4.html

Native Plant Propagation Protocols: http://nativeplants.for.uidaho.edu/network/

Native Seed Network: http://www.nativeseednetwork.org/index

Oregon state Seed Lab: quality testing of native seed: http://seedlab.oregonstate.edu/u

Seed testing protocols: http://www.aosaseed.com/publications.htm

Wyoming State Seed Lab: http://uwacadweb.uwyo.edu/seedlab/default.htm

Soil

Glossary of Soil Science Terms: http://soils.usda.gov/technical/

NCSS Web Soil Survey:
http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/plantsanimals/plants/techpub
http://www.nrcs.usda.gov/
http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm

NRCS Soil Quality Publications: http://soils.usda.gov/technical/

Soil series name search: http://soils.usda.gov/technical/classification/

Weeds

Halogeton: http://www.ars.usda.gov/Services/docs.htm?docid=9937

Weed Science Society of America: http://www.wssa.net

TNC Invasive species (weeds): http://tncinvasives.ucdavis.edu/

Wildlife

Important Wildlife Habitats: http://wgfd.wyo.gov/web2011/wildlife-1000426.aspx

Sage grouse range wide forum links: http://sagegrouse.ecr.gov/?link=110

Recommendations for Development of Oil and Gas Resources within Crucial and Important Habitats:
http://wgfd.wyo.gov/web2011/Departments/Wildlife/pdfs/HABITAT_OILGASRECOMMENDATIONS0000333.pdf

List of Participants

This document has been two years in the making and meetings included training sessions and visits to field sites in the general vicinity of the CD-C. The contributors of this document were members of an *ad hoc* committee that varied in size from meeting to meeting. This ad hoc group was created through the efforts of the Governor Freudenthal's Planning Office. Some of the participants were advisory only (AO) but others were involved in the writing, review and synthesis (WRS) of the final project. One member of the committee acted as the Chair.

Considerable review, both formal and informal, of this document was provided by the committee and an intensive external review was provided by an anonymous consultant.

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BLM Rollover Criteria for Alternative C
Continental Divide-Creston Environmental Impact Statement

INTRODUCTION

It is reasonable to anticipate that successful reclamation activities within the Continental Divide-Creston project area will be difficult. This can be observed by reviewing **Map 3.3-5** which shows an estimated 75 percent of the area with "poor" reclamation potential. Reclamation potential of soils in the CD-C project area is limited by saline/sodic soil conditions and either clayey or sandy soil textures (**Table 3.3-1**). In addition to these soil limitations, low annual precipitation of 6–10 inches in conjunction with erosion by wind and water will make successful reclamation difficult to attain quickly. Periodic droughts and extreme climatic conditions further complicate successful reclamation.

RECLAMATION PERFORMANCE MONITORING

Monitoring should include both qualitative data collection techniques and quantitative data collection. Qualitative evaluation of the interim reclamation can include the evaluation of soil movement (rills, sheet flow, petal-stilling, etc.), vegetative components (presence/absence of species, estimation of population and the population's condition), as well as visual contrast. The quantitative data collection should include both aerial and basal cover. The data should note the species during the evaluation. It is important to use the same methods for qualitative and quantitative data collection during each site evaluation to show a trend and display that the Interim Rollover Objective (IRO) has been met.

DISTINCTION BETWEEN INTERIM AND FINAL RECLAMATION

Two types of reclamation will occur within the CD-C area. Final reclamation occurs when all facilities are removed (e.g. when a natural gas well is plugged and abandoned), the site is re-contoured back to its original topography, and adequate native vegetation communities similar to those originally disturbed are established including, in part, weed control and stable soils. When completed and accepted, the company's bond is released and the site returns to BLM control. High desert sites, such as those found at CD-C, are slow to return to their original vegetative states, often requiring decades of time even with successful reclamation.

Interim reclamation occurs within the next growing season on any disturbance not needing to be continuously disturbed by ongoing operational activities. The existing pipelines, roadsides, and portions of well pads not needed for operations are examples of short-term disturbance which require interim reclamation. Areas with interim reclamation may be disturbed again by new construction or operational activities that may occur. Those areas will be reclaimed after any disturbance to maintain interim reclamation. Areas of a well pad might also remain undisturbed until final reclamation is achieved. Circumstances will vary site-by-site over the course of the project.

PURPOSE OF A DISTURBANCE CAP

A disturbance cap is a limit on the extent of surface disturbance that can occur within a given area. A disturbance cap that has potential to limit development activities within an area creates a direct incentive for developers to conduct successful reclamation on disturbed lands. Once the disturbance cap is reached further development is constrained until the disturbance acreage is reduced as a result of attaining the IRO.

ROLLOVER CONCEPT

Surface disturbance that has been reclaimed to the IRO standard will be classified as successful interim reclamation and this acreage can then be deducted from the number of acres counted as surface disturbance (or rolled over) for the area, and further disturbance could occur under the disturbance cap. The conditions under which interim reclamation can be considered acceptable for "rollover" are crucial for managing disturbance and the effects thereof on the natural resources BLM manages.

OBJECTIVES FOR INTERIM RECLAMATION

Work conducted in part by the State of Wyoming, local Conservation Districts, the University of Wyoming, participating leaseholders, oil and gas developers, and the BLM led to the development of several objectives for interim reclamation. It was agreed that the purpose of the IRO is to identify when reconstruction and re-vegetation activities on disturbed lands is adequate for rollover credit for the companies. Rollover credit could not be applied to the portion of the disturbed surface used for long-term production and continuous disturbance.

The IRO is to establish vegetation cover sufficient to maintain a healthy, biologically active topsoil; control erosion; and minimize habitat, visual, and forage loss during the life of the disturbed area. In addition, it was determined that the elimination of noxious weeds and the control of invasive non-native weeds must have occurred for successful attainment of IRO.

RECLAMATION ROLLOVER CRITERIA

The reclamation success standards listed below are the measures that would be used to evaluate whether the interim reclamation is successful:

- The area is revegetated with a stable, approved plant community.
- Vegetative cover is sufficient to maintain a healthy, biologically active topsoil.
- Erosion is controlled.
- Habitat, visual, and forage loss is minimized.
- No noxious weeds are present.

ACCOUNTING FOR DISTURBANCE TRACKING

Once a proposal for surface disturbance is approved and constructed the company will record the as-built disturbance using a GPS system compatible with the BLM's system. The extent of all disturbance from the approved proposal will be determined. The company will maintain a record of the extent of disturbance, generally by aliquot section, Township and Range, or by lease as applicable.

When further disturbance within an area is proposed the company will submit its existing disturbance records for the area in question to the BLM along with the rest of its plan of development. The BLM will review the existing extent of disturbance.

If the disturbance extent meets or exceeds the applicable disturbance cap, then the BLM will request from the Company why further disturbance should be approved. Based on the response from the company, the BLM will consider the proposal in the site-specific NEPA document, tiered to the CD-C Record of Decision (ROD).

If the new disturbance extent proposed does not meet or exceed the disturbance cap for the area in question, the BLM will evaluate the proposal with a site-specific NEPA document and determine what, if any, disturbance will be approved. Once construction activities are completed the company will supply

the BLM with the new as-built surface disturbance extent as provided above. The new disturbance information will be added to the existing data to determine the current disturbance figure.

Reclamation of the disturbed surface by the companies will be monitored by the companies at least annually as provided in the reclamation monitoring provisions of the Reclamation Plan. When the company feels disturbed sites have attained the IRO described above, the company may propose to the BLM to withdraw the acreage meeting the IRO from the surface disturbance acreage estimate. The BLM will reduce the disturbance figure when it is determined by the BLM that the IRO has been met, from data supplied by the company. The BLM may consult with cooperating agencies in its assessment of the data but the BLM is the final decision-maker on whether the IRO has been attained.

In the event areas meeting the IRO that have been removed from the disturbance are in turn re-disturbed, the acreage re-disturbed will be added back into the surface disturbance acreage estimate.

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APPENDIX N: TRANSPORTATION PLAN

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Introduction

This transportation plan has been developed to facilitate the planning of road, pipeline and electric transmission line construction in the CD-C project area, and to provide an assessment of all existing and future road and pipeline development and use in the project area. This plan is an expansion and extension of the existing transportation plan in place for the Continental Divide/Wamsutter II EIS.

The transportation planning area (TPA) for this project includes the CD-C project area plus adjacent areas that include roads that may be used to access the project area. This includes Interstate 80, county, BLM, and undeveloped roads/routes on and adjacent to the project area.

The objective of this transportation plan is to enable the BLM, in cooperation with other entities including Operators, permittees, and local agencies, to better facilitate planning and road/pipeline/transmission line design and construction.

This plan includes a brief description of the existing road network (**Map N-1**) and the identification of proposed high traffic volume roads and corridors. Relevant requirements for road construction or reconstruction and the development of road maintenance agreements, rights-of-ways (ROWs), and maintenance are also identified and outlined in this plan.

This plan also applies to the transportation of gas, condensate, or water via pipelines and electric power transmission within the CD-C project area. Pipelines and power lines within the CD-C will generally be located adjacent to roads or existing pipelines to reduce surface disturbance. In instances where locating pipelines adjacent to existing disturbance would lead to increased environmental impacts, pipelines may be located along alternate routes that would result in fewer impacts.

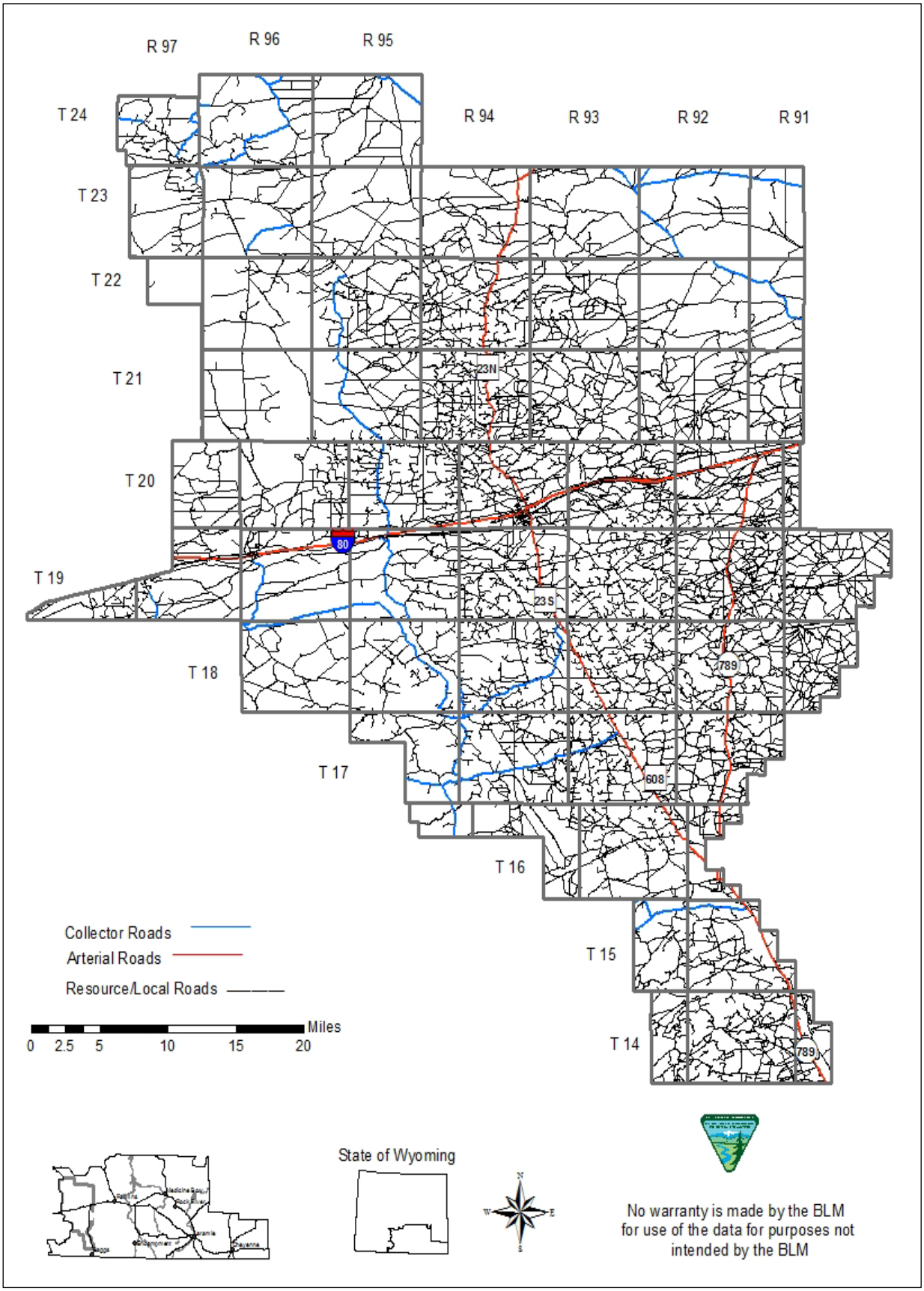
Some existing roads within the CD-C project area are under the jurisdiction of the governmental agencies (e.g. BLM, Sweetwater and Carbon counties) that approved their designs and require their maintenance. Roads under private easements between Operators and private landowners may or may not have maintenance requirements or agreements. In addition, there are many non-oil and gas routes that are not maintained. Oil and gas field roads may also be under the jurisdiction of government agencies; however, maintenance of these roads is generally the responsibility of the Operators.

Existing and Proposed Transportation Needs

Interstate 80 is the primary access to the entire CD-C project area. Other paved roads include State Highway 789 and sections of two county roads. The majority of the roads in the project area, including BLM roads, are not paved and are generally either gravel, aggregate or native material. These roads may become impassable when wet or during winter, and if these roads are used as access for the project they would require improvements and continued maintenance.

County roads provide public access across privately owned land; however, BLM roads or other roads that cross private lands may not have public access. Most of the roads that are not paved highways or county roads would require ROWs for access and would require improvement or reconstruction before project use. In addition, some realignment of these routes may occur to minimize impacts to sensitive resources, ensure safety, and maximize traffic flow efficiency.

The existing road and pipeline network with the major arterial roads is depicted on Map 1. The principle current use of these and other roads in the area is for oil and gas related traffic; however, other users include grazing permittees, recreationists, and the general public. Undesignated two track roads/routes may also be used to access the area; these routes are used primarily by permittees and recreationists.



Map N-1. Existing Road Network in the CD-C Project Area

Additional access roads will be constructed as necessary and specified in the annual operational updates; where these new routes duplicate existing two-track roads/routes, the upgrade of the existing two-track route should be considered prior to disturbance. When the use of existing two-track roads/routes is not feasible or would add to detrimental impacts, alternative routes should be considered and the existing two-track would be closed and reclaimed after consultation with the affected counties, private landowners and grazing permittees. At field abandonment, many roads are anticipated to be reclaimed unless there is an identified need for the road by the affected counties and other area users. Reclamation activities will be addressed with Transportation Planning Committee (TPC) members during annual planning.

Transportation Network Use

When planning transportation facilities, four transportation stages can be identified within the system and are listed below. Any stage may be eliminated if not necessary; however, each stage is handled by a separate facility designed specifically for its function.

1. Main movement – Interstate 80 and state highways for equipment, materials and workers with destinations terminating in the CD-C project area;
2. Transition – exits, turnout lanes, places where there is a change in travel speed;
3. Distribution/collection – county roads, oil and gas field unit, or ranch and recreation access roads;
4. Terminal access – well location access roads and resource roads.

Problems, such as congestion, at traffic stage changes are not anticipated due to the relatively low volume of expected traffic (need to update the table to show current AADT). The distribution by distance of traffic stage changes within the CD-C also eliminates the probability of congestion when vehicles turn from collector or local roads to well access roads. Although overall traffic volumes on CD-C roads would likely remain relatively low, heavy vehicles would use the roads throughout the life of the project, which will require road upgrades and continued maintenance. Proper road construction and maintenance will occur with the implementation of this plan.

Localized construction and drilling activity would temporarily place heavy demands on road servicing. Traffic demands would be high in areas where drilling and completion activities are occurring, but would be minimal in other areas of the CD-C. Once all wells have been completed, traffic requirements would be minimal for the remainder of the life of the project, but well and infrastructure access roads would still be in use until all wells in the area are abandoned and disturbed areas reclaimed. Maintenance of roads remaining in the area after field abandonment would be the responsibility of non-oil-and-gas entities.

Ultimate Road Disposition

When the field is ready for abandonment, the transportation network within the TPA would be reclaimed to specifications developed during approval of individual projects and the annual planning process. Roads may be identified for retention during the annual planning process; resource roads that are deemed necessary by the BLM for other area users may also be retained. County and BLM roads would likely be retained in an upgraded status; all other local/collector roads potentially developed as access roads for this project are likely to be entirely reclaimed or returned to conditions similar to those occurring in the area prior to oil and gas development activities. Road use following field abandonment would likely be limited to grazing management, recreation, and other general public. Responsibility for maintenance of roads would revert back to the counties, private landowners, or the BLM. A determination regarding the extent of post-project road maintenance (e.g. winter snow removal) on the TPA cannot be determined at this time, as the level of future area use is unknown. Decisions as to maintenance will be made during the later years of the project and will be based on TPC and public input received during annual update reviews.

Annual Planning and Operational Updates

To accommodate the uncertainty regarding proposed well locations and associated well productivity, future transportation routes within the TPA would be developed incrementally as wells are developed and associated information on Operator transportation requirements becomes available. Representatives of the BLM, Operators, counties, Wyoming Department of Transportation, landowners, grazing permittees, recreationists, and other interested groups or individuals will be involved in the annual planning process and will comprise a Transportation Planning Committee (TCP) that will be responsible for overall transportation planning and for identifying and considering issues and concerns. Subcommittees will be established for the resolution of site-specific issues.

Annual transportation planning generally would be done to determine the location, maintenance, and design criteria for roads developed in the area. This process would involve annual Operator projections for well and ancillary facility developments, public input, and updates on sensitive resources. With this information, the (TCP) would assist in designing a road network that accommodates Operator and other area users' needs, minimizes potential impacts to environmental resources, and maximizes traffic flow efficiencies commensurate with existing and potential needs.

The existing transportation network in the area is sufficient for existing uses; however, with the addition of 8,950 wells, changes to the existing network will be required. Geographic Information System (GIS) will be used to assist in the annual updating of the transportation network as appropriate. Maps would be updated to incorporate new sensitive resource locations, approved proposed roads, wells, pipelines, and ancillary facilities. In addition, existing roads designated for reclamation would be identified in consultation with the TCP. This process would result in minimizing the road densities in the area while accommodating all land user requirements.

Operators would submit, for committee review, annual operational updates. Information that may be included in these updates includes, but is not limited to, the following:

- Location of existing wells, roads, pipelines, power lines;
- Location of proposed development areas with as much detail as possible;
- Location of all roads and wellpads to be reclaimed within the next year;
- Anticipated traffic volumes for all existing and proposed developments;
- Identification of existing roads that require upgrades to accommodate existing and proposed traffic requirements;
- Identification of existing and required maintenance, ROW, and cooperative agreements for project required roads;
- Surfacing material source locations for road construction, upgrades, and maintenance;
- Location of sensitive resources and environmental obstacles; and
- Other identified transportation issues.

Final road location and design criteria for roads which either cross federal lands or are associated with federal wells would be included in the Application for Permit to Drill (APD) and/or ROW applications and would be subject to independent environmental reviews and National Environmental Policy Act (NEPA) analysis conducted by the BLM. Some modifications to proposed road locations specified in annual updates likely would occur as a result of these environmental analyses. Once a road has been constructed, its final location would be identified on maps provided in the annual operational updates. During the later years of the project, it is anticipated that annual updates primarily would identify well locations, ROWs, and other disturbances designated for abandonment and reclamation. Road upgrades for primary access routes would likely remain, and most resource roads developed for this project probably would be reclaimed unless they are determined necessary for other area users as identified during annual planning.

Table N-1. Annual Update Responsibilities and Dates

Action	Responsibility	Approximate Submittal / Completion Date
Provision of information regarding annual proposed well, road, and facility locations with traffic requirements; major pipeline and power line projects; road upgrades; landowner concerns; other issues	Operators, TPC, BLM, landowners, and other cooperators	Mid-October
Development of agenda; evaluation of proposed plans; preparation of updated maps; and review of updates and other issues	TPC, BLM, Operators	Late October / early November
Meeting to review development plans and associated issues	TPC, BLM, Operators, landowners, and other cooperators	Early November
Resolution of issues by TPC	TPC, BLM, Operators, landowners, and other cooperators	November / December
Final update completion/meeting to discuss resolution measures	TPC, BLM, Operators, landowners, and other cooperators	Early January

ATTACHMENT A: TRANSPORTATION PLAN TECHNICAL SUPPORT DOCUMENT

Introduction

This Transportation Planning Technical Support Document (TPTSD) has been prepared as part of a proposal by oil and gas operators (Operators) in the Continental Divide-Creston (CD-C) project area to develop public and private natural gas resources. This document is the implementation document for Appendix N, Transportation Planning. The TPTSD provides guidance for future transportation development in the CD-C area such that impacts to the existing transportation system and area resources associated with future oil and gas-related exploration and production transportation planning are avoided or minimized.

This TPTSD serves as a technical support document for the EIS and considers issues and concerns identified by the Transportation Planning Committee (TPC) identified in Appendix N. This document is intended to be a progressive/working document that is updated on an annual basis or as necessary during project development to detail specific localized transportation networks and resource maps, thereby providing current information for future development. The TPTSD also serves as a quality assurance/quality control program for the location, design, construction, maintenance, and abandonment of facilities required for the expansion of natural gas operations in the CD-C project area. The design and construction of roads, pipelines, and power lines (known as linear features) in the area would provide an adequate transportation system for the development and use of natural resources, as well as protection of the environment and user safety.

Geographic Information System (GIS) would be used to assist in the annual updating of the transportation network as appropriate. Maps would be updated annually to incorporate new information (e.g. sensitive resource locations and existing and proposed road, well, pipeline, and ancillary facility locations).

Objectives and Scope

The objective of this TPTSD include the identification of:

- Existing roads;
- Future roads and corridors;
- Existing natural gas pipelines/power lines and future pipeline development; and
- Transportation obstacles (e.g. Interstate-80, steep terrain, drainages) and environmentally sensitive areas.

In addition, road maintenance agreements (RMAs), road specifications, and erosion control methods are discussed.

This plan also applies to the transportation of gas, condensate, and water via pipelines and electric power transmission (power lines) within the CD-C project area. Pipelines and power lines would generally be located adjacent to roads to reduce the total amount of new surface disturbance. However, this practice may complicate road route selection and, in some instances, lead to increased environmental impacts. If increased environmental impacts are anticipated, pipelines and power lines may be located along alternate routes, and these routes would be evaluated and sited to minimize environmental impacts.

Roads that provide access to the CD-C project area are under the jurisdiction of private landowners and governmental agencies who approve their designs and require their maintenance.

Development outside of the CD-C project area is not discussed in this document.

Transportation Planning Area

The Transportation Planning Area (TPA) for this TPTSD includes the CD-C project area and adjacent roads which may be used to access the project area. This includes I-80, U.S. Highway 287, State Highway 789, and county, private, BLM, and undeveloped roads/routes on and directly adjacent to the project area (see **Map N-1**).

The primary arterial roads that serve the CD-C project area include I-80, SH 789, and county roads. There are numerous existing BLM roads and many undesignated routes (i.e. undeveloped two-tracks) in the area. Existing roads are those that have been previously constructed or maintained as a single-lane road or wider, and which supports truck traffic. Seismic trails and existing two-track trails are not considered existing roads.

Future resource roads (i.e., low-volume traffic roads) are not specifically identified in this document due to the lack of site-specific details for the proposed project. Resource roads and future local roads would be identified through the localized area transportation planning process based on the Operators' annual projects and would be specified in future updates to this document. Many of the existing casual routes within the CD-C project area may be upgraded and used for natural gas development activities.

Because the CD-C project is an infill natural gas development, the construction of large arterial roads is not anticipated. Rather, the development of shorter access roads to individual wellpads from existing arterial and resource roads will constitute the majority of new road construction.

Natural obstacles (e.g. topographic challenges, poor soils, sensitive resource, dry lake beds, low-lying areas, drainage channels, and rock outcrops) throughout the TPA pose problems for the construction and maintenance of linear features. Additional areas of concern would likely be identified during annual operation updates and associated planning and during APD and ROW application review processes. Linear features will avoid identified obstacles, when practicable, in order to minimize resource conflicts.

Most soils within the TPA have limitations for road construction, pipeline construction, and reclamation. See **Section 3.3** of the Final EIS for more information on soils within the project area.

Road Classifications

Road classification is the process of grouping roads having like characteristics into distinct categories and can define the administrative and jurisdictional characteristics of each road classification. This classification will help identify road types and jurisdictional responsibilities by defining public roads administered by the state and county agencies and management roads as administered by private and public land managers.

The following functional classifications are based on the BLM Manual Section 9113, Roads (BLM 1985).

<u>Arterial (public roads):</u> Arterial roads serve large areas and are considered public roads. Arterial roads within the CD-C project area include Wyoming state highways and Sweetwater and Carbon County roads. These roads are heavily traveled routes connecting developed areas of the CD-C project area to I-80, railroad crossings, industrial developments, services, and residential areas. State roads can be considered all-weather roads, and use of these roads is controlled by the Wyoming Department of Transportation (WYDOT). County roads may or may not be considered all-weather roads and are controlled by either Carbon County Road and Bridge or Sweetwater County Road and Bridge.

<u>Collector (management roads):</u> Collector roads serve smaller areas than arterial roads and may be divided into major and minor categories. Collector roads channel moderate to heavy traffic to and from the arterial system.

- Major collector: A developed road with recorded easements that provides public and industry access to the CD-C project. Generally, major collector roads would be BLM roads that are a permanent

part of the BLM road system, and may be controlled by the BLM. A county road would be classified as a major collector if it supports only occasional use.

- Minor collector: A developed road with an authorized ROW issued by private landowners, the BLM, or other land managers. These roads may include public-use rights, but use of these roads is at the discretion of the landowners and agencies. Portions of minor collector roads may have specific enforceable access restrictions.

Collector road maintenance objectives include the maintenance and improvement of drainage, road surfacing, and road grading to a smooth, compact surface.

Local (management roads): Local roads normally serve smaller areas than collector roads, channeling light to moderate traffic to a collector or arterial system. Local roads may support very heavy off-highway loads. Authorization for the use of locals roads is at the discretion of the landowner or agencies. Local roads within the CD-C project area would serve specific groups of wells, services, or support facilities, and these roads may become a permanent part of the larger road system. Maintenance objectives would include maintaining drainage, surfacing selected segments, or road-surface grading.

Resource (management roads): Resource roads serve a specific destination and connect to local, collector, or arterial road systems, and may dead-end at single well/service facilities or serve small numbers of wells or facilities. Depending on the level of activity, a resource road could serve light traffic and very heavy roads. Authorization and use of resource roads are at the discretion of the landowner or agencies. The maintenance objective for resource roads would be minimizing resource damage. A resource road would be abandoned and reclaimed once the road is no longer needed. Occasionally, a resource road could be stabilized and reverted back to a two-track.

General Implementation of the TPTSD

New linear features, realignments of existing routes, and maintenance of existing routes would be specified in annual operational updates. All routes would be selected to ensure safety, maximize transportation efficiency, to avoid sensitive resources, and to minimize road densities.

Before routes are selected and plans are prepared, the Operators would review available resources and land use data specific to the project area from the BLM, private landowners, other agencies, this document, and other sources. The BLM will determine the need for a registered engineer to be involved in locating and designing the road.

Initial consideration would be given to sensitive resources within the area which may affect the location and construction of proposed linear features. These may include (but are not limited to) wildlife, livestock, recreation, archaeology, paleontology, hydrology, and soils. Specific examples of sites, conditions, and resource concerns which may require consideration when locating linear features are raptor nesting areas, sage grouse leks, highly erodible soils, crucial winter range, and drainages.

Depending on the number of linear features or the complexity of a single linear feature, landowners, BLM engineers, or other consultants in conjunction with the Operators would determine the most feasible access route based on these data, drainage considerations, terrain, and standards for the type of route planned. The Operators would then submit to the BLM an APD, a Notice of Staking, or application for a ROW, with plans for the proposed route attached. There may be specific requirements for the design and construction of the route stipulated by the BLM or private landowner.

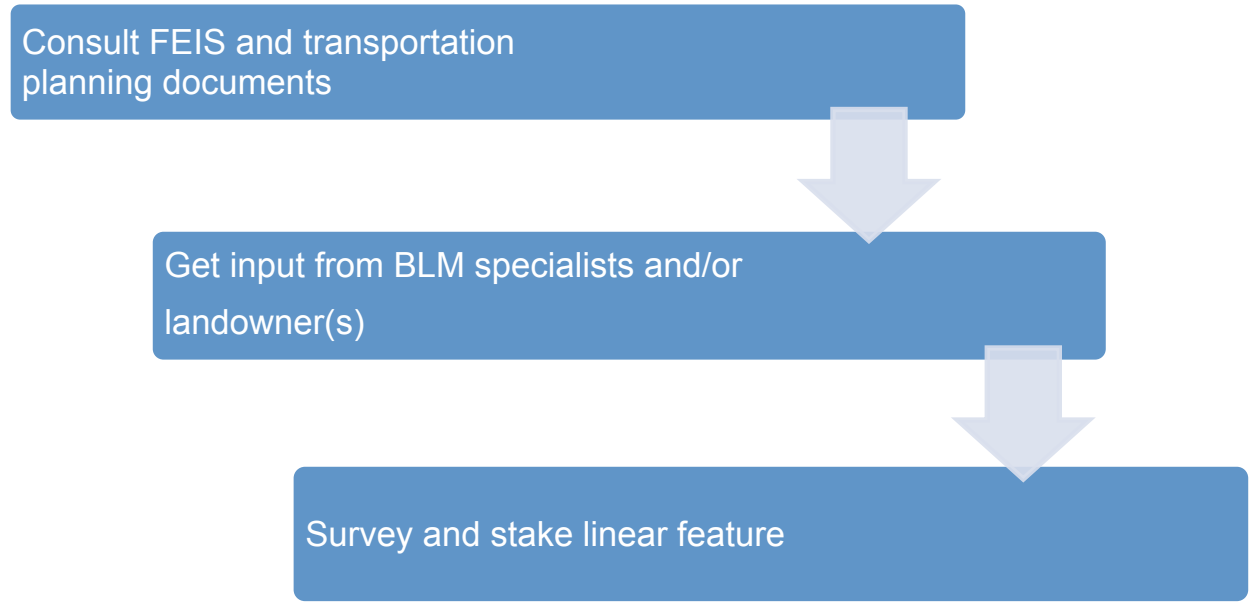
New Linear Features and Upgrades to Existing Linear Features

The following outlines the general process that would be used to develop a new route and/or improve existing routes. A specific order for implementing the process is presented below; however, alternate implementation procedures maybe used in some areas, and some additional items may be added to the

process. The information in the following steps is for well locations, roads, pipelines, and/or power lines. Flow charts have been developed to help guide transportation planners in the area.

1. Tentative annual development plans for the CD-C project area would be prepared and associated annual operational updates would be conducted; maps would be prepared as needed.
2. Roads, well locations, pipelines, power lines, and/or facility locations would be selected based on sensitive resources, environmental impacts, company plans, economics, geology, lease boundaries, and other data as necessary (Figure 1).
3. The EIS, Transportation Planning Appendix, the TPTSD, annual operational updates, BLM manuals 9112 and 9113, and current BLM policy would be reviewed by the Operators to determine design parameters and other requirements. Maps would be reviewed to determine which local and collector roads and other linear feature corridors would be used to access the well location or facility site.
4. The proposed road type would be selected; most would be local or resource roads. The type of road would determine the road design standards, and in some cases may influence the selection of the position of the road. As a general rule, resource roads would serve 3-15 wells, local roads would serve less than 50 wells, and collector roads would serve more than 50 wells. Many input parameters, including the pace of development, are used to determine the designation type of a road.
5. The impact of proposed well traffic on existing roads and the road network would be determined. With the addition of a new road, existing roads which serve the area may change in status (i.e. from a resource road to a local road) or become unnecessary. Only a portion of an existing road may change status. This is where the decisions of past road types influence the cost of constructing roads which serve newly proposed uses and traffic volumes. Better initial planning decreases the amount of road upgrading required.
6. An estimate of the length of the new or upgraded route would be made, and landownership would be determined. The proposed corridor would be identified on the map.
7. An on-site meeting would be held with the BLM Interdisciplinary Team (IDT), Operators, and private landowners, and negotiations would be initiated. Input would be obtained about the alignment, surfacing requirements, and the extent of design information required. Figure 2 provides guidelines for selecting surface material.
8. The identified corridor would be refined in an alignment. The necessary data for the design would be collected in the field and from appropriate maps.
9. The condition of existing local and/or collector access roads would be evaluated.
10. The APD and ROW application would be prepared and filed and would include a detailed ROW Plan of Development (POD) to expedite the BLM review process. Items to be included in or attached to the POD would include the road plan, pipeline location, etc.
11. State or county road access permits are required for new road approaches. Access information would be prepared and submitted to the appropriate agency; agency contacts are provided in an addendum to this document.

Guidelines for Selecting Linear Feature and Facility Locations



Linear feature location should minimize:

- earth work
- sharp curves
- steep grades
- steep side slopes
- disturbance to poor soils
- hazardous alignments

Avoid:

- downwind side slopes
- duplicate routes
- under- or over-designed roads
- paralleling drainages
- archaeological sites
- wetlands/riparian areas
- springs/water developments
- crucial wildlife areas, ranges and migration routes
- low, flat areas with poor drainage
- sand dunes
- poor soils
- sensitive resource areas as identified in EISs or by the BLM, landowners, or other relevant public

Figure N-1. Guidelines for selecting linear feature and facility locations.

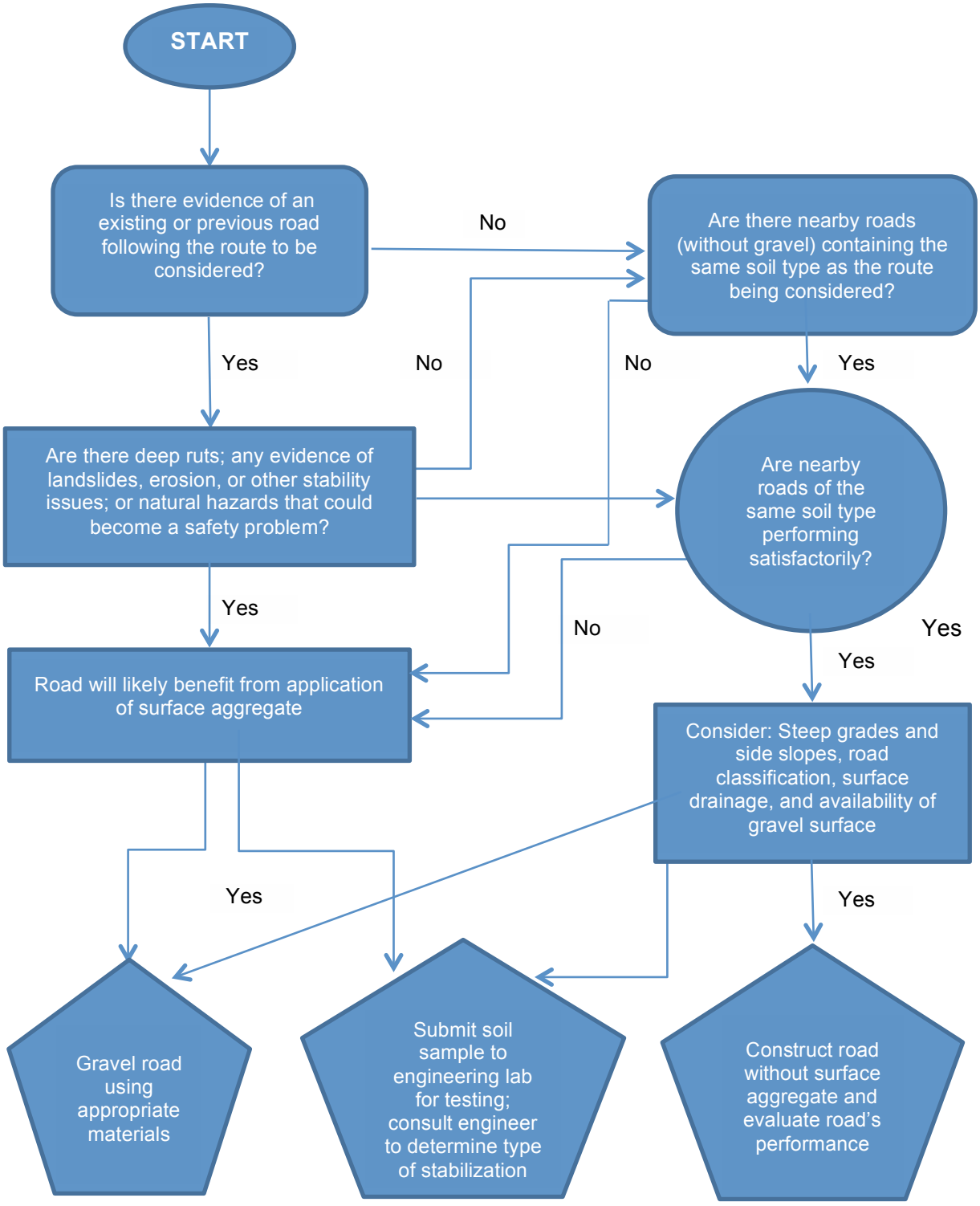


Figure N-2. Road surfacing decision flowchart.

Specifications and Plans

Roads

All roads to be built, improved, or rebuilt within the TPA on BLM lands would be constructed according to the required standards for designed roads (described below). Newly designed roads on federal lands or those requiring a federal undertaking would comply with the requirements of the BLM. The BLM requirements are detailed in BLM Manual Section 9113 Roads (BLM 1985) and the associated Wyoming state supplement (BLM 1991), as well as other BLM requirements. Roads on state or private land within the TPA would be built according to standards specified by the respective landowner, and may to the same standard as BLM roads.

Arterial roads: Arterial roads would be double-lane roads with shoulders and would be designed and constructed according to applicable federal, state, and/or county standards.

Collector roads: Collector roads would be double-lane roads and would be 24 feet wide after surfacing, with 4:1 ditches a minimum of 1 foot deep. These roads would have a gravel surface designed to support highway loads and provide a smooth compact road surface (without wash-boarding). Collector roads would be designed for a minimum travel speed of 35 mph.

Local roads: Local roads would be either double lane (20-24 feet wide after surfacing) or single lane (14-16 feet wide after surfacing) with turnouts and have 4:1 ditches a minimum of 1 foot deep. Gravel surfaces would be designed to support heavy loads in excess of standard highway loads. Depending on the length of the road, smoothness of the surface may be less important than the ability of the surface to transport heavy loads. Locals roads would be designed for speeds of 20-30 mph.

Resource roads: Resource roads would be single-lane roads with turnouts (14-16 feet wide after surfacing) with 4:1 ditches a minimum of 1 foot deep. Gravel, if needed, would be of sufficient quality to support heavy loads for short durations. The surface of a resource road is not required to be smooth. Resource roads would be designed for speeds of 15-30 mph.

All roads: All roads would be designed to provide for drainage and controlled runoff through construction of adequate culverts and drainage features; maintenance would be performed as necessary and as directed by the BLM.

Because each road is unique, it is not the purpose of this document to provide all of the technical data that may be necessary for every road. Each road construction project would be evaluated with its own requirements and appropriate technical information obtained during the annual transportation planning processes and subsequently processed APDs and ROW applications.

BLM Manual Section 9113 (BLM 1985) and its Wyoming state supplement (BLM 1991) contain the comprehensive technical requirements necessary for the design of roads on BLM-administered land. Where roads cross private lands, negotiations with private landowners would be necessary.

Surveying and staking necessary for road construction or improvement would be performed by or under the direction of Wyoming registered professional surveyors and/or engineers. Pursuant to state law, drawings with incorporated designs would require certification by a professional engineer. The complexity of the project would govern the amount of work, design, and inspection necessary.

Bridge, culvert, and low-water crossing designs would conform to the BLM Manual Section 9112 (BLM 1990a), U.S. Army Corps of Engineers (COE) regulations, Wyoming state law, and standard engineering practices. The COE would be consulted to obtain permits for crossing drainages. Culverts are to be aligned with the natural drainage and would comply with BLM Manual Sections 9112 and 9113, and the Wyoming State supplement. Low-water crossings may be used with BLM approval, when necessary, as a type of drainage crossing where a 10-year runoff design produces more runoff than can be reasonably handled with a drainage structure or when the cost of a structure is unreasonable. Bridges and major

culverts on BLM-administered land would conform to BLM standards including design by or under the direction of a qualified registered professional engineer. All drainage structures would be designed for a minimum of a HS-20 loading; bridges to be installed on county roads would require approval from the affected county Road and Bridge Department and WYDOT.

The unique qualities of the particular road and its location govern how the structure is designed and built. In general, road surfacing varies in thickness according to various design factors and availability of aggregate.

Right-of-Way, Maintenance, and Cooperative Agreements

ROW Grants and Agreements

Right-of-way grants and agreements would be required for linear features constructed across any land not controlled by the Operator. Procedures for obtaining and use of a ROW would follow BLM Manual 2801 Rights-of-Way Management (BLM 1996), BLM Handbook H-2801-1 Right-of-Way Plans for Development and Grants (BLM 1990b), and 43 Code of Federal Regulations (CFR) 2800.

When an Operator stakes a well and initiates a ROW application, the BLM would review the ROW application and would determine the terms and conditions that approval of the grant would be contingent upon. Acquisition of a ROW across private land can be obtained in several ways, including by payment of a one-time or annual fee, which is typically the most common. Deeds may be issued for some pipelines; this type of agreement allows the Operator that obtained access to pass over the land but requires other Operators to also obtain passage agreements. In some cases, ROWs are obtained from the private landowner by a company for themselves.

Maintenance Agreements

Maintenance agreements are usually binding contracts between Operators. The BLM generally does not enter into maintenance agreements with Operators. The preferred approach is for Operators to work together and adjudicate maintenance agreement amongst themselves. Operators would provide the BLM and counties with copies of all road maintenance agreements, including the name of the designated contact person.

Problems may occur when new Operators utilize the area; maintenance agreements must be revised to include new users. Operators drilling wells on private land may obtain a private landowner passage agreement but may not acquire ROWs from the BLM and may not participate with or even know about existing maintenance agreements. If an Operator is the first to drill in an area, that Operator may be the sole road maintainer until other Operators being to access the area. Agreements are challenging for roads within the checkerboard landownership areas due to different well permit requirements. Agreements would be reviewed and budgets for maintenance prepared annually in association with the annual transportation planning process. Maintenance agreements would be held as necessary with all participants to review all road maintenance agreements. When Operators or other area users proposed new activities that utilize part or all of an existing road, the maintenance agreement for the existing road would be restructured to include the new users.

Maintenance agreements would contain grading and other maintenance schedules, participant responsibilities, and cost allocations. Agreements would described response methods and primary and secondary emergency contacts for hazard maintenance.

Operator responsibilities for road maintenance can be divided into at least three types of agreements. The principle maintenance agreement type weights the maintenance cost share of each Operators according to the amount of projected use of the road. The projected use can be based on past use, number of producing wells and facilities down-road, and wet weather access needs. The maintenance contract would have each Operator's tallied amounts and commitments for the upcoming year. This agreement type would be the

most commonly used in the CD-C project area. Other types of agreements involve Operators conducting road maintenance on alternate time intervals or dividing a road into segments of near equal maintenance amounts and assigning each Operator maintenance responsibility for their segment of the road.

Snow removal is often considered a separate item. Some Operators may not need access to sites during winter months and may not participate in costs associated with snow removal. In some cases, roads may only need maintenance once or twice per year or at some other time interval.

Memorandum of Understanding

A non-binding Memorandum of Understanding (MOU) is primarily compiled to address concerns. It is anticipated that concerns identified during project development would be addressed and resolved, where possible, in consultation with the TPC as described later in this plan and the annual updates. MOUs do not form legally binding contracts among parties, but rather establish goals and present issues and concerns. An MOU amongst TPC participants will be developed to define the objectives and goals of the TPC. Other legal documents may result from parties negotiating a binding cooperative agreement. The localized yearly transportation development plans of Operators and linear feature classifications for development areas within the CD-C project area would be updated as specified by the BLM in annual operational updates. In addition, road densities would be identified, as would traffic management issues associated with other sensitive resources present in road development and use areas.

Meetings would be held as necessary, and would provide a forum for discussions among managers, land users, and administrators with diverse interests. Participants would voice concerns and propose solutions to conflicting activities. Mutually beneficial activities would be jointly planned for a desirable result. Proposed development activities would be discussed. Organizations represented at meetings likely would include Operators, private landowners, grazing permittees, lease holders, BLM, state government, and local governments.

Discussion topics for the meetings would include, but would not be limited to, the examples listed below.

1. Wildlife issues such as migration seasons and impacts from noise and other exploration/construction activities; as well as domestic animal grazing rotation schedules, would be discusses and coordinated to minimize disturbance;
2. Controlling, monitoring, and compensating for access would be discussed so that impacts from public access to private land are minimized;
3. Road development and/or upgrade plans would be discussed to ensure that the road networks serving portions of the CD-C project area are adequate. During these meetings, decisions would be made regarding the timing of construction and/or upgrading to accommodate anticipated traffic volumes.
4. Maintenance of access roads would be discussed. Agencies or companies that perform maintenance would express concerns and plan maintenance schedules. Solicitation of maintenance from other agencies for other roads may be discussed. Maintenance problem areas or areas that may be impassable during wet or snowy seasons would be discussed, and the amount and type of use would be determined.
5. Federal, state, and local agencies would review successes, problems, development plans, maintenance responsibilities, and ROW issues.
6. Roads no longer required for the project and roads identified by BLM specialists or others for closure would be identified, and road reclamation plans would be presented.

Road Maintenance

Roads in the project area would be maintained to the original design or better. State or county maintenance specifications would be applied on arterial roads, and alternative private landowner stipulations may be used on private lands. Maintenance on collector roads is anticipated to occur at least twice per year, whereas local and resource road maintenance may be required only once annually. All roads required for the proposed project would be maintained as necessary (e.g. grading, surface material application, snow plowing) and to control fugitive dust (e.g. application of water or dust suppressants). Operators would be responsible for these maintenance actions on their ROWs. Maintenance agreements developed among Operators would be provided to the BLM and counties. Where roads become impassable, the landowner or agency may deny access until the roads are repaired and/or the potential for resource damage is otherwise alleviated.

Roads in need of upgrading or maintenance would be identified and prioritized during annual TPC meetings.

Regular road maintenance would be necessary to mitigate environmental impacts and to provide a safe travel-way. Maintenance would be needed more frequently during drilling operations and/or inclement weather. The following items would be completed during maintenance:

1. Road crown and surface would be maintained to facilitate drainage, minimize erosion, and provide a safe travel-way. Some road surface problems that must be controlled are listed below:
    a. During wet weather, maintenance would be necessary to repair rutting.
    b. Large or sharp rocks, washboards, and loose gravel on road surface would be removed or otherwise repaired.
    c. Slick and soft road segments would require the addition of surface aggregate. Steep grades, areas of steep side-slopes or deep drainage crossings, and sharp curves would be top priority for reconstruction and surfacing.
2. Culverts would be repaired or replaced where damaged and cleaned to prevent backup caused by debris and sedimentation. Clearing allows culverts to perform to their design capacity. Washouts may occur during high precipitation or seasonal runoff. Washouts would be repaired as soon as weather permits. Roads with washouts that do not have adequate detours to allow passage of vehicles would be closed until repairs are made. Detours or closures would be properly signed.
3. Low-water crossings would have regular maintenance for the following items:
    a. The road surface in the channel crossing would be graded smooth and additional rock would be imported.
    b. Debris and sediment would be removed from the surface of the road and debris dams would be removed from immediately upstream and downstream of the crossing.
    c. Barrow ditches would be maintained clear and free-draining. In some cases, rip-rap maybe necessary to slow the erosion of ditches. If the stream is subject to regular floods, a depth gauge may be placed in the channel for motorists to judge the crossing safety. During winter months, it may be necessary to remove portions of ice accumulation within the channel crossing. In some cases, ice can be pushed upstream or downstream. Operator personnel would monitor the success of ice removal efforts and develop a working plan for future winter months. Reference to and consultation of COE permits, where necessary, would precede any in-channel maintenance work.

With appropriate road design (i.e. optimal route selection with elevated road beds that allow snow to blow from the road surface), minimal snow remove would be necessary; however, snow removal and winter maintenance may be necessary to access some producing wells and other ancillary facilities. For sites that

do not need regular maintenance, snowmobile or snow cats may be a winter access option. In these cases, travel would be restricted to approved routes and would not be allowed off-road in the CD-C project area.

Annual Planning and Operational Updates

Annual operational updates to the TPTSD would begin in 2014, and annual updates would be available each year in January until the project is completed or until the transportation system is so well-established that further annual planning is not needed.

To facilitate the planning process, a TPC is being established. The TPC will be composed of representatives from the BLM, Operators, Carbon and Sweetwater County Transportation Departments, Wyoming Department of Transportation, Wyoming Game and Fish Department, landowners, and grazing permittees. The committee will be responsible for overall transportation planning and for identifying and considering issues and concerns, whereas subcommittees would likely be established for the resolution of site-specific issues (e.g. operational/compliance issues, individual road maintenance, or construction problems). An MOU between participants of the TPC would be developed to define the objectives and goals of the group.

Annual transportation planning generally would be conducted to determine the location, required maintenance, and design criteria (e.g. road type) for linear features developed in the area. This process would involve annual Operator projections for well and ancillary facility developments, public input, and updates on sensitive resources. With this information , the TPC would assist in designing a linear feature network that accommodate Operator and other area user needs, minimizes potential impacts to sensitive environmental resources, and maximizes traffic flow efficiencies commensurate with existing and potential needs.

The existing transportation network in the area is generally suitable for existing uses; however, as areas with natural gas resource potential are further identified and developed, changes to the existing network would be required. Due to the infill nature of the proposed project, the development of larger arterial roads would likely not be necessary. The construction of smaller resource roads would dominate the new access construction in the area. Operators would be required to provide to the TPC annual projections specifying proposed well and facility site locations and associated traffic requirements (e.g. estimated number of round trips; duration of construction, drilling, and completion activities; vehicle size). This information would be provided to the TPC by approximately mid-October of each year for the life of the project (LOP) or until no longer required by the TPC. The TPC would evaluate this information, as well as known environmental constraints, other known uses of the area, and additional issues and concerns to develop tentative linear feature locations, types, and maintenance information. A draft update with maps would be developed by the TPC and submitted to area Operators and other relevant land users by approximately early November of each year. Meetings would then be held with the TPC to discuss modifications to the proposed update to accommodate Operator and other user concerns. Broad issues potentially affecting most area users would be discussed with the entire TPC, whereas site-specific operation, maintenance, or other specific road issues would be delegated for resolution to subcommittees. All issues associated with the annual operational updates would be resolved during November and December of each year. A final update that considers all comments would be prepared and available for review in January of each year.

Information that may be included in annual operational updates includes:

1. Location of all existing wells, roads, pipelines, power lines, and other natural gas related facilities in the area;
2. Location of all proposed wells, roads, pipelines, power lines, and other project-related features to be developed within the next year;
3. Location of all roads to be reclaimed within the next year;

4. Anticipated traffic requirements for all existing and proposed developments;
5. Identification of existing roads that require upgrades to accommodate existing and proposed traffic requirements (careful planning would be required to ensure roads would be neither under- nor over-designed);
6. Identification of existing and required maintenance and associated maintenance, ROW, and cooperative agreements (including scheduling, responsible parties, and activities) for project-required roads;
7. Surfacing material source locations for road upgrades and maintenance;
8. Location of sensitive resources (e.g. drainages, raptor nests, sage grouse leks, etc.) and environmental obstacles (e.g. steep slopes, erosive soils). The precise location of some sensitive resources may not be presented in updates to prevent impacts (e.g. culture and paleontological sits, raptor nests); however, the location of those resources should be considered during the planning process;
9. Other identified transportation issues.

During the later years of the project (years 30-50) it is anticipated that annual updates primarily would identify well locations, ROWs, and other routes designated for abandonment and reclamation. Roads that remain after the LOP would become the responsibility of the BLM and/or private landowner. In addition, road upgrades of primary access routes would probably remain, and most resource roads developed for this project probably would be reclaimed unless they are determined necessary for other area uses as identified during annual planning.

ROAD CLOSURE IDENTIFICATION

- Any party can propose the closure of a route or route segment
- Minimum requirements:
  - Name of party proposing closure;
  - Map depicting route/route segment;
  - Existing type and condition of route/route segment;
  - Reasons for proposing closure, examples being:
    - Well plugged and abandoned
    - Duplicate route
    - Wildlife issues
    - Landowner issues
    - Operator issues
    - Engineering/design or traffic issues
    - Any other issues.

TPC RESPONSBILITIES

- Identify surface ownership
- Identify permitted users (i.e. ROW, easements, agreements)
- Identify other users (casual use, recreationists)
- Address and evaluate need for closure:
  - Current or potential future need for route
  - Existence of potential alternative route, condition, and status
  - Environmental concerns, issues, benefits for closure and/or use of alternate route
  - Cultural resource concerns
  - Closure costs/cost sharing
  - Bonding issues.
- If parties agree to closure/alternate route usage, the following would apply:
  - Identify parties and responsibilities for closure/reclamation/alternate route(s)
  - Identify parties and responsibilities for environmental and cultural requirements
  - Identify existing conditions of approval, stipulations, and/or agreements for closure/reclamation
  - Obtain agreements among parties regarding desired results of closure/reclamation
  - Identify potential reclamation problems
  - Establish closure/reclamation timeframes
  - Implement follow-up monitoring and completion documentation.

Figure N-3. Procedures for existing route closure and/or reclamation.

Literature Cited

BLM. 1985. Bureau of Land Management Manual Section 9113 Roads.

BLM. 1990a. Bureau of Land Management Manual Section 9112.

BLM. 1990b. Bureau of Land Management Manual Section H-2801-1 Rights-of-Way Plans of Development and Grants.

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APPENDIX O: MUDDY CREEK WATERSHED MONITORING PLAN

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1. INTRODUCTION

This monitoring plan has been prepared to guide geomorphic, aquatic habitat, water quality and quantity and biological monitoring on the Muddy Creek watershed in the Continental Divide-Creston (CD-C) Natural Gas Development Project area. The CD-C Natural Gas Development Project is a natural gas field project that will be developed on public and private lands by BP America Production Company and others. The project area encompasses approximately 1.1 million acres and is located in an existing gas-producing area west of Rawlins, WY in Carbon and Sweetwater Counties. The CD-C project is an in-fill project with over 4,000 existing oil and gas wells and existing infrastructure. The selected alternative would include the development of an additional 8,950 gas wells as well as the construction of roads, pipelines, wellpads, and other supporting infrastructure.

A portion of the Muddy Creek watershed is located within the CD-C project area (**Figure O-1**). The Muddy Creek watershed is part of the Upper Colorado River Basin and is therefore subject to the Colorado River Basin Salinity Control Act. Muddy Creek has documented high levels of dissolved salts as well as elevated levels of suspended sediment. Reaches of Muddy Creek have been or are currently on the State's 303(d) list of impaired and threatened waters for sediment and habitat degradation. Monitoring should determine if activities associated with the CD-C project have an impact on Muddy Creek and its contribution of salinity to the Upper Colorado River.

The Muddy Creek drainage transitions from a cold water fish assemblage that supports Colorado River cutthroat trout, brook trout, and mountain suckers in the headwaters (upstream of the CD-C boundary), to a warm-water assemblage of native species including: bluehead sucker, flannelmouth sucker, and round tail chub within and downstream of the CD-C project area. Other species that occur within Muddy Creek include native speckled dace and non-native white suckers and creek chubs. There are four BLM sensitive fish species that are found in the Muddy Creek watershed: Roundtail Chub, Bluehead Sucker, Flannelmouth Sucker and Colorado River cutthroat trout.

Roundtail Chubs are found within the Green River drainage including portions of the Little Snake River drainage and can be found in the Muddy Creek watershed. Roundtail chubs occurring within Muddy Creek represent the most abundant population of this species known to occur within Wyoming (Baxter and Stone, 1995; Beatty, 2005; Bower, 2005). A recent status review indicated that the range of this species has been reduced roughly 55 percent from historical levels (Bezzerides and Bestgen, 2002). Causes for observed declines in the distribution of roundtail chubs include construction of mainstream dams, altered river flows, and changes in water temperatures (Bezzerides and Bestgen, 2002).

During the summer and fall of 2003 and 2004 within the upper Muddy Creek watershed, roundtail chubs were most abundant in areas containing deep pools and glides with rocky substrates. In addition, the abundance of roundtail chubs was positively associated with areas containing remnant pool habitats resulting from extensive stream drying (Bower, 2005). Extensive movements of adult roundtail chubs have not been documented within the Muddy Creek watershed (Compton, 2007), although movement of larvae and juveniles via drift has been documented in other portions of the Upper Colorado River Basin (Carter et al, 1986).

Bluehead suckers are present in the Little Snake, Green, Snake, and Bear River Basins in Wyoming (Baxter and Stone, 1995). This species is found in the Muddy Creek watershed (Baxter and Stone, 1995; Beatty, 2005; Bower, 2005). Bezzerides and Bestgen (2002) indicated that the range of this species has declined roughly 45 percent from historical levels. Causes for observed declines in distribution include construction of mainstream dams, altered river flows, changes in water temperatures, and hybridization with the white sucker (Bezzerides and Bestgen, 2002). Bluehead suckers within the upper Muddy Creek watershed represent the most abundant population of this species known within the Colorado River Basin of Wyoming (Bower, 2005).

Bluehead suckers were most abundant during the summer and fall of 2003 and 2004 in areas with rocky substrates (cobble-sized gravel) in close proximity to pool habitats within the upper Muddy Creek watershed. These areas are most common where pool-riffle sequences are present (Bower, 2005). Extensive movements of adult bluehead suckers during the spring were observed during 2005 within the Muddy Creek study area, presumably in association with spawning (Compton, 2007).

Flannelmouth Suckers are found primarily in the Yampa, Little Snake, Colorado, Green, and Gunnison River Basins and is the least abundant of the BLM sensitive species in Muddy Creek (Compton, 2007). Bezzeredes and Bestgen (2002) indicate that the range of this species has declined roughly 50 percent from historical levels. Similar to the causes identified for the decline of other native Colorado River Basin fishes, causes for observed declines in the distribution of flannelmouth suckers include construction of mainstream dams, altered river flows, changes in water temperatures, and hybridization with the white sucker (Bezzerides and Bestgen, 2002). Habitat features influencing the abundance of flannelmouth suckers during the summer and fall of 2003 and 2004 within the upper Muddy Creek watershed included rocky substrates as well as deep pools and runs (Bower, 2005).

Colorado River cutthroat trout were the only trout native to the Green River and Little Snake River drainages in Wyoming (Baxter and Stone, 1995). Historical records indicate that it was present in Muddy Creek in the mid-1800s. Historically, this subspecies inhabited clear-water tributaries of the Colorado River in Colorado, Utah, Wyoming, and probably also in New Mexico and Arizona (Behnke, 1992). This species now occupies only a fraction of its former range. Some of the most genetically “pure” of the remaining populations of this trout subspecies are found in Upper Muddy Creek (Baxter and Stone, 1995).

Colorado River cutthroat trout have been reintroduced into Littlefield Creek and other headwaters of Muddy Creek. The species is generally associated with steep, clear, cold-water streams around rocky areas, riffles, deep pools, and near or under overhanging banks and logs (Binns, 1977). Colorado River cutthroat trout have been extirpated from much of their original range through competition with brook trout, rainbow trout, and brown trout, and hybridization with rainbow trout (Binns, 1977).

Portions of the CD-C project area are also located within the Great Divide Basin (GDB) (**Figure O-1**). Although the GDB is a closed basin and has very few perennial waters, there is evidence that it is not hydrologically isolated via groundwater (Fisk, 1967). Geomorphic channel monitoring, habitat and biological monitoring will be limited in the GDB and monitoring efforts will be concentrated on water quality, water quantity and upland soil erosion monitoring.

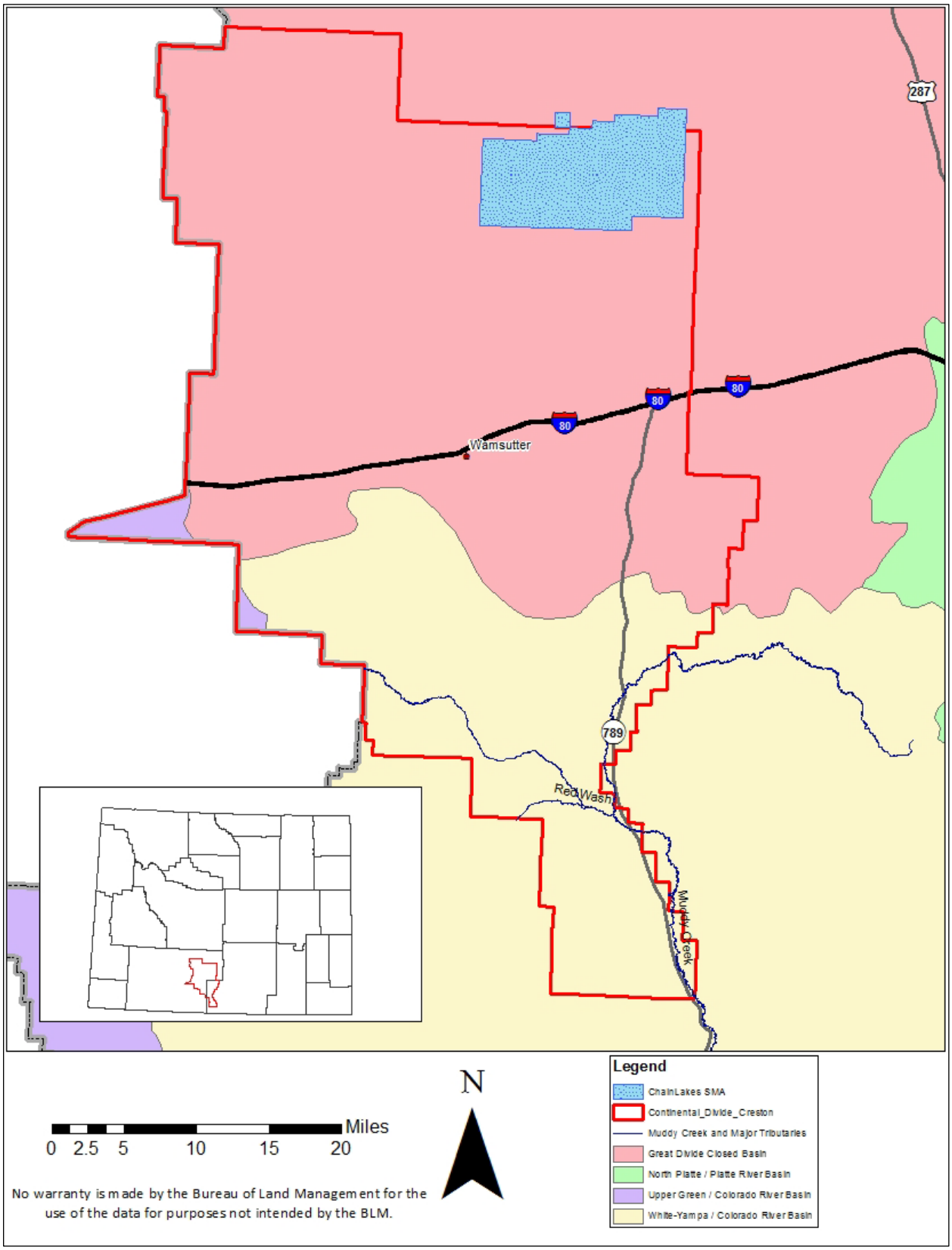

Figure O-1. CD-C project area and relevant watersheds.

1.1 Background

The CD-C project was proposed by BP and other operators in 2005. The Bureau of Land Management (BLM) initiated scoping for an Environmental Impact Statement (EIS) in 2006. The Record of Decision was signed in 2014. Significant impacts to water resources were identified in the Final EIS and the objective of this plan is to measure potential effects on these resources as a result of natural gas development within the CD-C EIS boundary. Monitoring will be managed and completed by BLM personnel, with assistance from CD-C operators when possible.

1.2 Monitoring Objectives

The primary concerns with development activities are the modification of flow regimes, potential increase in sediment delivery and transport, and potential impacts to channel stability. Increases in stream sediment load could adversely affect sensitive fish populations and distribution. Aquatic habitat and riparian habitat could be degraded or lost.

To determine if the CD-C project has adverse impacts on water quality and sensitive fish populations, a multi-parameter approach that encompasses geomorphology, habitat features, hydrology, biologic indexes and water quality is recommended. The objectives of this monitoring effort include:

- Measurement of sediment delivery from eroding stream banks and eroding uplands.
- Measurement of habitat features and stream morphology
- Measurement of in-stream sediment concentrations and other water quality parameters
- Measurement of water quantity impacts
- Measurement of effectiveness of upland erosion controls

This monitoring plan focuses on Muddy Creek and its tributaries and the Chain Lakes area within or near the project boundary because these areas could potentially be directly affected by natural gas development.

2. GEOMORPHIC AND AQUATIC HABITAT MONITORING

This section describes the timing, location and methods for monitoring of geomorphic and aquatic habitat features in perennial drainage channels.

2.1 Study Reach Locations

The objective of geomorphic and aquatic habitat monitoring is to monitor potential impacts of development on the stream geomorphology and habitat features of perennial drainages, particularly Muddy Creek and its major tributaries. There are very few perennial drainages in the GDB and monitoring efforts in the GDB will focus on the lacustrine ecosystem of the Chain Lakes area. There may be some reaches of Muddy Creek that are well vegetated and relatively stable as well as some that are currently highly degraded. The impacts of development may scarcely change the quality of already degraded reaches, and it is also possible that the reaches in good condition may be stable enough to resist the potential impacts of development. It may be that marginally stable reaches will be the most sensitive to any future impacts. Therefore, it is recommended that stream conditions be monitored by selecting reaches that represent a range of stability and aquatic habitat conditions. Another criterion for reach selection will be the presence of suitable habitat for sensitive native non-game fish species. Habitat for the species of interest will be considered with the guidance of Wyoming Game and Fish Department (WGFD) personnel. Up to 6 study reaches will be identified in Muddy Creek that fit these criteria. The study reaches will be of sufficient length to capture the range of physical and habitat parameters typical of that stream type and may be up to 600 feet in length.

2.2 Monitoring Methods

Monitoring methods for geomorphology and aquatic habitat monitoring have been selected based on the goals of the study, input from other agencies and the BLM's experience with watershed assessments in other natural gas development areas. These methods include a Rosgen Level II survey, bed measurements, bank stability evaluations, and aquatic habitat feature measurements.

2.2.1 Rosgen Level II Survey

The assessment of selected study reaches will generally follow the methods of David Rosgen as described in Applied River Morphology (Rosgen, 1996); specifically, the Level II method will be followed. This method results in a stream classification according to the author's system but also develops many important stream parameters in the process. It requires surveys of longitudinal profiles as well as surveys of cross sections at riffles and pools. The purpose of this initial assessment is to determine the general geomorphic condition and what the probable evolution of the stream would be under natural conditions. Measurements to be taken at each study reach include:

- Cross sections across the floodplain at riffle and pool locations within the reach (up to six per study reach).
- Longitudinal profile of thalweg, water elevation, bankfull indicators, terraces, and bars.
- Riffle-pool spacing and pool lengths.
- Channel material size using the Wolman (1954) pebble count method.

These measurements will be supplemented by measurements of stream sinuosity, which will be determined from high resolution mapping rather than in the field.

Field measurements will be supplemented by photographs and a plan-view sketch of the features of each study reach. Important geomorphic features such as bed rock outcrops will be noted on the field sketches.

The Level II analysis uses the aforementioned field measurements to calculate a number of parameters:

- Channel slope
- Bankfull maximum depth
- Floodprone area width
- Bankfull surface width
- Bankfull mean depth
- Entrenchment ratio
- Width/depth ratio, and
- Dominate bed material (D_{50} size)

In addition to the Level II analysis, for each pool, the residual depth will be calculated. Pool/riffle ratios will also be calculated based on the riffle spacing and pool length measurements. Benchmarks will be set locally on a local datum and will be located horizontally with a GPS receiver. Benchmarks will consist of iron rebar driven in the ground and guarded by a steel fence post.

2.2.2 Bed Measurements

Bed measurements are important for evaluating geomorphic stability as well as habitat. Variations in bed particle size over time may include aggradation or erosion of the bed material. The standard method for evaluating materials with course grained beds is the Wolman pebble count referred to above (Wolman, 1954) and is described in detail by Harrelson et al. (1994). Wolman pebble counts will be performed at three cross-sections within each study reach. The locations of the riffle reaches measured will be recorded with a GPS receiver. During data analysis, the cumulative size distribution for each pebble count will be plotted and the D_{50} size (median size) calculated.

Embeddedness is an important aquatic habitat measurement because it measures the amount of siltation in a streambed. Normally, siltation is undesirable because it reduces habitat for benthic macroinvertebrates and spawning areas for fish. Embeddedness measures the amount of silt in a course grained (gravel, cobble, boulder) bed. The methods laid out by the Wyoming Department of Environmental Quality (WDEQ) in the *Manual of Standard Operating Procedures for Sample Collection and Analysis* (WDEQ, 2011) will be followed. Locations of embeddedness measurements will be documented with a GPS receiver.

2.2.3 Bank Stability

The annual remeasurement of the monumented cross-section for each study reach will indicate if banks are eroding. These monumented cross-sections will be selected at points where bank erosion is most likely to occur in the reach. To provide a more precise measurement of bank movement, erosion pins will be driven near the monumented cross sections at points most susceptible to bank erosion or collapse. The method used is described by Rosgen (2006).

2.2.4 Aquatic Habitat Features

Aquatic habitat features add complexity and heterogeneity to a stream, which are generally important to the health of the aquatic life. These habitat features are varied and can include large rocks in the channel, drops, large woody debris, overhanging banks, vegetation cover that extends over the channel and any other features that provide cover or other habitat for aquatic animal life. Also included as habitat features are drops and pools with adequate residual depths, which will be identified through the stream survey. It is not expected that the stream will contain significant amounts of large rock or large woody debris although, if found, these features will be noted on the field sketches. The most measurable aquatic habitat feature not addressed by the stream survey is expected to be vegetative cover that extends over the channel. In each study reach, overhanging vegetative cover will be approximately measured and its ratio to the bank length of the reach calculated.

2.3 Monitoring period and frequency

Baseline data collection is planned to occur during 2014 and 2015. Monitoring is initially planned to occur annually. It is likely that the monitoring protocols will be revised over time based on the results of data collected. Monitoring will take place in late summer during a period of low flow. Although low flow periods often exhibit the highest concentrations of dissolved constituents in water, higher sediment concentrations would be expected during spring high flows. However, the watershed is largely inaccessible during the high flow period because of snow and wet conditions. Other reasons for monitoring during the low flow period are that the geomorphic and aquatic habitat monitoring protocols are more easily and more accurately performed when flows are low.

Prior to baseline data collection, a reconnaissance level assessment of the watershed will be undertaken by agency personnel to document the present watershed condition and identify reaches where monitoring is most needed.

Each study reach will have 6 cross sections. Only one cross section, the “permanent cross section” will be surveyed annually. The remaining 5 will be measured every 5 years.

3. WATER QUALITY MONITORING

The objective of this surface monitoring program is to assess the water quality of Muddy Creek and its tributaries as well as the Chain Lakes wetland area within or near the CD-C Project Area and compile a data set beginning with baseline. The data set will be used to identify trends in water quality within the watershed potentially caused by oil and gas development and to determine the effectiveness of BMPs and

reclamation efforts. If the data show undesired effects on the water quality that could impact sensitive fish species or aquatic habitat, BMPs can be implemented and modified to reduce impacts associated with natural gas development.

3.1 Locations and Monitoring Frequency

Due to the difference in hydrology, monitoring methods will differ between the Muddy Creek watershed and the Chain Lakes wetland area. Muddy Creek is a tributary to the Little Snake River and ultimately the Colorado River. The Chain Lakes area is a unique alkaline wetland system that is located within the Great Divide Basin. Surface water within the Great Divide Basin is hydrologically isolated.

For the Muddy Creek watershed, sampling will be conducted annually during low-flow conditions at four locations within the upper portions of Muddy Creek within the project area; one upstream of the wetland complex near Dad, one immediately downstream of the wetland complex, one near the confluence of Red Wash and Muddy Creek and one on Muddy Creek near the southern end of the project area. The first surface water quality sampling activities are scheduled for 2014 and will be conducted in conjunction with the geomorphic and aquatic habitat monitoring activities.

In the Chain Lakes area, sampling will be conducted annually in the early summer. Most of the lakes go dry toward the end of the summer. Locations will be determined during the 2014 reconnaissance field trip.

3.2 Parameters and Methods

Field parameters will be measured by using a Datasonde/Surveyor 4 System with integrated parameters measurement equipment or approved equal. The following parameters will be measured at each sampling location as much towards the middle of the stream or lake as possible and recorded in the project field logbook: pH, temperature, dissolved oxygen (DO), turbidity, and specific conductance. All parameter measurement sensors will be calibrated at the factory before bringing the instrument to the field for use. The pH and DO sensors will be calibrated in the field prior to use on a daily basis and the calibration noted.

Surface water samples will be collected in laboratory supplied containers containing preservatives as appropriate for calcium, magnesium, sodium, potassium, chloride, sulfate and total alkalinity. These samples will be collected at each location by submerging the bottle by hand (dip) and allowing the container to fill as the container is brought up to the surface.

In addition, Total Suspended Solids (TSS) samples will be collected in laboratory supplied containers according to the Sample Collection and Treatment Section of Field Guidelines for Collection, Treatment, and Analysis of Water Samples, Montana District (1985). Appropriate pages of this method are included in Attachment B. To ensure representative TSS samples, integrated samples will be collected using the equal-discharge-increment (EDI) method along each channel cross section. This method requires that the field team determine at least five equal-discharge increments for each cross-section prior to commencing the sampling activities. The total flow in the creek will first be determined using the equal-width-increment (EWI) method which will be used to determine the location of each flow increment. All measurements will be recorded in the field logbook. Depending on the depths of the lakes sampled in the Chain Lakes area, depth integrated samples will be taken.

4. BIOLOGICAL MONITORING

The objective of the biological component is to measure species richness through time using fisheries sampling. The fisheries component will be sampled using Robert Bramblett's Integrated Biotic Indices (IBI) (Bramblett et al, 2005).

Methods

Three total sites will be chosen on Lower Muddy Creek, both within the CD-C boundary and outside (downstream) the CD-C boundary. Sites will be sampled annually for three years to create a baseline. Once baseline sampling is complete, sites will be re-surveyed once every three years during the 15-20 year development stage and every five years once development is complete. The Fish Sampling Protocol is described below.

Each sampling site will be 300 meters in length. The sites will be sampled using a seine (net) or backpack electrofishing. Sampling technique will be determined on a site specific basis. When stream sections are flowing or continuous, block nets will be used on both the upstream and downstream starting and stopping points to create a 'closed' section.

Once the 300 meters has been sampled the fish will be identified, a small subset of 20 for each species will be measured and all fish will be counted. Any fish that cannot be identified will be vouchered and preserved for further analysis.

5. REPORTING

After completion of field activities and receipt and quality control of laboratory data, an annual data report will be prepared. The report for the initial monitoring year will also include information on the watershed and initial stream assessment information that will not be collected in future years. This information includes a description of the watershed and geomorphic stream classifications. The initial report will include interpretation of the assessment data such as determining Rosgen stream types, pool/riffle ratios, and bankfull flows. Monitoring data will be summarized in tabular form and a description of the existing conditions to the monitoring program will be presented.

In the following years, the annual report will summarize data collected in that year, compare it the previous year's data and note any significant changes in conditions. Recommendations for possible modifications of BMPs and operations in the watershed will be presented as well as recommendations for modifications to the monitoring program. The reports will contain appendices presenting field data sheets, sketches, site photos and laboratory data sheets.

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APPENDIX P: BEST MANAGEMENT PRACTICES FOR FUGITIVE DUST CONTROL

The Wyoming Department of Environmental Quality (DEQ), Air Quality Division (AQD), is responsible for regulating air quality in Wyoming. The Bureau of Land Management (BLM), Rawlins Field Office (RFO), is responsible for implementing management actions that ensure compliance with the DEQ's air quality regulations, through the use of Best Management Practices (BMPs) and site specific requirements to alleviate air quality impacts considered on a case-by-case basis (BLM 2008).

The purpose of this dust control plan is to:

1. identify sources of fugitive dust that can contribute to the degradation of both air and water quality and can affect palatability of forage for livestock and wildlife; and
2. to recommend fugitive dust control measures that can be implemented to minimize or eliminate the potential for air and water pollution as a result of fugitive dust.

In certain circumstances, on a case-by-case basis, specific requirements (not necessarily limited to the BMPs recommended in this plan) will be identified by the BLM, and Operators must comply with the measures. For example, in areas with high wildlife use, vegetation may be affected by dust. In these areas, specific dust control measures may be attached to an APD as a Condition of Approval (COA) to reduce impacts to forage palatability and therefore, wildlife. The use of chemical stabilizers must be approved by the BLM prior to application.

Fugitive Dust Sources

Fugitive dust is defined as particles lifted into the ambient air caused by man-made and natural activities such as the movement of soil as a result of vehicles, equipment, blasting, and wind. This excludes particulate matter emitted directly from the exhaust of motor vehicles and other internal combustion engines; from portable brazing, soldering, or welding equipment; and from pile drivers (EPA 1995). Dust is generated through the abrasion of soils as a result of mechanical force (i.e. wheels, bulldozers) and through the entrainment of dust particles in turbulent air currents (i.e. wind erosion from a spoils stockpile).

Fugitive dust sources in the CD-C project area include vehicular traffic on unpaved roads, spoil and topsoil piles, heavy construction operations, and areas with cleared vegetation.

The primary factors that affect the quantity of fugitive dust emitted from unpaved roads include vehicle speed, number of wheels per vehicle, number of vehicles, vehicle weight, particle size distribution of the surface material, restraint of the surface fines (compaction, cohesiveness/bonding), and durability of the road surface. Meteorological conditions also affect the volume of dust, as does the placement of well pads, roads, pipelines, soil stockpiles, and ancillary facilities in relation to the prevailing wind direction.

Fugitive dust is a concern during all phases of a well's life-cycle, and during the construction and reclamation of a pipeline. In addition, the construction and use of roads constitute major sources of fugitive dust in the project area.

Fugitive Dust Control Measures 1: Before Construction

Prior to construction, dust control can be implemented through the use of proper planning, which would include the minimization of surface disturbance through minimizing the size of well pads, pipeline rights-of-way, and road rights-of-way. The utilization of existing roads and disturbance can minimize the potential for fugitive dust through the overall reduction in surface disturbance. Proper planning can also result in reduced fugitive dust through proper placement of facilities, roads, pipelines, and well pads,

potentially in areas where the soil type is less conducive to wind erosion or through the construction of well pads in areas that are naturally wind-protected. Pre-planning where spoil and soil stockpiles are constructed, perhaps in less windy areas, may reduce the potential for wind erosion and thus loss of valuable topsoil and spoil material.

In addition to construction pre-planning, carpooling and other methods to reduce traffic volume (i.e. man camps) could be implemented as part of an overall plan (EPA 1992). Traffic speed limits could be set cooperatively through the use of Road Maintenance Agreements (RMAs) that are implemented by Operators.

Pre-planning the application of surface treatments (discussed in detail below) is important to the efficacy of the treatments. The application of wet suppression or chemical stabilizers during a cool, wet time period may not result in any increased effect of the treatment. Rather, the application of treatments during drier, warmer periods, when fugitive dust is more likely, would have the greatest impact. The application of suppressants should occur at a sufficient frequency, quantity, and depth, especially on hot, dry days. Operators should consider meteorological conditions, such as wind speed, when planning surface treatments. The application of suppressants should occur prior to high winds, and, if necessary, operations should be halted during extremely high wind events.

Fugitive Dust Control Measures 2: During and After Construction

Roads

Surface improvements can be implemented to control fugitive dust, and include such measures as paving or surfacing the road with another material with a lower silt content than the existing road base (EPA 1992). Depending on the material, grading and spot reapplication of the surfacing material may be required. In addition, road fabrics can be used as resurfacing material. For roads with a lower volume of use, maintaining a vegetative cover may be practicable in certain ecological areas.

Surface treatments require periodic reapplications, and include either the use of wet suppression or chemical stabilization. Wet suppression generally includes the use of water to control dust, possibly with the addition of surfactants or other additives, but does not chemically alter the road surface. Chemical stabilization changes the physical characteristics of the road surface. Reapplication necessity may range from several minutes for water to several months for chemicals (EPA 1992).

The efficacy of wet suppression is dependent on the amount of water applied per unit area, the time between applications, traffic volume during that time period, and prevailing meteorological conditions during the period. Chemical stabilization can either simulate a wet surface or a paved surface through either attracting and retaining moisture or by cementing loose material into the surface, respectively (EPA 1992). It is recommended that diluted treatments be reapplied every month to maintain effectiveness.

Fugitive dust generated from roads can also be reduced through the use of carpooling, reduced vehicle speeds, and reduced site visits through the use of remote well monitoring, when feasible. Only established routes should be used, and, if necessary, gravel or paved exits should be established to help remove soil and mud from vehicle tires.

General Surface Disturbance

Water (or chemical stabilizers, as appropriate) should be applied prior to, during, and after earth-moving operations.

Pipelines

Pipeline dust control can be implemented through the use of wet suppression and rapid reclamation. Chemical stabilizers should not be used on pipelines as they may interfere with the ability of vegetation to colonize the site.

Storage Piles (Topsoil and Spoil Stockpiles)

Good work practices can affect the severity of wind erosion; for example, loading and unloading of soils can be confined to the downwind side of the pile. Wet suppression should be used to control fugitive dust off of the pile. Chemical stabilizers are not recommended, as they may hinder successful reclamation. For piles that will be onsite for longer periods of time, seeding with appropriate vegetation may reduce wind erosion if a successful vegetative cover is achieved. Wind barriers (such as snow fences) may also be appropriate in some situations.

Conclusions

Natural vegetative cover is the most effective method of controlling wind erosion. Therefore, the successful implementation and achievement of both interim and final reclamation of pipelines and well pads would be the most effective way to reduce wind erosion.

The control of fugitive dust from roads is an ongoing challenge that must be addressed through proper and appropriate planning and enforced through the application of appropriate stabilizers and suppressants.

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APPENDIX Q1: BIOLOGICAL ASSESSMENT

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Acronyms and Abbreviations

APD	Application for Permit to Drill
APHIS	Animal & Plant Health Inspection Service
APLIC	Avian Power Line Interaction Committee
ARI	Aquatic Resources Inventory
BA	Biological Assessment
BBL	Barrel(s)
BLM	Bureau of Land Management
BMP	Best Management Practices
BO	Biological Opinion
CBM	Coalbed methane
CD-C	Continental Divide Creston Natural Gas Project
CDOW	Colorado Department of Wildlife
CDWII	Continental Divide Wamsutter II
CIAA	Cumulative Impact Analysis Area
COA	Conditions of Approval
CWA	Clean Water Act
DEIS	Draft Environmental Impact Study
DFC	Desired Future Condition
dBA	Decibels
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FLPMA	Federal Land Policy Management Act
FWS	United States Fish and Wildlife Service
GYA	Greater Yellowstone Area
IM	Instruction Memorandum
MLA	Mineral Leasing Act
NEPA	National Environmental Policy Act
NSO	No Surface Occupancy
OHV	Off Highway Vehicle
RFO	Rawlins Field Office
RIP	Recovery & Implementation Program
RMP	Resource Management Plan
ROD	Record of Decision
ROW	Right-of-way
T&E	Threatened or Endangered
USACE	U.S. Army Corps of Engineers
USDI	United States Department of the Interior
USFWS	United States Fish and Wildlife Service
WDEQ	Wyoming Department of Environmental Quality
WDEQ-WQD	Wyoming Department of Environmental Quality Water Quality Division
WGFD	Wyoming Game and Fish Department
WOGCC	Wyoming Oil and Gas Conservation Commission
WSGS	Wyoming State Geological Survey
WYNDD	Wyoming Natural Diversity Database

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1. Introduction

This biological assessment discusses the potential effects of the proposed Continental Divide–Creston (CD–C) Natural Gas Development Project on Threatened, Endangered, and Proposed species pursuant to the Endangered Species Act (ESA) of 1973. The assessment also presents recommendations to insure that the development and operation of the proposed project will not jeopardize the continued existence of those species or result in the destruction or adverse modification of their Critical Habitats. We refer the Fish and Wildlife Service (FWS) to the draft CD–C Environmental Impact Statement (EIS) for a greater level of data specific to this project and to the biological assessments and biological opinions prepared for previously permitted projects in the general area (see below).

The information compiled in this biological assessment was gathered from the published literature, agency files and databases, personal communication and meetings with applicable wildlife agency personnel, both State and Federal, and from field surveys conducted specifically for this project.

The Fish and Wildlife Service (USFWS 2013a) provided the list in **Table 1-1** of Endangered, Threatened, Proposed, and Candidate species and their designated Critical Habitats that may occur in Carbon and Sweetwater Counties, including the Continental Divide–Creston project area. Table 1-1 provides an overview of the species listed under the ESA, their habitats, and the potential or likelihood of these species being found in the CD–C project area. If the species or their habitats are known to occur in the area, the Table also provides a determination of the potential of the project to affect the species.

In April 2013, the USFWS (2013c) issued a statewide "block clear" letter to the Wyoming Game and Fish Department (WGFD) in response to their request to "block clear the remaining white-tailed prairie dog range," stating, "Service staff had reviewed the Block Clearance Document and find that the conclusions presented are sound and that your request for statewide block clearance is both warranted and timely." The USFWS (2013c) provided, "The change will be accomplished by expanding the block clearance area currently in place for black-tailed prairie dog range in eastern Wyoming and in portions of the white-tailed prairie dog range to include the entire state of Wyoming." BLM's review of the FWS statement on the species concludes, "This clearance indicates that no presence of black-footed ferrets is expected outside the reintroduction population areas of the state." (BLM 2013b)

Previous Section 7 Consultations

The BLM and FWS have previously entered into Section 7 consultation, both formally and informally, regarding the potential impacts of oil and natural gas exploration and development projects in the Continental Divide–Creston project area. These consultations included the Creston/Blue Gap Natural Gas Project in 1994, the Continental Divide/Wamsutter II Natural Gas Project in 2000, the Desolation Flats Natural Gas Field Development Project in 2002, and the Rawlins Resource Management Plan in 2008. Other consultations in the general area included the Atlantic Rim Natural Gas Project in 2007 and the Chokecherry–Sierra Madre Wind Energy Project in 2012. These documents were reviewed relative to previous determinations of effect made by the two agencies and mitigations or conservation measures deemed necessary to preclude take of a listed or Candidate species and/or its habitat. The BLM and FWS formally consulted on the Rawlins Resource Management Plan (2006-2007) and the biological opinion was issued on January 16, 2007 (USFWS 2007). The BLM Wyoming State Office has also issued several programmatic biological assessments for specific species, including the gray wolf, bald eagle, grizzly bear, Wyoming toad, black-footed ferret, Canada lynx, Ute ladies'-tresses and the Colorado butterfly plant. In the last few years, Environmental Assessments (EA) have been prepared for two oil and gas development projects within and adjacent to the CD-C project area, the Luman Rim project in 2010, and the Table Rock project in 2012. No BA was prepared for either project.

Table 1-1. Endangered, Threatened, Proposed, and Candidate species and their designated Critical Habitats that may occur in Carbon and Sweetwater Counties

Species / Critical Habitat	Scientific Name	Status[1]	Habitat	Occurrence Potential, CD-C Project Area[2]	Effects Determination Summary
Mammals					
Black-footed Ferret	*Mustela nigripes*	Endangered	Prairie dog towns	No	No effect
Black-footed Ferret, Shirley Basin - Experimental/ Non-essential	*Mustela nigripes*	Experimental/ Non-essential	Prairie dog towns, Shirley Basin	No	No effect
Canada Lynx	*Lynx canadensis*	Threatened	Montane forests	VU (possible transportation corridor)	May affect, not likely to adversely affect
Preble's Meadow Jumping Mouse	*Zapus hudsonius preblei*	Threatened	Lush vegetation along watercourses or herbaceous understories in wooded areas near water in SE Wyoming.	No	No effect
Birds					
Greater Sage-Grouse	*Centrocercus urophasianus*	Candidate	Sagebrush communities	P	No effect
Yellow-billed Cuckoo (Western)	*Coccyzus americanus*	Proposed	Riparian areas west of Continental Divide	No	No effect
Amphibians					
Wyoming Toad	*Bufo baxteri*	Endangered	Floodplains, ponds, and seepage lakes occurring between 7,000 and 7,500 ft elev. in the Laramie Basin	No	No effect
Colorado River Fish[3]					
• Bonytail	*Gila elegans*	Endangered	Riverine habitat downstream of Wyoming in the Yampa, Green, and Colorado River systems	PAD	May affect, likely to adversely affect
• Colorado Pikeminnow	*Ptychocheilus lucius*	Endangered			
• Humpback Chub	*Gila cypha*	Endangered			
• Razorback Sucker	*Xyrauchen texanus*	Endangered			

Species / Critical Habitat	Scientific Name	Status[1]	Habitat	Occurrence Potential, CD-C Project Area[2]	Effects Determination Summary
• Critical Habitat	Designated for Colorado River Fish in riverine habitat downstream of Wyoming in the Yampa, Green, and Colorado River systems (see 50 CFR 17.95(e))			PAD	May contribute to the destruction or modification of designated critical habitat
Plants					
Blowout penstemon	*Penstemon haydenii*	Endangered	Sand dunes or blowouts	No	No effect
Colorado butterfly plant	*Gaura neomexicana coloradensis*	Threatened	Moist soils in wet meadows of flood plain areas in SE Wyoming	No	No effect
• Critical Habitat	Approximately 3,538 acres along approximately 51 stream miles in Platte and Laramie counties in southeast Wyoming (FR, Vol 70, No.7, Jan. 11, 2005).			No	No effect
Ute Ladies'-tresses	*Spiranthes diluvialis*	Threatened	Seasonally moist soils and wet meadows of drainages below 7,000 ft. elevation	U	May affect, not likely to adversely affect
Platte River Species					
• Least Tern (interior population)	*Sternula antillarum*	Endangered	Riverine habitat downstream of Wyoming in the Platte River system	No	Not found in or downstream of Continental Divide-Creston project area.
• Piping Plover	*Charadrius melodus*	Threatened			
• Whooping Crane	*Grus americana*	Endangered			
• Pallid Sturgeon	*Scaphirhynchus albus*	Endangered			
• Western Prairie Fringed Orchid	*Platanthera praeclara*	Threatened			
• Platte River Species Critical Habitat	Designated for whooping crane in Nebraska in riverine habitat of the Platte River system (see 50 CFR 17.95[b])				

[1] *Candidate species are those for which the USFWS has sufficient information to propose for listing as Threatened or Endangered under the ESA, but for which development of a proposed listing regulation is precluded by other higher priority listing actions. Proposed species are those Candidate species that were found to warrant listing as either Threatened or Endangered and are currently undergoing a 12-month status review. Conservation measures for Candidate and Proposed species are voluntary but recommended because, by definition, the species may warrant future protection under the ESA if adequate conservation measures are not in place.*

[2] *Occurrence potential includes: present (P); potentially present (pp); unlikely (U); very unlikely (VU); and potentially affected downstream (PAD).*

[3] *Present in the Colorado River system downstream of the project area.*

2. Project Description

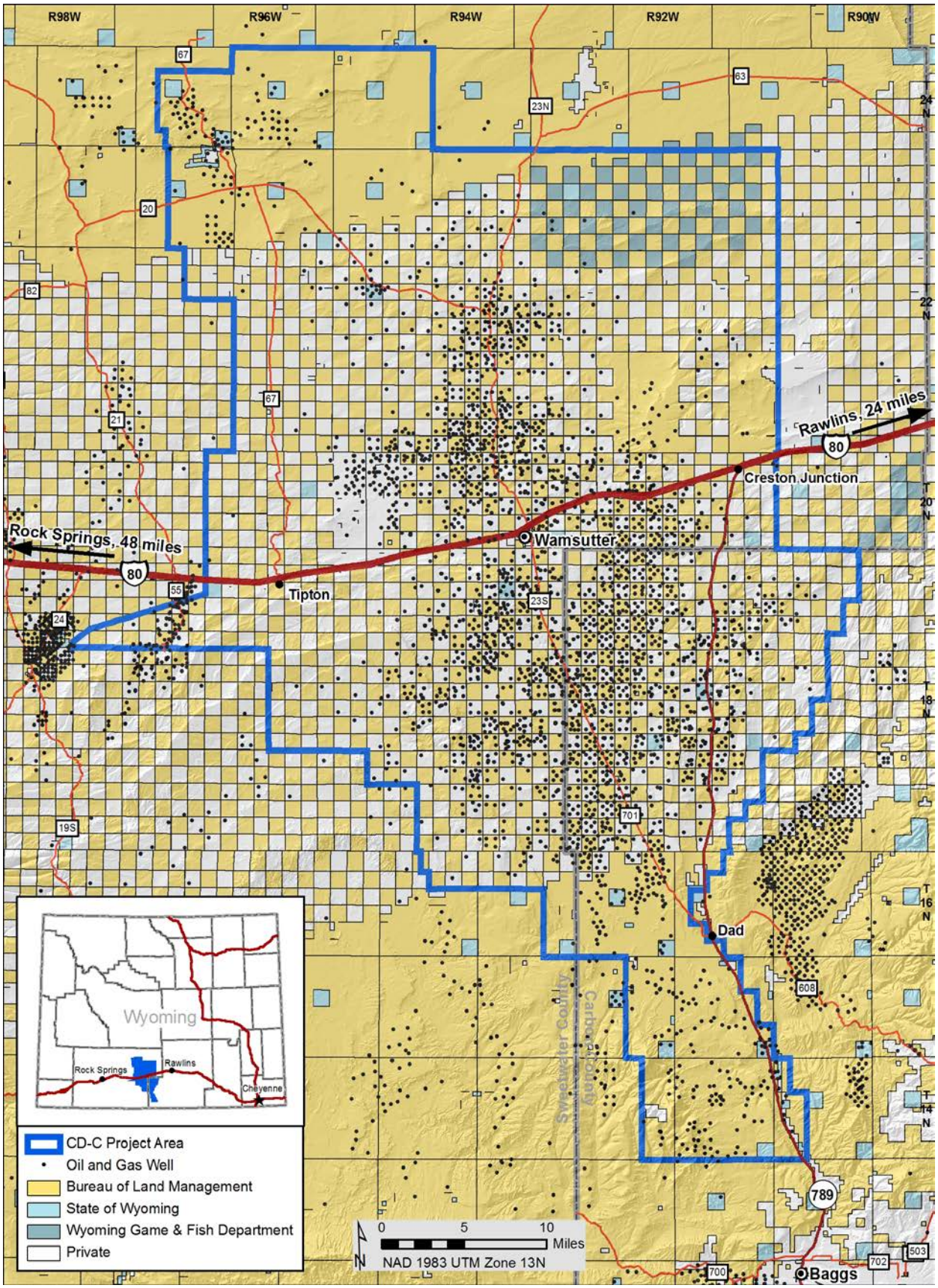
The CD–C Operators propose drilling up to 8,950 natural gas wells in a project area of approximately 1.1 million acres (1,672 square miles) located in Townships 14 through 24 North, Ranges 91 through 98 West, Sixth Principal Meridian, Carbon and Sweetwater counties (**Map 2-1**). The eastern boundary of the Continental Divide–Creston (CD-C) project area is about 25 miles west of the city of Rawlins; the western boundary is roughly 50 miles east of the city of Rock Springs. Interstate 80 (I-80) generally bisects the project area. The checkerboard pattern of land ownership in the central portion of the project area is a result of early land grants from the federal government to the Union Pacific Railroad Company. The BLM, the State of Wyoming, and private owners issued the oil and gas leases covering these lands. The Rawlins Field Office (RFO) manages BLM surface lands and the federal mineral estate in the project area. The BLM manages approximately 626,932 surface acres (58.6 percent), the State of Wyoming owns approximately 48,684 acres (4.5 percent), and private landowners own approximately 394,470 acres (36.9 percent), as shown in **Map 2-1**. The map also shows all natural gas development to date within and adjacent to the project area.

The CD-C project is an infill project in a region that has seen extensive natural gas exploration and development. More than 4,700 wells have already been drilled in the project area. The Continental Divide, Wamsutter, Creston/Blue Gap and Continental Divide/Wamsutter II projects are only a few of the oil and gas projects previously evaluated in the greater Continental Divide-Creston project area. Other projects that lie adjacent to or overlap the CD-C project area include Atlantic Rim to the east, Desolation Flats to the southwest, Table Rock at the center west, and Luman Rim at the northwest corner. Table Rock and Luman Rim are two relatively small projects approved by the Rock Springs Field Office in the last few years. The scale of some of these predecessor and neighboring projects is summarized in **Table 2-1**.

Table 2-1. Oil and gas development in and near the CD-C project area

Project	Date Approved	Drilling to be Complete	Project Acres	Project Wells
Creston/Blue Gap	1994	2014	207,746	275
Continental Divide/Wamsutter II	2000	2015	1,061,200	3,000
Atlantic Rim	2006	2026	270,080	2,000
Desolation Flats	2004	2018	233,542	385
Luman Rim	2010	2015-20	21,471	58
Table Rock	2012	2012-26	13,633	88

The CD-C Draft EIS (DEIS) provides a detailed description and analysis of the Proposed Action and five alternatives: Alternative A: 100-Percent Vertical Drilling; Alternative B: Enhanced Resource Protection; Alternative C: Surface Disturbance Cap—High and Low Density Development Areas; Alternative D: Directional Drilling; and Alternative E: No Action. In the Final EIS, Alternative A was dropped from consideration but the Proposed Action, Alternative B, Alternative C, Alternative D, and Alternative E were carried forward. A new alternative, the Agency Preferred Alternative was added to the Final EIS as Alternative F.



Map 2-1. Continental Divide–Creston project boundary and existing oil and gas development

No warranty is made by the BLM for use of the data for purposes not intended by the BLM.

The Agency Preferred Alternative (Alternative F) limits development to no more than eight well pads per section to minimize surface disturbance and reduce impacts to the area's resources, including federally listed and proposed species. The alternative emphasizes transportation planning, development pre-planning, and a fugitive dust control plan. To address salt and sediment impacts to sensitive fish species and general water quality, well pads, access roads, pipelines, and ancillary facilities located within ½ mile of Muddy Creek, Red Wash, and Bitter Creek and within ¼ mile of playas in the Chain Lakes Wildlife Habitat Management Area would be subject to controlled surface use stipulations. The stipulations include monitoring and maintenance of Best Management Practices (BMPs), identification of well locations in these areas as High Inspection Priority areas, boring of all pipeline crossings of perennial drainages and riparian areas, soil stabilization of all disturbances within 30 days of well completions, and closed or semi-closed loop drilling. In addition, a monitoring plan for Muddy Creek has been developed and will be implemented by the BLM. A Wildlife Inventory, Monitoring and Protection Plan is intended to avoid or minimize project impacts to wildlife by monitoring population trends as the field develops, annually reviewing project activities and identified impacts, applying appropriate mitigation, and modifying future development through an adaptive management process. Finally, a CD-C discussion group would be formed that would respond to evolving energy issues. The Agency Preferred Alternative is evaluated in this Biological Assessment.

2.1 Description of the Proposed Project

The CD-C Operators propose drilling up to 8,950 infill natural gas wells, in addition to the more than 4,700 wells already drilled in the project area (**Map 2-1**). Although operations are subject to change as conditions warrant, the Operators' long-term plan of development is to drill at the average rate of approximately 600 wells per year until the resource is fully developed.

The precise locations of these additional wells have not been identified at this time. The Operators anticipate drilling at well densities of up to one down-hole well bore per 40 acres. Based on existing reservoir and well performance information, most gas wells will be completed in the Almond Formation (Mesa Verde Group), although secondary reserves may be encountered in other formations (e.g. Lewis, etc.). The average life of a well is expected to be 30 to 40 years. Combining average well life with a 15-year field development period produces a potential project life of 45 to 55 years. Factors outside of the Operators' control, including geologic characteristics, reservoir quality, engineering technology, and economic conditions could affect the Operators' ability to adequately drain the reservoir and could result in fewer than 8,950 wells being drilled.

Wells may be drilled conventionally (vertically) or directionally from single or multiple well pads. The proposed project also includes construction and operation of ancillary facilities such as: roads; gas, water, and condensate-gathering pipelines; overhead and buried power lines; and separation, dehydration, metering, and fluid-storage facilities.

Table 2-2 shows the estimated surface disturbance for the Agency Preferred Alternative. The alternative is expected to reduce overall surface disturbance by about 7 percent. Initial disturbance is that which will occur during well site, access road and infrastructure construction. It is followed by interim reclamation, as in the case of well pads, and/or final reclamation, as in the case of pipelines; long-term disturbance is that disturbance which will remain over the life of the project, such as access roads, producing well sites, or compressor stations.

Table 2-2. CD-C project area disturbance, Agency Preferred Alternative

Category	Well Pads (incl. roads)	Related O&G Facilities	Total Disturbed Area
		Acres	
Initial	38,497	5,311	43,808
Long-term	16,765	863	17,628

2.1.1 Road Construction Activities

As this project would largely be an infill development in existing natural gas fields, new road construction would not be extensive. The primary access to the project area is I-80. Existing arterial roads, including Wyoming State Highway (WY) 789 and several Sweetwater and Carbon county roads, provide access within the project area. New road construction would primarily be short sections of road from the existing road network to new well sites and support facilities. Some existing access roads may need to be improved to accommodate increased traffic. Specific locations for access roads are not known at this time but will be included in permit applications and will be evaluated by the BLM during onsite inspections.

2.1.2 Well Construction, Drilling, and Completion Activities

The project would include up to 8,950 well bores from both single-well pads and well pads with multiple directional well bores. Construction of a typical conventional single-well pad would require approximately 6.3 acres, which includes 0.9 acres for an access road. A typical multiple-well pad would disturb approximately 2.45 acres per well bore, which includes 0.45 acre for an access road. Operators will determine the locations of new wells according to the subsurface reservoir, the topography of the area, and Wyoming Oil and Gas Conservation Commission (WOGCC) spacing rules. Dimensions of drill pads will depend on topography and specific well needs.

Well-drilling and completion activities will be in compliance with Federal Onshore Oil and Gas Order No. 2. These guidelines specify the following:

> *...proposed casing and cementing programs shall be conducted as approved to protect or isolate all usable water zones, potentially productive zones, lost-circulation zones, abnormally pressured zones, and any prospectively valuable deposits of minerals. Any isolating medium other than cement shall receive approval prior to use.*

The Operators anticipate that the drilling-rig count within the project area would be up to 25 rigs at any particular time in order to achieve development objectives. Wells would be drilled utilizing conventional, mechanically powered mobile drilling rigs. Drilling each gas well would take from 7 to 10 days, with additional time likely for directional wells and wells deeper than 10,000 feet. Completion and testing operations typically require approximately 10 to 20 (up to 30) days to perform. The Operators propose to drill year-round subject to environmental considerations.

Approximately 24,000 to 42,000 barrels (bbls) of water are needed to perform drilling and completion operations for each well. Fresh water would be used for drilling the first 5,000–7,000 feet of each well, and water-based muds would be used for the remainder of the drilling operation. Water would come from existing and new water-supply wells within the project area, as well as from produced-water sources. The use of produced water to the greatest extent possible would conserve fresh-water aquifers. Estimated annual freshwater use within the CD-C project area would range from 1,856 to 3,248 ac-ft /yr and would average 2,552 ac-ft /yr. All freshwater would be withdrawn from groundwater sources; no freshwater would be withdrawn from surface waters. (The depletion calculation related to annual water use for the CD-C project is included in **Section 5.2**, **Colorado River Species**, page 21.)

2.1.3 Production Facilities

Production facilities on the well pad would typically include wellhead valves and piping; separation, dehydration, and metering equipment; oil and water production tanks; a methanol storage tank and pump; and telemetry equipment. Production equipment would be fueled by natural gas or electricity. Telemetry equipment is currently used or planned for use by most Operators to improve well evaluation and operational efficiency, and to minimize well visits. Production pits would not be used. Well-site compression could be utilized on an as-needed basis. Buried natural gas gathering lines would be installed to transport produced gas from new wells to the existing gas-gathering pipeline system.

The project may also include the development of an overhead electrical system to provide commercial power to portions of the field, as well as lower-voltage, buried power utilities to individual well pads. The overhead system is estimated to include approximately 36 miles of line.

2.1.4 Pipeline Facilities

The Operators would use existing natural gas transmission lines that serve the project area. Operators are not responsible for the construction or operation of gas transmission lines and new transmission lines are not included as a component of the CD-C project.

Gathering lines would be installed below the surface to transport the produced gas from the new wells to the gas gathering pipeline system. The gas production lines would be located adjacent and parallel to well access roads where possible to minimize surface disturbance. New pipelines would cross federal, state, and private surfaces in a route developed to minimize both resource conflicts and development costs.

Pipeline construction consists of trenching, pipe stringing, bending, welding, coating, lowering pipeline sections into the trench, and backfilling. In general, construction widths would be 50 to 75 feet when not adjacent to a road and 25 to 50 feet when adjacent to an existing or new road. Newly constructed pipelines would be hydrostatically tested to ensure structural integrity. As an example of water requirements, approximately 2,700 gallons of water would be required to test one mile of four-inch pipeline. Hydrostatic test water would be disposed of as approved by the BLM and/or the state.

2.1.5 Compression, Gas Treatment, and Ancillary Facilities

Because the existing compression infrastructure in the project area would not provide sufficient capacity to compress the additional gas volumes anticipated from the CD-C project, supplemental compression would be required at various locations throughout the project area. An estimated 24,936 horsepower (hp) of additional compression may be needed as the project is developed for dedicated compressor sites and at well sites. The additional compressor sites, including a large central pipeline compression facility and possibly some well-site compression, could add up to 60 acres of disturbance.

It is anticipated that one additional central gas-processing/stabilization facility would be needed within the project area, affecting up to 30 acres.

2.1.6 Produced-Water Disposal

Produced water from conventional natural gas production may be stored in tanks at the well site prior to transport by water-hauling trucks or transported in flowlines to collection facilities for disposal. All produced water disposal would be in accordance with applicable WOGCC and WDEQ requirements and approved under BLM Sundry Notice, as appropriate. An estimated 30 new injection wells and 20 produced water handling facilities would be constructed to dispose of produced water. The Operators have no plans for surface discharge of produced water. Conventional wells in the project area average 18 bbls/day of produced water. Produced water, condensate, and gas would be separated at the well site or at central facilities. Depending on the method of disposal, permits are required from WDEQ-WQD (surface) or WOGCC (subsurface) for disposal of produced water.

The Project EIS and any associated approval actions do not include the disposal of produced water from coal bed methane (CBM) development. The actual volumes produced and the methods by which the produced-water would be managed are greatly dependent on the site-specific development proposals, and it would be speculative for the BLM to analyze this aspect of CBM development in detail in this EIS. When the BLM receives site-specific CBM proposals in the CD-C project area, those proposals, including their produced water treatment, will be analyzed in a future NEPA document.

2.1.7 Reclamation

Interim reclamation on well pads and roads would begin as soon as possible after the well is put into production. The reserve pit, that portion of the well location and access road not needed for production operations, and pipeline corridors would be reclaimed according to the requirements specified in the approved APDs. Well pads and roads would be reclaimed and reseeded back to the minimum size required.

When production at a well site is completed, the Operators would cut off the casing three feet below the final graded ground level and cap it. All surface equipment would be removed from the site and the surface would be recontoured to its original appearance, to the extent possible. Topsoil would be distributed over the location to blend the site in with its natural surroundings. All surface disturbance would then be planted with an appropriate seed mixture. Reclaimed sites would be monitored to ensure erosion is prevented and/or controlled and the desired plant species are being re-established. Monitoring would continue until the reclamation is deemed successful.

The CD-C Agency Preferred Alternative includes implementation of Reclamation Guidance (Appendix E of the Draft EIS). The Reclamation Guidance is designed to achieve successful reclamation and with it the various stages of vegetative recovery, while permitting flexibility in site-specific reclamation activities.

3. Habitat/Affected Environment Overview

The CD-C project area is located within the Omernik Level III "Wyoming Basin" Ecoregion 18 (Omernik 1987), a broad intermontane basin dominated by arid grasslands and shrublands and interrupted by high hills and low mountains. Two Level IV Ecoregions are present within the project area: 18a (Rolling Sagebrush Steppe) and 18e (Salt Desert Shrub Basins).

Ecoregion 18a is a vast, semiarid region of rolling plains, alluvial and outwash fans, hills, cuestas (a ridge with a gentle slope on one side and a cliff on the other), mesas, and terraces. Average annual precipitation in this ecoregion ranges from 10–12 inches depending upon elevation and proximity to mountains. The dominant vegetation is sagebrush (*Artemisia* spp.), often associated with various wheatgrasses (*Agropyron* spp.) or fescue (*Festuca* spp.). The ecoregion is also interspersed with desert shrublands, dunes, and barren area in the more arid parts (e.g., Red Desert), and with mixed-grass prairie at the eastern limit of the ecoregion (Knight 1994). Streams originating in the center of the basin are usually incised with a low gradient with fine gravel substrates derived from shales. Small streams are ephemeral or weakly intermittent with sand or platy shale substrates (EPA 2003, 2004).

The Salt Desert Shrub (18e) ecoregion includes disjunct playas and isolated sand dunes. The plains, terraces, and rolling alluvial fans of Ecoregion 18e have soils that tend to be more alkaline and less permeable than soils in the Rolling Sagebrush Steppe (18a). Vegetation is a sparse cover of xeric-adapted species such as shadscale (*Atriplex confertifolia*), greasewood (*Sarcobatus vermiculatus*), and Gardner's saltbush (*Atriplex gardneri*). Areas with stabilized sand dunes are dominated by alkali cordgrass (*Spartina gracilis*), Indian ricegrass (*Achnatherum hymenoides*), blow-out grass (*Redfieldia flexuosa*), alkali wildrye (*Leymus simplex*), and needle-and-thread (*Hesperostipa comata*). Streams are incised and flow into playa areas that are usually seasonal and have high levels of soluble salts (e.g., Chain Lakes area).

Riparian and wetland habitats are found at only a few locations in the project area. Freshwater wetlands in the northern portion of the project area occur along Riner Road (BLM 3203) in the Chain Lakes area, and along Luman Road (SCR 20) north of Horseshoe Bend, where a flowing well supplies year-round water to an enclosed water impoundment surrounded by emergent vegetation. The George Dew/Red Wash wetland complex is located near Dad about 25 miles north of Baggs, west of and adjacent to WY 789. This site encompasses approximately 6 miles of willow-dominated (*Salix* sp.) riparian corridor along Muddy Creek with associated floodplain and meadows ranging from 0.25 to 0.75 mile wide, constructed and natural impoundments, and adjacent upland sites dominated by greasewood, sagebrush, and Gardner saltbush.

The primary cover types associated with these two ecoregions are described in **Table 3-1** and **Map 3-1.**

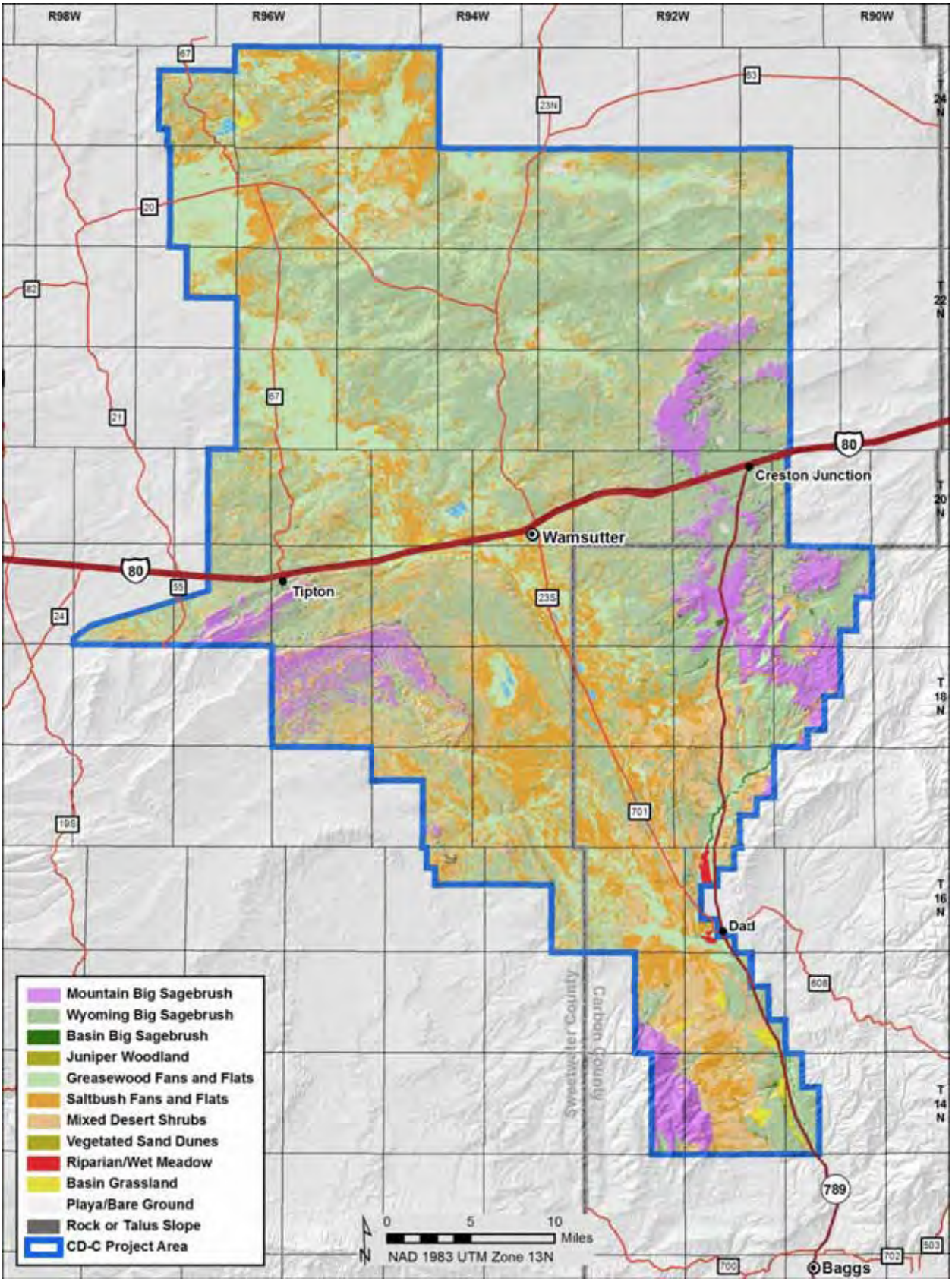
Table 3-1. Primary cover types within the CD-C project area

Primary Area	Acres	Percent of Total Project Surface Area
Wyoming Big Sagebrush	417,572.7	39.00
Greasewood flats and fans	246,272.7	23.00
Saltbush flats and fans	172,698.7	16.10
Mixed desert shrub	142,062.6	13.30
Mountain Big Sagebrush	54,605.9	5.10
Basin Big Sagebrush	7,157.1	0.70
Basin grassland	5,122.2	0.50
Bare ground	4,117.5	0.40
Water	2,128.5	0.20
Rock or talus slope	1,033.9	0.10
Riparian/wet meadow	1,003.7	0.10
Juniper woodland	536.0	0.05
Vegetated sand dunes	275.5	0.03
Playa	124.3	0.01

Almost all of the CD-C project area drains into two basins: the Little Snake River Basin (a component of the Colorado River system) and the Great Divide Basin. A very small portion of the far western part of the project area drains into Bitter Creek, also a component of the Colorado River system. Muddy Creek, which drains the southeastern portion of the project area, feeds into the Little Snake River Basin. The majority of the northern part of the project lies within the Great Divide Basin, which is closed, with no outflow to an ocean.

Except for Muddy Creek, perennial streams are not present within the project area due to limited precipitation. The majority of drainages within the project area are ephemeral. Ephemeral water tables are always below the stream channel, only flowing in direct response to precipitation or snowmelt. Ephemeral waters only support very limited aquatic communities for the short periods when surface flow is present, although some ephemeral streams in the project area may be used for spawning.

Muddy Creek is the largest stream within the project area. It is a warm-water stream that is designated as class 2AB by the Wyoming Department of Environmental Quality (WDEQ) and supports game and non-game species. Muddy Creek exhibits perennial flow for the majority of its length and in some years flows intermittently as a result of irrigation water removal south of the George Dew/Red Wash wetlands complex. In years with high runoff amounts, Muddy Creek flows perennially throughout its length. The stream typically becomes intermittent during late summer and early fall. Muddy Creek has alkaline pH (8.2–8.6) and relatively high Total Dissolved Solids (346–2,810 mg/L). Dissolved oxygen measurements were high, generally ≥10 mg/L. These values were of sufficient quality to support aquatic life. No streams other than Muddy Creek within the project area sustain any fish species (WGFD 1998).



Map 3-1. Major land cover types within the CD-C project area

No warranty is made by the BLM for use of the data for purposes not intended by the BLM.

About 286 reservoirs and ponds (<1–960 acres) are present within the project area. Some of these are fed by waters recovered from wells drilled at upstream locations, while others are impoundments on small drainages. These man-made impoundments are generally designed to supply water for livestock and wildlife use. Only one of these, Little Robbers Gulch Reservoir, is stocked annually with Colorado River cutthroat trout (*Oncorhynchus clarkii pleuriticus*) by the WGFD. None of the others are known to sustain fisheries.

As described in **Section 2.1**, up to 8,950 new natural gas wells and ancillary facilities would be anticipated over the 15-years development period. The project is estimated to initially disturb a total of 43,808 surface acres, which represents about 4.1 percent of the total land surface of the project area. During the projected 30–50 year life of the project, the initial 43,808 acres of disturbance would be reduced to about 17,628 acres depending upon time required for successful reclamation. In addition to the 43,808 acres initially disturbed by implementation, an estimated 60,176 acres of historic disturbance already exist within the project area. The addition of historic disturbance to CD-C project disturbance would result in a grand total of 103,984 acres or about 9.7 percent of the total project area. Much of that earlier disturbance remains unvegetated and in use, an estimated 17,663 acres. Together with long-term disturbance from the CD-C project, up to 35,291 acres, or about 3.3 percent of the total project area would remain in an unvegetated state.

The majority of development would likely occur in the Wyoming big sagebrush, greasewood flats and fans, and saltbush flats and fans primary cover types, which collectively occupy about 78 percent (**Table 3-1**) of the project's land surface area. Wyoming big sagebrush plant communities typically occur on sites with low precipitation and poor soil development, which increases the difficulty of reclamation and makes it likely that only initial shrub re-establishment would occupy disturbed sites during the estimated 30–50 year life of the project. Greasewood communities occupy about 246,000 acres (**Table 3-1**) within the project area. They are primarily located within the Muddy Creek drainage in the southern portion of the project area and within several large greasewood-dominated flats in the Red Desert Basin area in the northern portion of the project area.

Due to the scarcity of wetland/riparian sites on the project area, the probability of well pads, roads, pipelines, and ancillary facilities impacting these resources is low. The Rawlins RMP (BLM 2008b) specifies that a 500-foot buffer be maintained around perennial waters, springs, wells, wetlands, and areas within 100 feet of the inner gorge of ephemeral channels. These restrictions not only protect perennial water sources and wetland/riparian sites, but also basin big sagebrush sites which are often located in or adjacent to ephemeral drainages and provide protection and foraging habitat for numerous wildlife species, including Greater Sage-Grouse. The probability of removing wetland vegetation or disturbing any Waters of the U.S. is low due to their low occurrence within the project area and existing federal and state laws and regulations providing for their protection.

4. Status of Species and Critical Habitat in the Project Area by Species

Of the 21 Threatened, Endangered, Proposed, or Candidate species and/or areas of designated Critical Habitat that occur in, or downstream from, Carbon and Sweetwater counties where the project is located (**Table 1-1**) only eight are potentially present within, or downstream from, the CD-C project area (USFWS 2013a, **Table 4-1**). The black-footed ferret, yellow-billed cuckoo, Wyoming toad, Preble's meadow jumping mouse, blowout penstemon, Colorado butterfly plant and its Critical Habitat, and the five listed North Platte River species and their Critical Habitat are located within the RFO; however, they are not located nor do they have habitat within or near the CD-C project area.

Table 4-1. Occurrence potential of Threatened, Endangered, Proposed, and Candidate species within or near the CD-C project area

Species	Scientific Name	Occurrence Potential within the project area[1]	Status[2]
Mammals			
Canada lynx	*Lynx canadensis*	VU	Threatened
Birds			
Greater Sage-Grouse	*Centrocercus urophasianus*	P	Candidate
Fish[3]			
Bonytail	*Gila elegans*	PAD	Endangered
Colorado pikeminnow	*Ptychocheilus lucius*	PAD	Endangered
Humpback chub	*Gila cypha*	PAD	Endangered
Razorback sucker	*Xyrauchen texanus*	PAD	Endangered
Colorado River System Critical Habitat		PAD	
Plants			
Ute ladies'-tresses	*Spiranthes diluvialis*	U	Threatened

[1] *Occurrence potential includes: present (P); potentially present (pp); unlikely (U); very unlikely (VU); and potentially affected downstream (PAD).*

[2] *Candidate species are those for which the USFWS has sufficient information to propose for listing as Threatened or Endangered under the ESA, but for which development of a proposed listing regulation is precluded by other higher priority listing actions. Proposed species are those Candidate species that were found to warrant listing as either Threatened or Endangered and are currently undergoing a 12-month status review. Conservation measures for Candidate and Proposed species are voluntary but recommended because, by definition, the species may warrant future protection under the ESA if adequate conservation measures are not in place.*

[3] *Present in the Colorado River system downstream of the project area.*

Table 4-2 provides a summary of the anticipated impacts of the CD-C project on the ESA-listed and Candidate species shown in **Table 4-1**.

Table 4-2. Summary of project impacts on Threatened, Endangered, Proposed, and Candidate species within or near the CD-C project area

Feature Resource	Impact
Canada lynx	May affect but not likely to adversely affect due to the lack of suitable habitat and the requirement to avoid impacts to riparian systems.
Endangered fish	May affect and is likely to adversely affect; additionally, the project may contribute to the destruction or modification of designated Critical Habitat.
Ute ladies'-tresses	May affect but not likely to adversely affect due to the lack of suitable habitat and the requirement to avoid impacts to riparian systems.

4.1 Canada Lynx

The Canada lynx is a medium-sized cat with long legs, large, well-furred paws, long tufts on the ears, and a short, black-tipped tail. The winter pelage of the lynx is dense and has a grizzled appearance with grayish-brown mixed with buff or pale brown fur on the back, and grayish-white or buff-white fur on the belly, legs and feet. Summer pelage of the lynx is more reddish to gray-brown. Adult males average 10 kilograms (22 pounds) in weight and 85 centimeters (33.5 inches) in length (head to tail), and females average 8.5 kilograms (19 pounds) and 82 centimeters (32 inches). The lynx's long legs and large feet make it highly adapted for hunting in deep snow (USFWS 2013b).

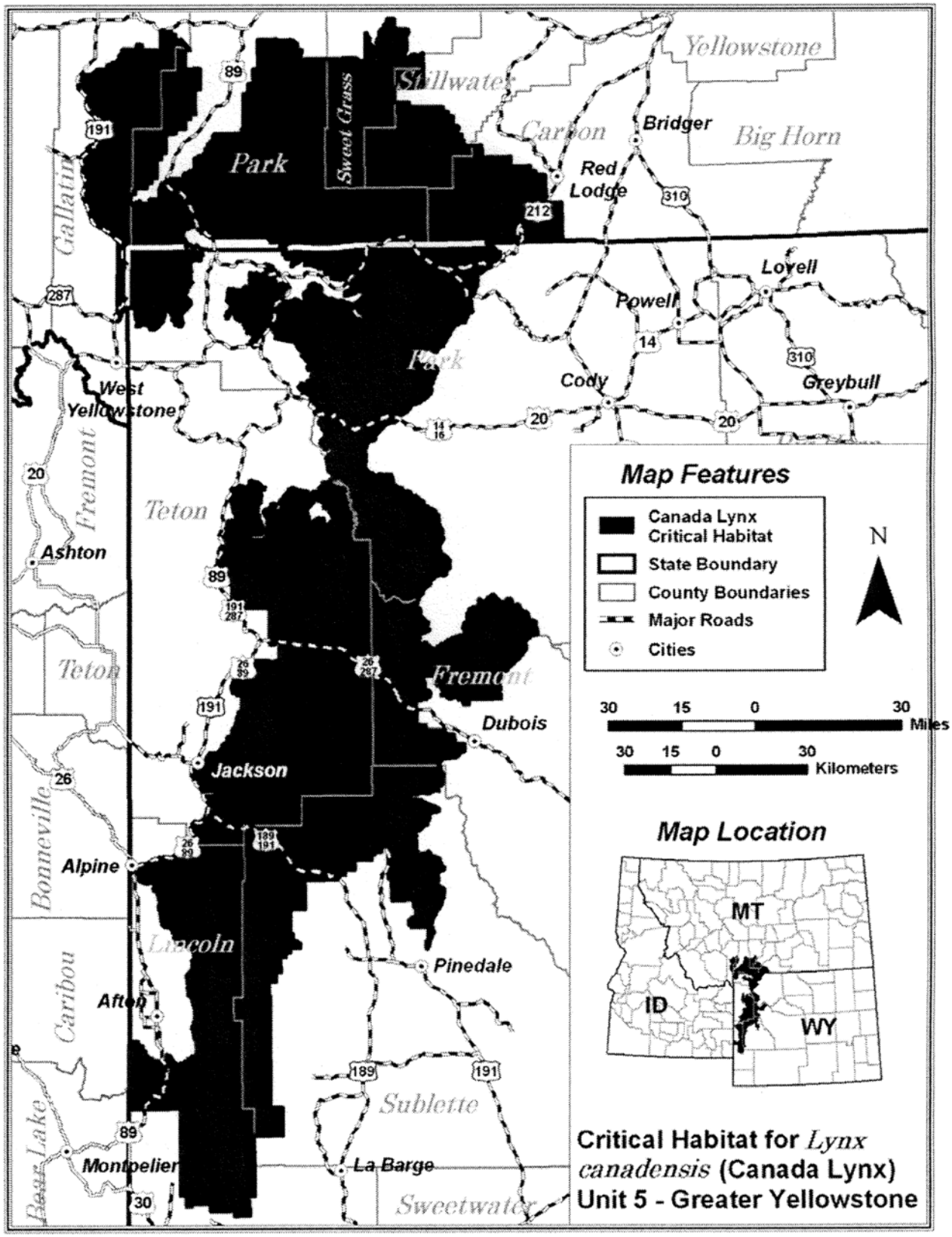
The distribution of lynx in North America is closely associated with the distribution of North American boreal forest. In Canada and Alaska, lynx inhabit the classic boreal forest ecosystem known as the taiga. The range of lynx populations extends south from the classic boreal forest zone into the subalpine forest of the western United States, and the boreal/hardwood forest ecotone in the eastern United States. Forests with boreal features extend south into the contiguous United States along the North Cascade and Rocky

Mountain Ranges in the west, the western Great Lakes Region, and northern Maine. Within these general forest types, lynx are most likely to persist in areas that receive deep snow and have high-density populations of snowshoe hares, the principal prey of lynx (USFWS 2013b).

In 1999, the Colorado Department of Wildlife (CDOW) began reintroducing the Canada lynx into the San Juan Mountains of southwest Colorado. Subsequent radio and satellite tracking has demonstrated reproduction and dispersal of individuals from the southern Colorado re-introduction area through the Colorado Rockies and into the Medicine Bow National Forest in south-central Wyoming, continuing northwest into the Greater Yellowstone Area (GYA), supporting the possibility of dispersal through the project area (CDOW 2010).

The Wyoming BLM issued a Statewide Programmatic Biological Assessment for Canada lynx (BLM 2005) which provides support for the concept of CD-C project area riparian corridors potentially serving as travel linkages for the species, "The Rawlins FO does, however, have non-delineated potential travel linkage and movement corridors that may be of value to lynx. These include: 1) a number of riparian corridors coming out of the Sierra Madre range; 2) the low-elevation, sparsely forested lodgepole and ponderosa pine and juniper stands between the Medicine Bow and Sierra Madre ranges may be useful for movement between the two mountain ranges; and 3) a potential corridor along the Shirley, Seminoe and Ferris mountains, which (along with the Green and Crooks mountains) form a linkage between the Medicine Bow Range and the Wind River Range." This biological assessment also provides direction for "an action plan delineating these three linkage corridors and determining any management restrictions needs to be developed to further the conservation of the lynx"; however, this plan has not yet been developed.

The GYA is identified as Unit 5 of designated Critical Habitat for the species in the lower 48 states and comprises Yellowstone National Park and surrounding lands in southwest Montana and northwest Wyoming including Park, Teton, Fremont, Sublette, and Lincoln Counties in Wyoming (**Map 4-1**). This area was occupied by lynx at the time of listing and is currently occupied by the species. The area contains the physical and biological features essential to the conservation of the lynx. The GYA is naturally marginal lynx habitat with highly fragmented foraging habitat (USFWS 2009). Unit 5 is the southernmost of the designated Critical Habitat areas; no Critical Habitat for the species has been designated in Colorado or south-central Wyoming.



Map 4-1. Canada Lynx Critical Habitat Unit 5 (USFWS 2009)

4.2 Colorado River Fish

Four federally Endangered fish species may occur as downstream residents of the Colorado River System: Colorado pikeminnow (*Ptychocheilus lucius*), bonytail (*Gila elegans*), humpback chub (*Gila cypha*), and razorback sucker (*Xyrauchen texanus*) (USFWS 2004a). The Colorado pikeminnow, bonytail, and humpback chub are all members of the minnow family. The razorback sucker is a member of the sucker family. All four of these fish species share similar habitat requirements and historically occupied the same river systems. Declines in populations of these species are mainly attributed to the impacts of water development (e.g. dams and reservoirs) on natural temperature and flow regimes, creation of migration barriers, habitat fragmentation, the introduction of competitive and predatory non-native fishes, and the loss of inundated bottom lands and backwater areas (Minckley and Deacon 1991, USFWS 1993). The Final Programmatic Biological Opinion on the Management Plan for Endangered Fishes in the Yampa River Basin, also identifies pesticides and pollutants as additional threats to the four Colorado River fish species (USFWS 2005b).

The last sighting of any of these fish species in the Little Snake River was of a single Colorado pikeminnow in 1990. No Critical Habitat for these species has been designated in Wyoming (Upper Colorado River Endangered Fish Recovery Program 1999). However, the potential for project-related reductions in water quantity and/or quality to tributaries to the Colorado River warrant their inclusion in this EIS.

Habitat of the **bonytail** is primarily limited to narrow, deep, canyon-bound rivers with swift currents and whitewater areas (Valdez and Clemmer 1982; Archer *et al.* 1985; Upper Colorado River Endangered Fish Recovery Program 1999). With no known reproducing populations in the wild today, the bonytail is thought to be the rarest of the Endangered fishes in the Colorado River System. The bonytail historically inhabited portions of the upper and lower Colorado River basins. Today in the upper Colorado River Basin, only small, disjunct populations of bonytail are thought to exist in the Yampa River in Dinosaur National Monument, in the Green River at Desolation and Gray canyons, in the Colorado River at the Colorado/Utah border, and in Cataract Canyon (USFWS 2005b).

The **Colorado pikeminnow** is the largest member of the minnow family and occurs in swift, warm waters of the Colorado River basins. The species was once abundant in the mainstem of the Colorado River and most of its major tributaries throughout Wyoming, Colorado, Utah, New Mexico, Arizona, Nevada, California, and Mexico. It was known to occur historically in the Green River of Wyoming at least as far north as the City of Green River. In 1990, one adult was collected from the Little Snake River in Carbon County, Wyoming (Baxter and Stone 1995). Subsequent survey attempts to collect Colorado pikeminnow from this area of the Little Snake River by WGFD personnel failed to yield any other specimens.

Habitat of the **humpback chub** is also limited to narrow, deep, canyon-bound rivers with swift currents and whitewater areas (Valdez and Clemmer 1982, Archer *et al.* 1985, USFWS 2005b). The humpback chub was historically found throughout the Colorado River System and its tributaries, which are used for spawning (Valdez *et al.* 2000). It is estimated that the humpback chub currently occupies 68 percent of its original distribution in five independent populations that are thought to be stable (Valdez *et al.* 2000).

The **razorback sucker** is an omnivorous bottom-feeder and is one of the largest fishes in the sucker family. Adult razorback sucker habitat use varies depending on season and location. This species was once widespread throughout most of the Colorado River Basin from Wyoming to Mexico. Today in the Colorado River Basin, populations of razorback suckers are only found in the upper Green River in Utah, the lower Yampa River in Colorado, and occasionally in the Colorado River near Grand Junction (USFWS 2005b).

Suitable habitat for these four fish species exists downstream of the project area in the Little Snake, Yampa, and Green Rivers. Because the Colorado pikeminnow is found in the Little Snake River, it could migrate into Muddy Creek. Muddy Creek, however, is not suitable habitat for this species.

The Upper Colorado River Endangered Fish Recovery Program is a partnership working to recover the Endangered fish of the Upper Colorado River Basin (USFWS 2005b). The goal of recovery is to achieve natural, self-sustaining populations of the Endangered fish so that they no longer require protection under the ESA. Under the Recovery and Implementation Program (RIP) for Endangered Fish Species in the Upper Colorado River Basin, "any water depletions from tributary waters within the Colorado River drainage are considered as jeopardizing the continued existence of these fish." Tributary water is defined as water that contributes to instream flow habitat. Depletion is defined as water that would contribute to the river flow if not intercepted and removed from the system.

The FWS has determined that progress made under the RIP has been sufficient to merit a waiver of the mitigation fee for depletions of 100 acre-feet per year or less (Memorandum dated April 9, 1995 to Assistant Regional Director, Ecological Services, Region 6, from Regional Director 6, "Intra-Service Section 7 Consultation for Elimination of Fees for Water Depletions of 100 acre-feet or Less from the Upper Colorado River Basin"). Depletions of 100 acre-feet or more per year may require payment of a one-time depletion fee by the project proponent.

4.3 Ute Ladies'-tresses

Ute ladies'-tresses (*Spiranthes diluvialis* Sheviak) was designated by the FWS as a Threatened plant species throughout its range in 1992. The FWS, Wyoming Ecological Field Office, has determined that Ute ladies'-tresses may occur in suitable habitats within Carbon and Sweetwater counties, where the CD-C project is located (**Table 4-1**). The species is endemic to moist soils near wetland meadows, springs, lakes, and perennial streams with an elevation range of known occurrences from 4,200 to 7,000 feet (although no known populations in Wyoming occur above 5,500 feet). Ute ladies'-tresses is not known to occur within the CD-C project area and the likelihood of occurrence is low for the following reasons: (1) much of the project area is very arid and there are few perennial streams; (2) the elevation of the project area is near the upper limit for the species; (3) very few moist riparian area meadows are present; (4) where moist soils are present, the transition from stream margins to upland vegetation is abrupt; and (5) in Wyoming, the species has only been located in the eastern and southeastern portions of the state, in Converse, Goshen, Laramie, and Niobrara Counties (Fertig 2000).

As a component of the requirements for the CD-C EIS and to fulfill FWS Section 7 requirements of the ESA, Hayden-Wing Associates, LLC (HWA) conducted field surveys during the 2006 and 2007 growing seasons to locate and map special status plants populations identified by the RFO and the FWS (HWA 2008). Ute ladies'-tresses was included in the surveys. These surveys failed to document the presence of Ute ladies'-tresses or any suitable habitat within the CD-C project area. The survey indicated that the likelihood of finding suitable habitat for Ute-ladies tresses within the project area is minimal based on the following assessment, using FWS-defined disqualifying factors (USFWS 1995), of potential habitat made during the survey:

1. **Appropriate hydrology is not present**, typically indicated by an area of mostly upland vegetation that dries up by mid-July, with a water table lower than 12 inches below the surface. The potential areas surveyed were dominated by upland plant species such as Western wheatgrass, threadleaf sedge, Plains pricklypear cactus, Gardner's saltbush and Wyoming big sagebrush. With the exception of the George Dew/Red Wash wetland complex, the areas surveyed are dry by mid-July, with a water table lower than 12 inches below the soil.
2. **The soils in the survey areas are strongly alkaline**, typically indicated by whitish (alkali) residue on ground surface where pools have evaporated, salt marks present along stream shoreline and water's edge, and the presence of salt-tolerant invasive plants. The survey indicated the presence of high salt content soils along Muddy Creek and stream bank salt marks. In addition, there was a dominance of saline-tolerant plant species along Muddy Creek.
3. **The soils in the survey areas are predominantly heavy clays.** Muddy Creek channels and streambeds are dominated by heavy clay soils. Most of the upland areas surveyed have a high

proportion of clays which are members of the smectite group (mostly montmorillonite) with clay-derived shale outcrops fairly common; during the geologic past, natural erosion has deposited these upland, shale-derived clays, into the draws and water channels of the project area.

4. **The sites are heavily disturbed**. This factor was not applicable to the survey areas.
5. **Streams tend to be deeply incised** and the transition from upland areas to the stream margin is abrupt. Stream banks of Muddy Creek are steep and demonstrate an abrupt transition zone from upland vegetation to species normally associated with riparian habitats.
6. **Site characterized by apparent non-moving water** where cattails, bulrushes, and other aquatic-type vegetation are dominant. Riparian areas surveyed such the George Dew/Red Wash wetland complex are vegetated with dense rhizomatous species such as reed canarygrass and cattails.
7. **Riparian areas or stream banks vegetated with dense rhizomatous species** such as reed canarygrass and cattails. Riparian areas surveyed such the George Dew/Red Wash wetland complex are vegetated with dense rhizomatous species such as reed canarygrass and cattails.
8. **Riparian areas have been overgrazed** to the point that only native upland species and invasive weeds are present. This factor was not applicable to the survey areas.
9. **Potential habitat is no longer in a natural condition.** This factor was not applicable to the survey areas.
10. **Wetland is a brackish playa or pothole not fed by a perennial water source** or connected by a source of fresh water. This factor was not applicable to the survey areas.

The potential Ute ladies'-tresses habitat areas surveyed met six of the ten disqualifying factors defined by the FWS and the remaining four were not applicable.

Critical Habitat for the Ute ladies'-tresses within the project area has not been designated by the FWS.

5. Direct and Indirect Impacts of the Proposed Project by Species

5.1 Canada Lynx

Direct Impacts

Due to the lack of suitable habitat and the extremely limited possibility of lynx using the project area as a travel corridor, direct impacts to the species are not anticipated. The BLM Rawlins RMP established required riparian area setbacks of 500 feet for disturbance actions (BLM 2008b). This setback would further reduce the opportunity for direct impact to any transient lynx.

Indirect Impacts

Indirect impacts to the species could result from the removal of, or impacts to, riparian areas used as travel corridors. The mitigations established by the RMP to protect riparian areas (avoidance by 500 feet) would protect potential travel corridors in the project area.

5.2 Colorado River Species

Direct Impacts

Suitable habitat for the four Colorado River fish species is not found in the CD-C project area but exists downstream of the project area in the Little Snake, Yampa, and Green Rivers. Because the Colorado pikeminnow is found in the Little Snake River, it could migrate into Muddy Creek. Muddy Creek, however, is not considered suitable habitat for this species. Designated Critical Habitat is located well downstream from the CD-C project area, where the Little Snake River meets the Yampa River, about 75 miles away. Although these fish species currently only exist downstream of the project area, water draining from

the project area affects the downstream habitat for these species. The sources of risks to these fish species are water depletions, discharges of produced water, and spills of toxic materials.

Produced water from the CD-C project would not be discharged to the surface and hence produced water would not find its way to Muddy Creek and the Little Snake River drainage. Therefore, produced-water discharges will not pose a risk to these species. For any future proposals involving CBM, the proposed treatment and disposal of produced water will be analyzed in a separate NEPA document.

Accidental releases (e.g., spills) of toxic chemicals could occur. However, accidental releases of toxic chemicals would become highly diluted before they would reach any downstream waters where these species occur; consequently, the risks from such occurrences are negligible (BLM 2007a). For example, the average annual discharge from 2004-2012 (the period of record) for Muddy Creek at USGS Station 09258980 near Baggs, immediately upstream from the Little Snake River, is 22 cfs. Average annual discharge in the Little Snake River near Slater at USGS Station 09253000, upstream of the confluence of Muddy Creek, for this same period was 259 cfs, 12 times greater than the flow in Muddy Creek. Average annual discharge in the Yampa River at USGS Station 09260050 near Deer Lodge, downstream of the confluence of the Yampa River with the Little Snake River for this same period was 2189 cfs, which is 98 times greater than the average annual discharge in Muddy Creek. Average annual discharge in the Green River at USGS Station 09261000 near Jensen, UT for this same period was 3887 cfs, which is 173 times greater than the average annual discharge in Muddy Creek near Baggs. On average, Muddy Creek water is diluted by flow in the Little Snake River about 12:1, by flow in the Yampa River about 98:1 and by flow in the Green River about 173:1. Any toxic chemicals in accidental spills to Muddy Creek would be diluted similarly, greatly reducing their potential toxicity to fish in these waters.

Indirect Impacts

The Upper Colorado River Endangered Fish Recovery Program is a partnership working to recover the Endangered fish of the Upper Colorado River Basin. The goal of recovery is to achieve natural, self-sustaining populations of the Endangered fish so that they no longer require protection under the ESA. Under the Recovery and Implementation Program (RIP) for Endangered Fish Species in the Upper Colorado River Basin, "any water depletions from tributary waters within the Colorado River drainage are considered as jeopardizing the continued existence of these fish." Tributary water is defined as water that contributes to instream flow habitat. Depletion is defined as water that would contribute to the river flow if not intercepted and removed from the system.

The FWS has determined that progress made under the RIP has been sufficient to merit a waiver of the depletion fee, which helps fund the RIP, for depletions of 100 acre-feet per year or less (Memorandum dated April 9, 1995 to Assistant Regional Director, Ecological Services, Region 6, from Regional Director 6, "Intra-Service Section 7 Consultation for Elimination of Fees for Water Depletions of 100 acre-feet or Less from the Upper Colorado River Basin"). The Preferred Alternative, however, is estimated to deplete more than 100 acre-feet per year so a one-time depletion fee may be required.

The CD-C proponents do not intend to use any surface water in their development and production activities. Water needed for drilling and completion activities would come from new and existing State Engineer's Office (SEO)-approved local water wells, as well as from produced-water sources. Most (96 percent) SEO-approved wells are completed in Tertiary age aquifers, particularly the Wasatch Formation. According to Mason and Miller (2005), the Wasatch Formation has the potential to lose groundwater to the southeast and ultimately to the Colorado River system. Roughly 20 percent of the Wasatch Formation within the CD-C project area is within that portion of the Washakie Structural Basin that loses groundwater to the southeast toward the Little Snake River, a tributary of the Colorado River. As such, an interruption of this groundwater flow could lead to depletions to the Colorado River system, although the proportion of flow in the Little Snake River that comes from groundwater discharge from the Wasatch Formation has not been quantified.

The CD-C project's estimated annual freshwater use would range from 1,856 to 3,248 ac-ft /yr and would average 2,552 ac-ft /yr. Assuming that CD-C project groundwater use from the Wasatch Formation is

evenly distributed across the project area, approximately 20 percent of the groundwater would come from that portion of the Wasatch Formation that could contribute water to the Little Snake River. Therefore, a range of 371 to 650 ac-ft, of groundwater, averaging 510 ac-ft, would be removed from the Wasatch Formation in this area each year. Fisk (1967) estimated that the Wasatch Formation within the Washakie Structural Basin holds some 300,000,000 ac-ft of groundwater in storage. In light of this volume of groundwater in storage, the average 510 ac-ft/yr withdrawn from the Wasatch Formation within the Washakie Structural Basin (estimated at removal of 0.00017% of the water in the formation each year) would likely have no measurable effect on Colorado River flows. However, these groundwater withdrawals may result in a depletion in the Colorado River flows and therefore the project proponent may be required to make a contribution to the Upper Colorado River Endangered Fish Recovery Program for water depletions.

5.3 Ute Ladies'-tresses

Direct Impacts

Potential direct impacts to Ute ladies'-tresses include destruction of plants or suitable habitat by construction or other activities related to well pads, roads, pipelines or other facilities. However, suitable habitat is not known to occur within the CD-C project area and the likelihood of occurrence on public, state, or private lands within the project area is low because much of the project area is very arid and there are few perennial streams, the elevation of the project area is near the upper limit for the species, very few moist riparian area meadows are present, and, where moist soils are present, the appropriate site specific conditions are not found. CD-C project surveys in 2006 and 2007 established that the few areas of potential habitat met a number of the factors established by the FWS that disqualified them as suitable habitat. Because the potential for occurrence of the plants or their habitat on public, state, or private lands in the project area is low, the likelihood of direct impacts to Ute ladies'-tresses is also low.

The low likelihood of impact is further reduced by protective measures that would insure that activities that might directly impact plants or habitat would not occur within that habitat. The Rawlins RMP bars surface disturbing activity within 500 feet of perennial waters, springs, and wetland and riparian areas, the types of areas where Ute ladies'-tresses habitat might be located. In addition, USACE guidelines require identification and protection of wetlands, special aquatic sites, and other waters of the U.S. (USACE 2013). Wetlands include marshes, wet meadows, and streams that are ephemeral, intermittent, or perennial. Other non-wetland surface waters such as playas, ponds, reservoirs, irrigation ditches and canals are also included. Protection of these landscape features would also serve to protect Ute ladies'-tresses habitat, in the unlikely event that such habitat was present in the CD-C project area.

Indirect Impacts

Ute ladies'-tresses could be indirectly affected by activities that occurred at some distance from any plants and habitat but that might still produce an adverse effect. Such activities within the CD-C project area could include accidental releases of pollutants associated with construction, drilling, and production operations and potential changes to the downstream hydrology and hydrograph of streams, seeps and springs with suitable habitat. The impacts of discharges of produced water from CBM operations is not considered here because such activities have been specifically excluded from this EIS and, if proposed, would be treated in a separate NEPA analysis.

The lack of suitable habitat within the project area makes the likelihood of indirect impacts occurring low. In addition, authorization of the proposed project would require full compliance with the Federal Clean Water Act (CWA), EO 11990 (wetlands protection), and EO 11988 (floodplain protection), and their permitting regulations at the federal and state level. These regulations address development of surface runoff, erosion, and sediment control plans; injection-well permitting; oil-spill containment and contingency plans; Stormwater Pollution Prevention Plans; Spill Prevention Control and Countermeasures Plans; and CWA Section 404 permits. Adherence to these plans, permits, leases, and

regulations for the protection of water resources would further decrease the likelihood that suitable habitat, if it occurred within the CD-C project area, would be indirectly impacted.

6. Cumulative Effects of Proposed Project

Cumulative effects are "the effects of future state, tribal, local or private actions that are reasonably certain to occur in the action area considered" in this biological assessment. Future federal actions that are unrelated to the CD-C project are not considered in this section because they require separate consultation pursuant to Section 7 of the Act (USFWS 1998). The cumulative effects analysis area for Canada lynx and Ute ladies'-tresses is the CD-C project area. For the four Colorado River fish, the cumulative effects analysis area includes the Muddy Creek drainage and the Little Snake River watershed.

As discussed in **Section 2** of this biological assessment, the central portion of the project area lies within the checkerboard, a pattern of land ownership resulting from early land grants from the federal government to the Union Pacific Railroad Company. The BLM, the State of Wyoming, and private parties own the surface and mineral resources covering these lands. The RFO manages BLM surface lands and the federal mineral estate in the project area. The BLM manages approximately 626,932 surface acres (58.6 percent), the State of Wyoming owns approximately 48,684 acres (4.5 percent), and private landowners own approximately 394,470 acres (36.9 percent), as shown in **Map 2-1**.

"Actions that are reasonably certain to occur" include only future non-federal actions and not past and present activities and generally only actions for which a strong, current indicator of intent is available, such as an existing or imminent state permit. Past activities that are ongoing and will continue into the future, such as livestock grazing, are included. The only actions in the CD-C action area that are reasonably certain to occur on private or state lands and that do not have a federal nexus are livestock grazing on those lands and those few oil and gas drilling actions that would not require a federal permit of some kind. Most future actions that are reasonably certain to occur within the cumulative effects analysis area would require some form of federal permit, such as a right-of-way across BLM land in the checkerboard, and would thus require separate Section 7 consultation.

6.1 Canada Lynx

The cumulative effects analysis area for Canada lynx encompasses the CD-C project area. Cumulative impacts relative to the Canada lynx would result from individual well projects occurring in the CD-C on state or fee minerals and lands with no federal nexus. In the analysis area there are limited riparian corridors that the species could use for travel between the occupied habitats in northern Colorado, the Sierra Madre and the GYA. These areas could be impacted by non-federal actions that are not designed and implemented to avoid riparian systems.

6.2 Colorado River Species

The cumulative effects analysis area for the Endangered Colorado River fish species includes the Muddy Creek drainage and the Little Snake River watershed. The types of non-federal activities in the area that might affect the four fish include livestock grazing on private and state lands and those few oil and gas drilling actions that would not require a federal permit of some kind. No specific activities have been identified. The activities are not expected to generate more than minimal impacts on Muddy Creek and the Little Snake River. The amount of water depletions other than for the CD-C project, is indeterminate but is expected to be small.

6.3 Ute Ladies'-tresses

The cumulative effects analysis area for Ute ladies'-tresses encompasses the CD-C project area. The types of non-federal activities in the area that might affect the plant include livestock grazing on private and

state lands and those few oil and gas drilling actions that would not require a federal permit of some kind. As described in the biological opinion for the ROD of the Rawlins RMP, Appendix 14 (BLM 2008b), impacts to Ute ladies'-tresses from livestock grazing on private lands could be beneficial (maintaining habitat through grazing or haying) or detrimental (limiting individual plant reproductive fitness by removal of fruiting parts through trampling or ingestion). However, as previously described, direct and indirect impacts to Ute ladies'-tresses as a result of the CD-C project are not anticipated to occur because the potential for occurrence within the project area is so low.

7. Conservation Measures by Species

The Rawlins RMP ROD (BLM 2008b) on page 2-54 provides the following overarching commitments for the protection of federally listed Endangered, Threatened, Proposed, and Candidate Species:

1. *Informal conferencing and consultation with the USFWS will occur for authorized activities that would potentially affect the habitat for Endangered, Threatened, Proposed, and Candidate species within the RMPPA (Appendix 10).*
2. *Habitat and species conservation measures for Threatened, Endangered, Candidate, and Proposed species are identified in the biological assessment (USDI, BLM 2008) and the biological opinion (USDI, BLM 2008). Both documents will be adhered to for compliance with the ESA and the BLM Wyoming State Director's Sensitive Species List (BLM Manual 6840). Conservation measures will be applied to all surface disturbing and disruptive activities, as appropriate. Appendix 14 lists all reasonable and prudent measures and terms and conditions for Threatened and Endangered species and conservation measures for Proposed and Candidate species.*

In addition, the RFO provides a substantial number of measures that protect wildlife habitats in general and also minimize the surface and activity disturbance that could produce direct and indirect effects on listed or proposed species. Appendix C of the draft EIS (attached) describes the standard Conditions of Approval (COAs) that the RFO places on Applications for Permit to Drill (APDs) to achieve those conservation goals and also references BMPs that the RFO can require as appropriate. Those BMPs and the entire Rawlins RMP Record of Decision can be found at:
http://www.blm.gov/wy/st/en/programs/Planning/rmps/rawlins/rod_armp.html.

7.1 Canada Lynx

While no habitat for the Canada lynx occurs in the project area it is possible the species moves through the area following riparian corridors as it disperses from occupied habitats to the south and northwest.

Given the protections applied to the riparian areas in the project area (p. 2-50 of the RMP ROD), the project is not likely to affect the Canada lynx:

21. *For the protection of amphibian species and their habitats, surface disturbing and disruptive activities will be avoided in the following areas: (1) identified 100-year floodplains, (2) areas within 500 feet of perennial waters, springs, wells, and wetlands, and (3) areas within 100 feet of the inner gorge of ephemeral channels.*

Best Management Practices from the Rawlins RMP Biological Assessment include the following, which will be considered by RFO staff biologists and applied to the CD-C Project as appropriate:

- Where applicable on BLM-administered lands, key linkage riparian travel corridors should be enhanced or maintained, using the U.S. Forest Service guidelines when possible.
- Evaluations should be made on BLM-administered public lands adjacent to identified lynx habitat to determine whether fire suppression, forest type conversions, and other forest management practices have altered, or have the potential to alter, fire regimes and the functioning of forest ecosystems. Fire management practices should be adjusted where needed to produce forest

composition, structure, and patterns more similar to those that would have occurred under historical succession and disturbance regimes, and would not negatively impact the Canada lynx. Chemical treatments would be considered when beneficial to habitat composition and structure.

- Provide for habitat conditions through time that support dense horizontal understory cover, and high densities of snowshoe hares. This includes, for example, mature multi-storied conifer vegetation, and vegetation management, including timber harvest and use of prescribed fire to increase dense horizontal cover. Design regeneration prescriptions to mimic historical fire (or other natural disturbance) events, including retention of fire-killed trees and coarse woody debris.
- Consider improvement harvests (commercial thinning, selection, etc.) to provide additional denning and foraging habitat. Improvement harvests should be designed to retain and recruit the understory of small diameter conifers and shrubs preferred by hares, as well as coarse woody debris, and maintain or improve the juxtaposition of denning and foraging habitat.
- Burn prescriptions should be designed to retain or encourage shrub and tree species composition and structure that will provide habitat for snowshoe hares, red squirrels, or other alternate prey species. In situations where objectives can still be met, design treatments and fire suppression actions to maximize lynx denning habitat.
- Map and monitor the location and intensity of snow compacting activities (for example, snowmobiling, snowshoeing, cross-country skiing, dog sledding, etc.) that coincide with lynx habitat, to facilitate future evaluation of effects on lynx as information becomes available. As this information becomes available, the types of activities which cause snow-compaction resulting in compromised lynx habitat should be limited or discouraged. Provide, where possible, a landscape with interconnected blocks of foraging habitat.
- Work cooperatively and proactively with the WGFD and other agencies to reduce incidental take of lynx related to trapping and to ensure that important lynx prey are conserved, and provide for unified management direction via habitat conservation plans, conservation easements or agreements, and land acquisitions.
- To reduce mistaken shooting of lynx, initiate and/or augment interagency information and education efforts throughout the range of lynx in the contiguous states. Utilize trailhead posters, magazine articles, news releases, state hunting and trapping regulation booklets, etc. to inform the public of the possible presence of lynx, field identification, and their status.
- Identify, map, and prioritize site-specific locations, using topographic and vegetation features, to determine where highway crossings are needed to reduce highway impacts on lynx, and where needed, develop protection measures such as wildlife fencing and associated underpasses or overpasses to reduce mortalities related to those potential lynx crossings.
- Dirt and gravel roads traversing lynx habitat (particularly those that could become highways) should not be paved or otherwise upgraded (e.g., straightening of curves, widening of roadway, etc.) in a manner that is likely to lead to significant increases in traffic volumes, traffic speeds, increased width of the cleared right-of-way, or would foreseeably contribute to development or increases in human activity in lynx habitat. Whenever rural dirt and gravel roads traversing lynx habitat are proposed for such upgrades, a thorough analysis should be conducted on the potential direct and indirect effects to lynx and lynx habitat.
- Determine where high total road densities (>2 miles per square mile) coincide with lynx habitat, and prioritize roads for seasonal restrictions or reclamation in those areas.
- Minimize building of roads directly on ridge tops or areas identified as important for lynx habitat connectivity, and close newly constructed roads (e.g., for access to mines, leases, or timber harvest) in lynx habitat to limit public use during project activities. This requires the design of new roads, especially near forest entrances, to allow for effective closure upon completion of sale activities, and/or upon project completion, reclaim and obliterate roads.

- Using best available science, develop a plan to identify and protect key linkage areas on federal lands from activities that would create barriers to movement. Barriers could result from an accumulation of incremental projects, as opposed to any one project. Where feasible, within identified key linkage areas, maintain or enhance native plant communities and patterns, and habitat for potential lynx prey species.
- Identify and protect potential security habitats in and around proposed developments or expansions.

7.2 Colorado River Species

Although the CD-C Natural Gas Development Project is not likely to affect the Colorado River species and their downstream habitats, the ROD for the Rawlins RMP (p. 2-54) provides the following Management Actions that will be applied to activities on public lands that would provide assurance that no impacts would occur.

20. *Surface disturbing and disruptive activities will be intensively managed (BMPs) (Appendices 14 and 15) to maintain or enhance reptile and amphibian species and their habitats.*
21. *For the protection of amphibian species and their habitats, surface disturbing and disruptive activities will be avoided in the following areas: (1) identified 100-year floodplains, (2) areas within 500 feet of perennial waters, springs, wells, and wetlands, and (3) areas within 100 feet of the inner gorge of ephemeral channels.*
22. *Fish habitats will be managed to achieve desired future condition (DFC).*
23. *Impoundments and instream structures will be designed to minimize impacts on Special Status fish species and their habitats.*
24. *Road crossings of waterbodies that potentially support fish for a portion of the year will be designed to simulate natural stream processes.*

In addition, the Preferred Alternative of the CD-C EIS places special emphasis on the Muddy Creek and Bitter Creek watersheds to reduce salt and sediment contributions to these watersheds that are tributary to the Colorado River

a. Well pads, access roads, pipelines, and ancillary facilities located within the Muddy Creek and/or Bitter Creek watersheds would be subject to intensive management.

b. A geomorphologic monitoring plan for Muddy Creek (**Appendix O of the FEIS**) has been developed and would be implemented by the BLM.

These measure would provide still further assurance that no impacts would occur on the fish or their habitat.

7.3 Ute ladies'-tresses

Although the occurrence of Ute ladies'-tresses or suitable habitat has not been identified within the CD-C project area, should undetected plants or habitat exist within the area, impacts would be avoided or minimized by the implementation of the 16 Ute ladies'-tresses conservation measures described in the Biological Opinion for the Rawlins RMP (USFWS 2007). The seven measures most likely of use during the CD-C project are:

3. *The Bureau will manage stream habitats to retain, re-create, or mimic natural hydrology, water quality, and related vegetation dynamics. Projects upstream and downstream may alter natural hydrology or water quality, change the vegetation of the riparian ecosystem and cause direct ground disturbance. These projects may adversely affect the orchid. These projects will be*

evaluated and redesigned to ensure that adverse effects to known populations of the orchid do not occur.

5. *Biological control of noxious plant species will be prohibited within 1.0 mile from known Ute ladies' -tresses orchid habitat until the impact of the control agent has been fully evaluated and determined not to adversely affect the plant population. The Bureau will monitor biological control vectors.*

6. *Except in cases of extreme ecological health (insect or weed outbreaks/infestations), herbicide treatment of noxious plants/weeds will be well-regulated within 0.25 miles of known populations of the orchid and insecticide treatments will be well-regulated within 1.0 mile of known populations of Ute ladies' -tresses to protect pollinators.*

   Where insect or weed outbreaks have the potential to degrade area ecological health inside the buffers listed above the following will apply: a pesticide use proposal or other site specific plan will address concerns of proper timing, methods of use, and chemicals. Pesticides specifics to dicots will be preferred where these are adequate to control the noxious weeds present.

   Aerial application of herbicides will be carefully planned to prevent drift in areas near known populations of the orchid (outside of the 0.25 mile buffer). The Bureau will work with the Animal and Plant Health Inspection Service (APHIS), the Service, and County Weed and Pest Agencies to select pesticides and methods of application that will most effectively manage the infestation and least affect the orchid.

7. *If revegetation projects are conducted within 0.25 miles of known habitat for Ute ladies'-tresses orchids, only native species will be selected. This conservation measure will reduce the possibility that non-native species will be introduced and will compete with Ute ladies' -tresses orchids.*

9. *The Bureau will apply a condition of approval (COA) on all applications for permit to drill (APDs) oil and gas wells for sites within 0.25 miles of any known populations of the orchid. This condition will prohibit all authorized surface disturbance and OHV travel from sites containing populations of the orchid. Operations outside of the 0.25 mile buffer of orchid populations, such as "directional drilling" to reach oil or gas resources underneath the orchid's habitat, would be acceptable.*

13. *All proposed rights-of-way projects (powerlines, pipelines, roads, etc.) will be designed and locations selected at least 0.25 miles from any known orchid habitat to minimize disturbances. If avoidance of adverse effects is not possible, the Bureau will re-initiate consultation with the Service.*

14. *All proposed projects will be designed and locations selected to minimize disturbances to known Ute ladies' -tresses populations, and if the avoidance of adverse affects to known populations is not possible, the Bureau will re-initiate consultation with the Service. Projects will not be authorized closer than 0.25 miles from any known populations of the orchid without concurrence/re-initiation of consultation of the Service and the Bureau authorized officer. No ground disturbing construction activities will be authorized within 0.25 miles of any known populations of the orchid during the essential growing season time period (from July through September, the growing, flowering and fruiting stages) to reduce impacts to the species.*

Beyond these measures specific to Ute ladies'-tresses, additional measures that would work against any detrimental impact on the species include:

- A RFO COA—based on the 2008 RMP—applied by BLM on all public lands that bars surface disturbing activity within 500 feet of perennial waters, springs, and wetland and riparian areas—those types of areas where Ute ladies'-tresses habitat might be located.

- USACE guidelines requiring identification and protection of wetlands, special aquatic sites, and other waters of the U.S. on all public, private, and state lands (USACE 2013).
- All regulations and permits associated with the Clean Water Act including: development of surface runoff, erosion, and sediment control plans; injection-well permitting; oil-spill containment and contingency plans; Stormwater Pollution Prevention Plans; Spill Prevention Control and Countermeasures Plans; and CWA Section 404 permits.

The Preferred Alternative of the CD-C EIS places special emphasis on the Muddy Creek Corridor and watershed, including several measures that would work to protect Ute ladies'-tresses and its habitat:

- Well pads, access roads, pipelines, and ancillary facilities located within the Muddy Creek and/or Bitter Creek watersheds would be subject to intensive management (which could include, but is not limited to, site-specific BMPs [determined during the onsite inspection by BLM hydrologist and/or soil scientist, or other applicable specialist] applied during construction and operations, the use of mat drilling, reclamation of access roads to two-tracks once production begins, implementation of and strict adherence to WY-2012-007, consolidation of facilities, closed or semi-closed loop drilling, classification of disturbance in these areas as High Surface Inspection Priorities that would ensure more frequent BLM environmental inspections, consolidation and utilization of existing roads and pipelines, no new road crossings of Muddy Creek, etc.). Additional site-specific measures may be developed during the onsite inspection.
- A geomorphologic monitoring plan for Muddy Creek (**Appendix O** of the FEIS) has been developed and would be implemented by the BLM.

8. Effects Determination for Listed Species

8.1 Canada Lynx

Given the unlikely presence of the species in the CD-C and the mitigations provided for protection of riparian areas, we therefore conclude that the CD-C Natural Gas Development Project *may affect, but is not likely to adversely affect* the Canada lynx.

8.2 Colorado River Species

The BLM has determined that all CD-C groundwater withdrawals from that portion of the Washakie Structural Basin that loses groundwater toward the Little Snake River are to be considered depletions for purposes of the RIP. Furthermore, the BLM proposes that the depletion payment be based on the maximum estimated annual usage - 650 acre-feet per year – to assure that there will be no need to consult again in the event that groundwater withdrawals were to exceed the average of 510 acre-feet per year. Assuming a depletion fee of approximately $20 per acre-foot, a total one-time depletion fee of $13,000 is estimated.

Because the groundwater withdrawals have been determined to constitute a depletion in excess of the minimum figure of 0.1 acre-feet per year considered by the FWS to be the threshold for causing significant effects, it is concluded that the CD-C Natural Gas Development Project *may affect and is likely to adversely affect* the Endangered fish of the Colorado River. Additionally, it is concluded that the project *may contribute to the destruction or modification of designated Critical Habitat* for the Colorado River Endangered fish.

8.3 Ute Ladies'-tresses

In the biological opinion on the Rawlins RMP (USFWS 2007), the FWS concurred with BLM's determination that activities described in the RMP, with the exception of certain livestock grazing

activities, would not likely adversely affect the Ute ladies'-tresses orchid. The concurrence for Ute ladies'-tresses was based on (1) lack of known occupied habitat and (2) the commitment by the BLM to implement conservation measures adequate to ensure that if adverse activities did occur in the habitat of the listed plant, the effects from Bureau activities would be sufficiently minimized by protective buffers, timing restrictions, etc. For the same reasons, this biological assessment has determined, and seeks FWS concurrence, that the Agency Preferred Alternative of the CD-C Natural Gas Development Project *may affect, but is not likely to adversely affect* the Ute ladies'-tresses or its habitat. Potential habitat is limited within the project area and the unsuitability of that habitat and the absence of the species within the habitat were documented. In the unlikely event that the species is discovered within the project area through future BLM-required site-specific surveys and/or USACE Aquatic Resources Inventories (ARIs), potential impacts to the species would be satisfactorily avoided by the conservation measures described in above in **Section 7.3**. If, for some reason, the BLM was unable to avoid such impacts when permitting some activity, the activity would be addressed through consultation with the FWS, with avoidance being the primary objective.

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10. List of Contacts Made/Preparers

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APPENDIX Q2: BIOLOGICAL OPINION

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United States Department of the Interior

FISH AND WILDLIFE SERVICE

Ecological Services
5353 Yellowstone Road, Suite 308A
Cheyenne, Wyoming 82009

DEC 29 2014

In Reply Refer To:
06E13000-2013-F-0044

Memorandum

To: Field Manager, Bureau of Land Management, Rawlins Field Office, Rawlins, Wyoming

From: Field Supervisor, U.S. Fish and Wildlife Service, Wyoming Field Office, Cheyenne, Wyoming

Subject: Final Biological Opinion for the Continental Divide-Creston Natural Gas Project, Carbon and Sweetwater Counties, Wyoming

In accordance with section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 *et seq.*), and the Interagency Cooperation Regulations (50 CFR 402), this document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion based on our review of the proposed Continental Divide-Creston Natural Gas Project located in Carbon and Sweetwater Counties, Wyoming, and its effects on the endangered Colorado pikeminnow (*Ptychocheilus lucius*), humpback chub (*Gila cypha*), bonytail (*Gila elegans*), and razorback sucker (*Xyrauchen texanus*) and their designated critical habitats.

This biological opinion is in response to your October 27, 2014, request to initiate consultation for the Continental Divide-Creston Natural Gas Project (CD-C Project; Project). The Service concurs that the proposed Project may adversely affect the endangered Colorado pikeminnow (*Ptychocheilus lucius*), humpback chub (*Gila cypha*), bonytail (*Gila elegans*), and razorback sucker (*Xyrauchen texanus*) and their designated critical habitat.

Additionally, in sections 8.1 and 8.3 of the biological assessment, you requested concurrence on your determinations that the proposed Project may affect, but is not likely to adversely affect, the federally threatened Canada lynx (*Lynx canadensis*) and Ute ladies'-tresses orchid (*Spiranthes diluvialis*), respectively. Based on the information provided in your Biological Assessment we concur that the Project, as currently proposed, is not likely to adversely affect the Canada lynx because of (1) the lack of suitable habitat for the snowshoe hares, the primary prey of lynx, and (2) the implementation of conservation measures to protect riparian habitats that could serve as migration corridors for lynx dispersing from occupied habitats to the south and northwest. Based on the information provided in your Biological Assessment we concur that the Project, as currently proposed, is not likely to adversely affect the Ute ladies'-tresses orchid because of

(1) the lack of known occupied habitat (2) the limited amount of potential habitat within the action area, and (3) the commitment by the BLM to implement conservation measures to avoid adverse effects, such as spatial buffers and timing restrictions.

CONSULTATION HISTORY

On January 21-22, 1988, the Secretary of the Department of the Interior; the Governors of Wyoming, Colorado, and Utah; and the Administrator of the Western Area Power Administration signed a Cooperative Agreement to implement the "Recovery Implementation Program for Endangered Fish Species in the Upper Colorado River Basin" (USFWS 1987). In 2001, the Recovery Program was extended until September 30, 2013. The objective of the Recovery Program is to recover the listed species while water development continues in accordance with Federal and State laws and interstate compacts.

In order to further define and clarify processes outlined in sections 4.1.5, 4.1.6, and 5.3.4 of the Recovery Program, a section 7 Agreement (Agreement) and a Recovery Implementation Program Recovery Action Plan (RIPRAP) was developed (USFWS 1993). The Agreement establishes a framework for conducting all future section 7 consultations on depletion impacts related to new projects and all impacts associated with historic projects in the Upper Basin. Procedures outlined in the Agreement are used to determine if sufficient progress is being accomplished in the recovery of the endangered fishes to enable the Recovery Program to serve as a reasonable and prudent alternative (RPA) to avoid jeopardy. The RIPRAP was finalized on October 15, 1993, and has been reviewed and updated annually.

In accordance with the 1993 Agreement, the Service annually assesses progress of the implementation of recovery actions to determine if progress toward recovery has been sufficient for the Recovery Program to serve as a RPA for projects that deplete water from the Colorado River. In the last review the Service determined that the Program has made sufficient progress to offset water depletions from individual projects up to 4,500 acre-feet/year. Therefore, it is appropriate for the Recovery Program actions to serve as Conservation Measures in the project description for projects up to 4,500 acre-feet/year.

After many years of successful implementation of the Recovery Program and Agreement, Federal action agencies have come to anticipate Recovery Program activities and a requirement of a financial contribution (for new depletions greater than 100 acre-feet) toward these activities serving as RPAs that must be included in their project planning to avoid jeopardy to listed species. Thus, the RPA has essentially become part of the proposed action. The Recovery Program activities will now serve as conservation measures within the proposed action and minimize adverse effects to listed species or critical habitat. The following excerpts summarize portions of the Recovery Program that address depletion impacts, section 7 consultation, and Project proponent responsibilities:

> "All future section 7 consultations completed after approval and implementation of this program (establishment of the Implementation Committee, provision of congressional funding, and initiation of the elements) will result in a one-time contribution to be paid to the Service by water project proponents in the amount

> of $10.00 per acre-foot based on the average annual depletion of the project . . . This figure will be adjusted annually for inflation [the current figure for FY2015 is $20.54 per acre-foot] . . . Concurrently with the completion of the Federal action which initiated the consultation, e.g., . . . issuance of a 404 permit, 10 percent of the total contribution will be provided. The balance . . . will be . . . due at the time the construction commences . . . ."

It is important to note that these provisions of the Recovery Program were based on appropriate legal protection of the instream flow needs of the endangered Colorado River fishes. The Recovery Program further states:

> ". . . it is necessary to protect and manage sufficient habitat to support self-sustaining populations of these species. One way to accomplish this is to provide long term protection of the habitat by acquiring or appropriating water rights to ensure instream flows. Since this program sets in place a mechanism and a commitment to assure that the instream flows are protected under State law, the Service will consider these elements under section 7 consultation as offsetting project depletion impacts."

BIOLOGICAL OPINION

This biological opinion addresses an average annual depletion of approximately 650 acre-feet of water from the Upper Colorado River Basin. Water depletions in the Upper Basin have been recognized as a major source of impact to endangered fish species. Continued water withdrawal has restricted the ability of the Colorado River system to produce flow conditions required by various life stages of the fishes.

Critical habitat has been designated for the Colorado pikeminnow, humpback chub, bonytail, and razorback sucker within the 100-year floodplain in portions of their historic range (59 FR 13374). This biological opinion does not rely upon the regulatory definition of "destruction or adverse modification" of critical habitat at 50 CFR 402.02. Instead, we have relied upon the statutory provisions of the ESA to complete the following analysis with respect to critical habitat. In considering the biological basis for designating critical habitat, the Service focused on the primary physical and biological elements that are essential to the conservation of the species without consideration of land or water ownership or management. The Service has identified water, physical habitat, and biological environment as the primary constituent elements. This includes a quantity of water of sufficient quality that is delivered to a specific location in accordance with a hydrologic regime that is required for the particular life stage for each species. Water depletions reduce the ability of the river system to provide the required water quantity and hydrologic regime necessary for recovery of the fishes. The physical habitat includes areas of the Colorado River system that are inhabited or potentially habitable for use in spawning and feeding, as a nursery, or serve as corridors between these areas. In addition, oxbows, backwaters, and other areas in the 100-year flood plain, when inundated, provide access to spawning, nursery, feeding, and rearing habitats

DESCRIPTION OF THE PROPOSED ACTION

ACTION AREA

Our regulations define the action area as all areas directly or indirectly affected by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). Water depletions associated with the Project will result in a loss of water from the Upper Colorado River Basin.

PROJECT DESCRIPTION

The CD-C Project involves drilling up to 8,950 natural gas wells in a Project area of about 1.1 million acres (1,672 square miles) located in Townships 14 through 24 North, Ranges 91 through 98 West, Sixth Principal Meridian, Carbon and Sweetwater Counties. The Rawlins Field Office (RFO) manages BLM surface lands and the Federal mineral estate in the Project area. The CD-C Project is an infill project in a region that has seen extensive natural gas exploration and development. More than 4,700 wells have already been drilled in the Project area, including the Continental Divide, Wamsutter, Creston/Blue Gap and Continental Divide/Wamsutter II projects. Although operations are subject to change as conditions warrant, the long-term plan of development is to drill at the average rate of approximately 600 wells per year until the resource is fully developed (about 15 years).

Wells may be drilled conventionally (vertically) or directionally from single or multiple well pads. The Project also includes construction and operation of ancillary facilities such as: roads; gas, water, and condensate-gathering pipelines; overhead and buried power lines; and separation, dehydration, metering, and fluid-storage facilities. The average life of a well is expected to be 30 to 40 years. Combining average well life with a 15-year field development period produces a potential Project life of 45 to 55 years.

Up to 25 drilling-rigs will be used at any particular time in order to achieve development objectives. Wells will be drilled using conventional, mechanically powered mobile drilling rigs. Drilling each gas well will take from 7 to 10 days, with additional time likely for directional wells and wells deeper than 10,000 feet. Completion and testing operations typically require approximately 10 to 20 (up to 30) days to perform. Drilling will occur year-round subject to environmental considerations.

Approximately 24,000 to 42,000 barrels (3.1 to 5.4 acre-feet) of water are needed to perform drilling and completion operations for each well. Fresh water will be used for drilling the first 5,000–7,000 feet of each well, and water-based muds will be used for the remainder of the drilling operation. Water will come from existing and new water-supply wells within the project area and from produced-water sources. Using produced water to the greatest extent possible will conserve fresh-water aquifers and reduce the amount of water depleted from the Colorado River system. Estimated annual freshwater use within the CD-C Project area will range from 1,856 to 3,248 acre-feet per year and will average 2,552 acre-feet per year. All freshwater will be withdrawn from groundwater sources; no freshwater will be withdrawn from surface waters.

Water needed for drilling and completion activities will come from new and existing State Engineer's Office (SEO)-approved local water wells, as well as from produced-water sources.

Most (96 percent) SEO-approved wells are completed in Tertiary age aquifers, particularly the Wasatch Formation. According to Mason and Miller (2005), the Wasatch Formation has the potential to lose groundwater to the southeast and ultimately to the Colorado River system. Roughly 20 percent of the Wasatch Formation within the CD-C project area is within that portion of the Washakie Structural Basin that loses groundwater to the southeast toward the Little Snake River, a tributary of the Colorado River. As such, an interruption of this groundwater flow could lead to depletions to the Colorado River system, although the proportion of flow in the Little Snake River that comes from groundwater discharge from the Wasatch Formation has not been quantified.

The Project's estimated annual freshwater use ranges from 1,856 to 3,248 acre-feet per year, averaging 2,552 acre-feet per year. Assuming groundwater use from the Wasatch Formation is evenly distributed across the Project area, approximately 20 percent of the groundwater will come from that portion of the Wasatch Formation that could contribute water to the Little Snake River. Therefore, between 371 and 650 acre-feet of groundwater, averaging 510 acre-feet, will be removed from the Wasatch Formation in this area each year.

The BLM has determined that all CD-C groundwater withdrawals from that portion of the Washakie Structural Basin that loses groundwater toward the Little Snake River will be considered depletions for purposes of the RIP. Furthermore, the BLM is consulting on the maximum estimated annual usage, 650 acre-feet per year, in order to address the maximum effects to listed Colorado River species and their designated critical habitat.

The CD-C draft environmental impact statement (DEIS) provides a detailed description and analysis of the Proposed Action and alternatives, including the agency preferred alternative (alternative F). Alternative F limits development to no more than eight well pads per section to minimize surface disturbance and reduce impacts to the area's resources, including federally listed and proposed species. The alternative emphasizes transportation planning, development pre-planning, and a fugitive dust control plan. Under this alternative, well pads, access roads, pipelines, and ancillary facilities located within 0.5 mile of Muddy Creek, Red Wash, and Bitter Creek and within 0.25 mile of playas in the Chain Lakes Wildlife Habitat Management Area will be subject to controlled surface use stipulations in order to address salt and sediment impacts to sensitive fish species and general water quality.

CONSERVATION MEASURES

Conservation measures are actions that the action agency and applicant agree to implement to further the recovery of the species under review. The beneficial effects of conservation measures are taken into consideration for determining both jeopardy and adverse modification analyses. As explained in the Consultation History section, the Recovery Program is intended to implement actions that are needed to recover the endangered fishes and avoid jeopardy and adverse modification of critical habitat. Included in the Recovery Program is a requirement for project proponents of projects that cause water depletions greater than 100 acre-feet per year to make monetary contributions to the Recover Program. The BLM agrees to incorporate any required contribution as a condition of any issued permit or authorization. The conservation measures for this project are below:

The Recovery Program will serve as conservation measures to minimize adverse affects to the endangered fishes and their critical habitat caused by the project's water depletions. Depletion impacts can be offset by accomplishment of activities necessary to recover the endangered fishes as specified under the RIPRAP and the water Project proponent's one-time contribution to the Recovery Program for new depletions greater than 100 acre-feet per year.

New Depletion

As the project's average annual new depletion of 650 acre-feet is below the current sufficient progress threshold of 4,500 acre-feet, the Recovery Program will serve as conservation measures to minimize adverse affects to the Colorado pikeminnow, razorback sucker, humpback chub, and bonytail and designated critical habitat caused by the project's new depletion.

With respect to the depletion contribution the applicant will make a one-time payment which has been calculated by multiplying the Project's average annual depletion (acre-feet) by the depletion charge in effect at the time payment is made. For Fiscal Year 2015 (October 1, 2014, to September 30, 2016), the depletion charge is $20.54 per acre-foot for the average annual depletion which equals a total payment of $13,351 for this Project. Ten percent of the total payment (i.e., $1,350) will be provided to the Service's designated agent, the National Fish and Wildlife Foundation (Foundation), at the time of issuance of the Federal approvals from the BLM. The balance will be due at the time the construction commences. The payment will be included by the BLM as a condition of approval. The amount payable will be adjusted annually for inflation on October 1 of each year based on the Composite Consumer Price Index. All payments should be made to the Foundation:

National Fish and Wildlife Foundation
Attn: Donna McNamara, Finance Department
1133 15th Street, NW, Suite 1100
Washington DC 20005

The payment will be accompanied by a cover letter that identifies the project and biological opinion number **(06E13000-2013-F-0044)** that requires the payment, the amount of payment enclosed, check number, and the following notation on the check – "Upper Colorado Fish Recovery Program, NA.1104." The cover letter also shall identify the name and address of the payor, the name and address of the Federal agency responsible for authorizing the Project, and the address of the Service office issuing the biological opinion. This information will be used by the Foundation to notify the BLM and the Service that payment has been received. The Foundation is to send notices of receipt to these entities within five (5) working days of its receipt of payment.

STATUS OF THE SPECIES AND CRITICAL HABITAT

The purpose of this section is to summarize the best available information regarding the current range wide status of the listed fish species. Additional information regarding listed species may be obtained from the sources of information cited for these species[1].

COLORADO PIKEMINNOW

SPECIES DESCRIPTION

The Colorado pikeminnow (*Ptychocheilus lucius*) is the largest cyprinid fish (minnow family) native to North America and evolved as the main predator in the Colorado River system. Individuals begin consuming other fish for food at an early age and rarely eat anything else (Sigler and Sigler 1996). It is a long, slender, cylindrical fish with silvery sides, greenish back, and creamy white belly (Sigler and Sigler 1996). Historically, individuals may have grown as large as 6 feet long and weighed up to 100 pounds (estimates based on skeletal remains) (Sigler and Miller 1963), but today individuals rarely exceed 3 feet or weigh more than 18 pounds (Osmundson et al. 1997).

The species is endemic to the Colorado River Basin, where it was once widespread and abundant in warm water rivers and tributaries from Wyoming, Utah, New Mexico, and Colorado downstream to Arizona, Nevada, and California (multiple citations in U.S. Fish and Wildlife Service 2002b). Currently, wild populations of pikeminnow occur only in the Upper Colorado River Basin (above Lake Powell) and the species occupies only 25 percent of its historic range-wide habitat (U.S. Fish and Wildlife Service 2002b). Colorado pikeminnow are long distance migrators, moving hundreds of miles to and from spawning areas, and requiring long sections of river with unimpeded passage. They are adapted to desert river hydrology characterized by large spring peaks of snow-melt runoff and low, relatively stable base flows.

The Office of Endangered Species first included the Colorado pikeminnow (as the Colorado squawfish) in the List of Endangered Species on March 11, 1967 (32 FR 4001). It is currently protected under the Endangered Species Act of 1973 as an endangered species throughout its range, except the Salt and Verde River drainages in Arizona. The Service finalized the latest recovery plan for the species in 2002 (U.S. Fish and Wildlife Service 2002b) but is currently drafting an updated revision.

The Service designated six reaches of the Colorado River System as critical habitat for the Colorado pikeminnow on March 21, 1994 (59 FR 13374). These reaches total 1,148 miles (mi) as measured along the center line of each reach. Designated critical habitat makes up about 29 percent of the species' historic range and occurs exclusively in the Upper Colorado River Basin. Portions of the Colorado, Gunnison, Green, Yampa, White, and San Juan Rivers are designated critical habitat. The primary constituent elements of the critical habitat are water, physical habitat, and the biological environment (59 FR 13374).

[1] The latest recovery goals for all four endangered fish, which provide information on species background, life history, and threats, can be found on the internet at: http://www.coloradoriverrecovery.org/documents-publications/foundational-documents/recovery-goals.html

Water includes a quantity of water of sufficient quality delivered to a specific location in accordance with a hydrologic regime required for the species. The physical habitat includes areas of the Colorado River system that are inhabited or potentially habitable for use in spawning and feeding, as a nursery, or serve as corridors between these areas. This includes oxbows, backwaters, and other areas in the 100-year floodplain that provide access to spawning, nursery, feeding, and rearing habitats when inundated. The biological environment includes food supply, predation, and competition from other species.

Recovery of Colorado pikeminnow in the Colorado River Basin is considered necessary only in the Upper Colorado River Basin (above Glen Canyon Dam, including the San Juan, and Green River sub-basins) because of the present status of populations and because existing information on Colorado pikeminnow biology supports application of the metapopulation concept to extant populations (U.S. Fish and Wildlife Service 2002b). As a result, this biological opinion will focus on the status of the Colorado pikeminnow in that unit.

LIFE HISTORY

The Colorado pikeminnow requires relatively warm waters for spawning, egg incubation, and survival of young. Males become sexually mature at approximately 6 years of age, which corresponds to a length of about 400 millimeters (mm) (17 inches (in.)), and females mature one year later (Sigler and Sigler 1996).

Mature adults migrate to established spawning areas in late spring as water temperatures begin to warm, with migration events up to 745 river kilometers (km) round-trip on record (463 miles) (Bestgen et al. 2005). Spawning typically begins after peak flows have subsided and water temperatures are above 16° Celsius (°C) (60.8° Fahrenheit (°F)) (multiple references in Bestgen et al. 2005). Mature adults deposit eggs over gravel substrate through broadcast spawning and eggs generally hatch within 4 to 6 days (multiple references in Bestgen et al. 2005). River flows then carry emerging larvae fish (6.0 to 7.5 mm long (0.2 to 0.3 in.)) downstream 40 to 200 km (25 to 125 mi), to nursery backwaters, where they remain for the first year of life (U.S. Fish and Wildlife Service 2002b).

Colorado pikeminnow reach lengths of approximately 70 mm by age 1 (juveniles) (2.8 in.), 230 mm by age 3 (subadults) (9 in.), and 420 mm by age 6 (adults) (16.5 in.), with mean annual growth rates of adult and subadult fish slowing as fish become older (Osmundson et al. 1997). The largest fish reach lengths between 900 and 1000 mm (35 to 39 in.); these fish are quite old, likely being 47 to 55 years old with a minimum of 34 years (Osmundson et al. 1997).

Reproductive success and recruitment of Colorado pikeminnow is pulsed, with certain years having highly successful productivity and other years marked by failed or low success (U.S. Fish and Wildlife Service 2002b). The most successful years produce a large cohort of individuals that is apparent in the population over time. Once individuals reach adulthood, approximately 80 to 90 percent of adults greater than 500 mm (20 in.) survive each year (Osmundson et al. 1997; Osmundson and White 2009). Strong cohorts, high adult survivorship, and extreme longevity are likely life history strategies that allow the species to survive in highly variable ecological conditions of desert rivers.

POPULATION DYNAMICS

Population dynamics of the Colorado pikeminnow are measured separately in the Green, upper Colorado, and San Juan River basins, because distinct recovery criteria are delineated for each of these three basins (U.S. Fish and Wildlife Service 2002b). In the 2002 recovery plan, initial abundance estimates for wild adults in the basins were: upper Colorado River, 600 to 900; Green River, 6,000 to 8,000; and San Juan River, 19 to 50 (circa 2000 references for individual rivers found in U.S. Fish and Wildlife Service 2002b).

UPPER COLORADO RIVER – To monitor recovery of the Colorado pikeminnow, the Recovery Program conducts multiple-pass, capture-recapture sampling on two stretches of the upper Colorado River which are roughly above and below Westwater Canyon (Osmundson and White 2009). In the most recent summary of the data (Osmundson and White 2013, in draft) the principal investigators conclude that during the 19-year study period [1992-2010], the population remained self-sustaining. The current downlisting demographic criteria for Colorado pikeminnow (USFWS 2002b) in the Upper Colorado River Subbasin is a self-sustaining population of at least 700 adults maintained over a 5-year period, with a trend in adult point estimates that does not decline significantly. Secondarily, recruitment of age-6 (400–449 mm Total Length (TL)), naturally produced fish must equal or exceed mean adult annual mortality (estimated to be about 20 percent). The average of all adult estimates (1992 – 2010) is 644. The average of the five most recent annual adult population estimates is 658. Osmundson and White (2013) determined that recruitment rates were less than annual adult mortality in six years and exceeded adult mortality in the other six years when sampling occurred. The estimated net gain for the 12 years studied was 32 fish >450 mm TL. Whereas the Colorado River population appears to meet the trend or 'self-sustainability' criterion, it has not met the abundance criteria of 'at least 700 adults' during the most recent five year period (Figure 1).

GREEN RIVER – Population estimates for adult Colorado pikeminnow in the Green River subbasin began in 2000. Sampling occurs on the mainstem Green River from the confluence with the Yampa River to the confluence with the Colorado River and includes the Yampa and White Rivers (Bestgen et al. 2005). The initial year of sampling did not include the lower Green River (near the confluence of the White River to the confluence with the Colorado River). Beginning in 2001, the sampling regime has consisted of three years of estimates followed by two years of no estimates (Bestgen et al. 2005). The first set of estimates showed a declining trend; however, estimates collected in 2006–2008 showed an increasing trend approaching the level of the estimate made in 2000 (Figure 2) (Bestgen et al. 2010). Data from the third round of population estimates for years 2011–2013 for the Green River sub-basin are still being analyzed (thus no confidence intervals are shown for the 2011–2013 estimates in Figure 2). Preliminary results from this analysis indicate adults and sub-adults are in decline throughout the entire Green River sub-basin.

The downlisting demographic criteria for Colorado pikeminnow in the Green River subbasin require that separate adult point estimates for the middle Green River and lower Green River do not decline significantly over a 5-year period, and each estimate for the Green River subbasin exceeds 2,600 adults (estimated minimum viable population [MVP] number) (USFWS 2002b). The average of the first two sets of adult estimates was 3,020 (between 2000 – 2008).

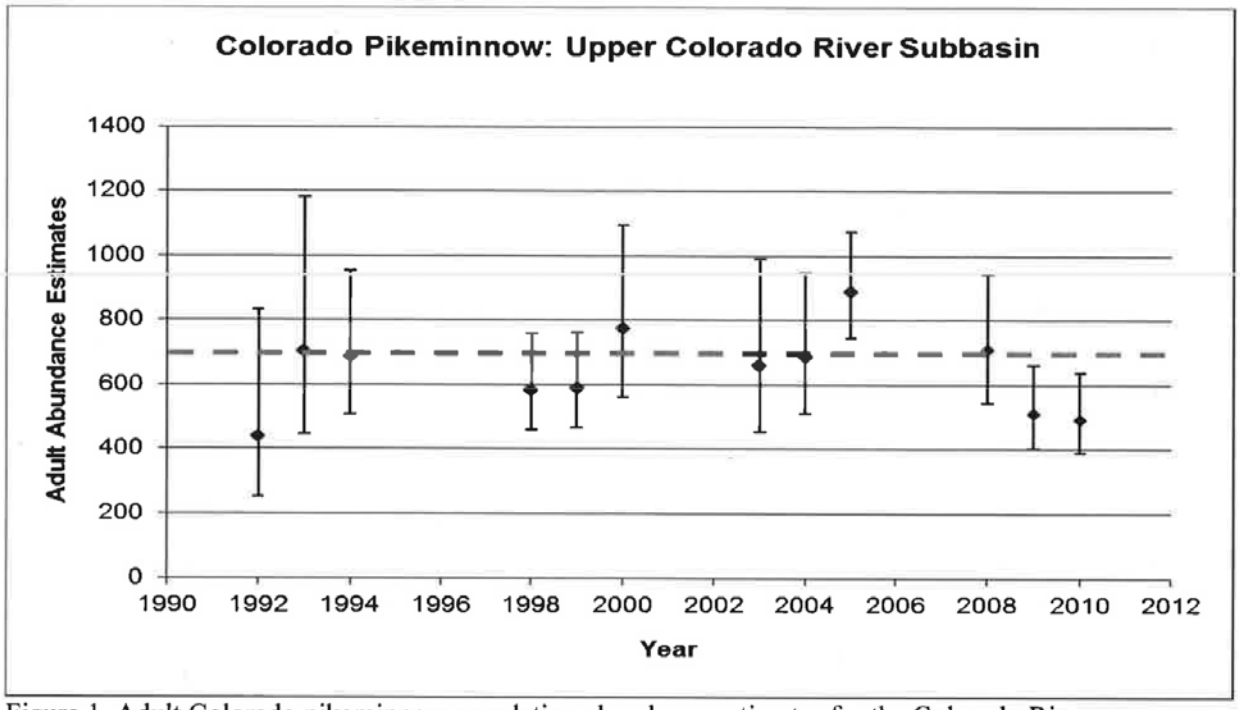

Figure 1. Adult Colorado pikeminnow population abundance estimates for the Colorado River (Osmundson and Burnham 1998; Osmundson and White 2009; 2013). Error bars represent the 95% confidence intervals. Dashed horizontal line represents the current population size downlist criterion.

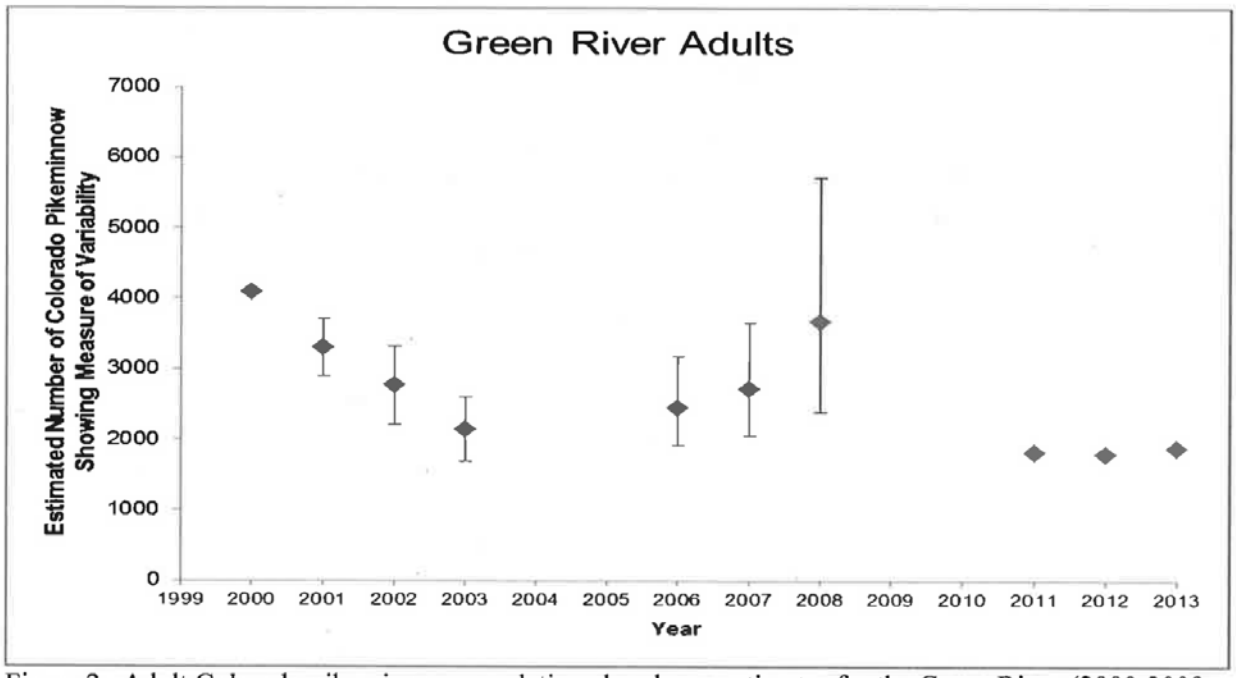

Figure 2. Adult Colorado pikeminnow population abundance estimates for the Green River (2000-2008 estimates from Bestgen et al. 2010; preliminary estimates from 2011-2013 (Bestgen, personal communication). Error bars represent the 95% confidence intervals. In 2000, the lower Green River was not sampled. Data depicted for 2000 incorporates an extrapolated lower Green River contribution to the overall population estimate and therefore lacks a confidence interval.

The downlisting demographic criteria for Colorado pikeminnow in the Green River subbasin also require that recruitment of age-6, naturally produced fish must equal or exceed mean annual adult mortality (USFWS 2002b). In general, the estimates of recruitment age fish have averaged 455 and have had a positive trend (Figure 3). Beginning in 2006, recruitment has exceeded the annual adult mortality of about 20 percent.

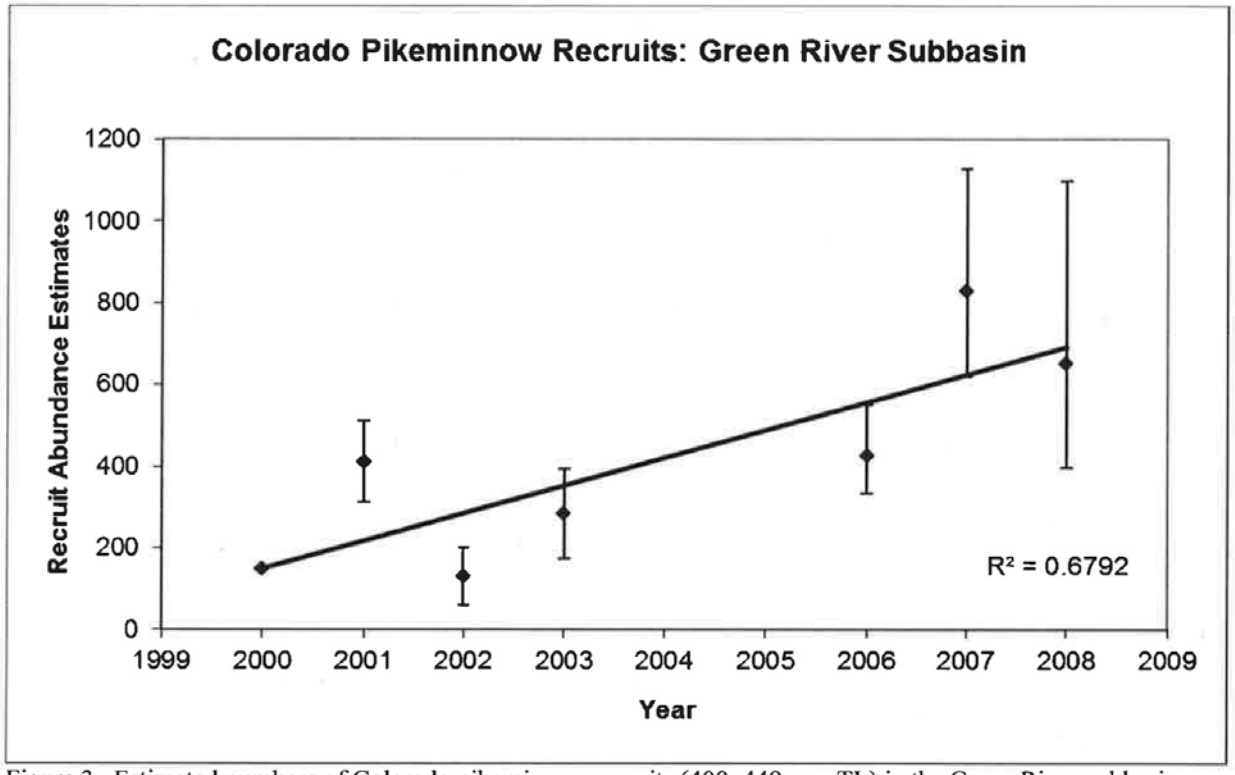

Figure 3. Estimated numbers of Colorado pikeminnow recruits (400–449 mm TL) in the Green River subbasin (Yampa, White, Middle Green, Desolation-Gray Canyons, and Lower Green) for 2001–2003 and 2006–2008. Error bars represent the 95% confidence intervals. Data from Bestgen et al. (2010). Estimates of recruitment for the most recent 2011-2013 sampling period are pending.

Bestgen et al. 2010 recognized that the mechanism driving frequency and strength of recruitment events was likely the strength of age-0 Colorado pikeminnow production in backwater nursery habitats. Osmundson and White (2013, in draft) saw a similar relationship between a strong age-0 cohort in 1986 and subsequent recruitment of late juveniles five years later, but that relationship was more tenuous in later years. Researchers are particularly concerned with what appears to be very weak age-0 representation in the Middle Green reach (1999 thru 2008) and in the lower Colorado River (2001 thru 2008) (Figure 4).

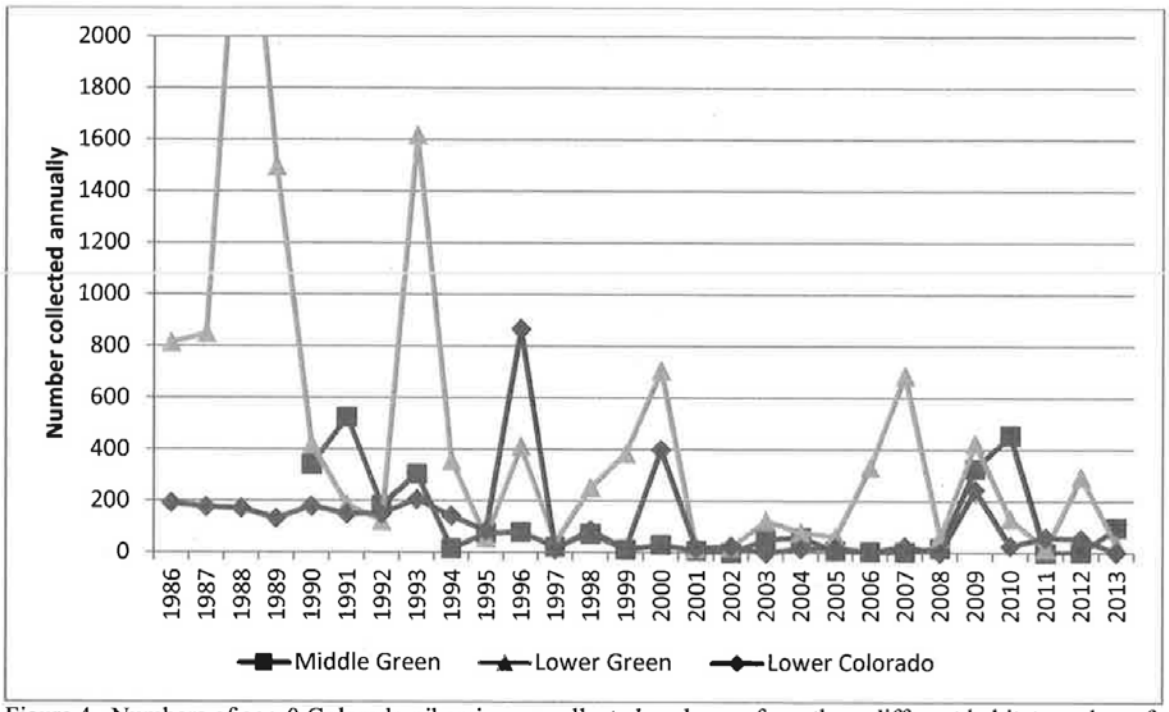

Figure 4. Numbers of age-0 Colorado pikeminnow collected each year from three different habitat reaches of river. A total of 2,892 Age-0 were collected in the lower Green River in 1988; the significance of strong Age-0 cohorts collected in the late 1980's was discussed in Bestgen et al. 2010. Data from Harding et al. 2013.

SAN JUAN RIVER – Unlike the Green and upper Colorado River Basins, wild Colorado pikeminnow are extremely rare in the San Juan River. The majority of individuals come from hatchery reared stocks supported by the San Juan River Recovery Implementation Program. This program has stocked more than 2 million age 0 and age 1+ fish in the San Juan River since 2002 (Furr and Davis 2009). No wild adults were collected since 2000 (Elverud 2008) and only five wild-spawned pikeminnow larvae were collected since 2002 (two in 2004; three in 2007) (Brandenburg and Farrington 2009).

In addition, adult Colorado pikeminnow collections in the San Juan River are extremely rare (Elverud 2008), indicating that many stocked fish do not reach sexual maturity. From 2002 to 2004, sampling conducted by the Utah Division of Wildlife Resources (UDWR) revealed low numbers of Colorado pikeminnow adults—presumably fish from the 1996 and 1997 stocking efforts—using the lower San Juan River in the spring and summer (Elverud 2008). No adult Colorado pikeminnow were collected between 2005 and 2008 in the lower San Juan River despite yearly sampling efforts (Elverud 2008).

River-wide population estimates for Colorado pikeminnow do not exist for the San Juan River (personal communication, Scott Durst 2009), but population estimates of individuals greater than 150 mm were generated after 2004 for the lower San Juan River (Elverud 2008). However, the observed variation in the population estimates within and among years makes identifying trends in the number Colorado pikeminnow difficult (Elverud 2008). In 2008, population estimates of Colorado pikeminnow greater than 150 mm in the lower San Juan River ranged from 270-572, depending on the model used (Elverud 2008).

BASIN-WIDE STATUS AND DISTRIBUTION

The Colorado pikeminnow was designated as an endangered species prior to enactment of the ESA, and therefore a formal listing package identifying threats was not assembled. Construction and operation of mainstem dams, nonnative fish species, and local eradication of native minnows and suckers in advance of new human-made reservoirs in the early 1960's were recognized as early threats (references in U.S. Fish and Wildlife Service 2002b). According to the 2002 Recovery Goals for the species, the primary threats to Colorado pikeminnow populations are streamflow regulation and habitat modification (including cold-water dam releases, habitat loss, and blockage of migration corridors); competition with and predation by nonnative fish species; and pesticides and pollutants (U.S. Fish and Wildlife Service 2002b). No new threats have emerged since the completion of this document.

As described in previous sections, Colorado pikeminnow are restricted to a portion of their historical range. Within currently occupied habitat, population trends are variable, with periods of noticeable decline, such as the early 2000s, and periods of population increase, such as the late 2000s. The current estimated population numbers in all three upper Colorado sub-basins are below estimates from the late 1990s, indicating that populations have not fully rebounded from the early 2000 population decline.

Major declines in Colorado pikeminnow populations occurred during the dam-building era of the 1930s through the 1960s. Behnke and Benson (1983) summarized the decline of the natural ecosystem, pointing out that dams, impoundments, and water use practices drastically modified the river's natural hydrology and channel characteristics throughout the Colorado River Basin. Dams on the mainstem broke the natural continuum of the river ecosystem into a series of disjunct segments, blocking native fish migrations, reducing temperatures downstream of dams, creating lacustrine habitat, and providing conditions that allowed competitive and predatory nonnative fishes to thrive both within the impounded reservoirs and in the modified river segments that connect them. The highly modified flow regime in the lower basin coupled with the introduction of nonnative fishes decimated populations of native fish.

Major declines of native fishes first occurred in the lower basin where large dams were constructed from the 1930s through the 1960s. In the Upper Basin, the following major dams were not constructed until the 1960s: Glen Canyon Dam on the mainstem Colorado River, Flaming Gorge Dam on the Green River, Navajo Dam on the San Juan River, and the Aspinall Unit Dams on the Gunnison River. To date, some native fish populations in the Upper Basin have managed to persist, while others have become nearly extirpated. River segments where native fish have declined more slowly than in other areas are those where the hydrologic regime most closely resembles the natural condition, such as the Yampa River, where adequate habitat for important life phases still exists, and where migration corridors are unblocked and allow connectivity among life phases.

RAZORBACK SUCKER

SPECIES DESCRIPTION

The largest native sucker to the western United States, the razorback sucker (*Xyrauchen texanus*) is a robust, river catostomid endemic to the Colorado River Basin (Sigler and Sigler 1996; U.S. Fish and Wildlife Service 2002d). The species feeds primarily on algae, aquatic insects, and other available aquatic macroinvertebrates using their ventral mouths and fleshy lips (Sigler and Sigler 1996). Adults can be identified by olive to dark brown coloration above, with pink to reddish brown sides and a bony, sharp-edged dorsal keel immediately posterior to the head, which is not present in the young (Sigler and Sigler 1996). The species can reach lengths of 3 feet and weights of 16 pounds (7.3 kg), but the maximum weight of recently captured fish is 11 to 13 pounds (5 to 6 kg) (Sigler and Sigler 1996; U.S. Fish and Wildlife Service 2002d). Taxonomically, the species is unique, belonging to the monotypic genus Xyrauchen, meaning that razorback sucker is the only species in the genus (U.S. Fish and Wildlife Service 2002d).

Historically, the razorback sucker occupied the mainstem Colorado River and many of its tributaries from northern Mexico through Arizona and Utah into Wyoming, Colorado, and New Mexico (U.S. Fish and Wildlife Service 2002d). In the late 19th and early 20th centuries, it was abundant in the Lower Colorado River Basin and common in parts of the Upper Colorado River Basin, with numbers apparently declining with distance upstream (references in U.S. Fish and Wildlife Service 2002d). Distribution and abundance of razorback sucker declined throughout the 20th century across its historic range, and the species now exists naturally only in a few small, unconnected populations or as dispersed individuals. Specifically, razorback sucker are currently found in small numbers in the Green River, upper Colorado River, and San Juan River sub-basins; the lower Colorado River between Lake Havasu and Davis Dam; Lakes Mead and Mohave; in small tributaries of the Gila River sub-basin (Verde River, Salt River, and Fossil Creek); and in local areas under intensive management such as Cibola High Levee Pond, Achii Hanyo Native Fish Facility, and Parker Strip (U.S. Fish and Wildlife Service 2002d).

The razorback sucker is listed as endangered under the Endangered Species Act of 1973, as amended (ESA; 16 U.S.C. 1531 et. seq.), under a final rule published on October 23, 1991 (56 FR 54957). The Service finalized the latest recovery plan for the species in 2002 (U.S. Fish and Wildlife Service 2002d) but is currently drafting an updated revision.

Fifteen reaches of the Colorado River system were designated as critical habitat for the razorback sucker on March 21, 1994 (59 FR 13374). These reaches total 2,776 km (1,724 mi) as measured along the center line of the river within the subject reaches. Designated critical habitat makes up about 49 percent of the species' original range and occurs in both the Upper and Lower Colorado River Basins. In the Upper Basin, critical habitat is designated for portions of the Green, Yampa, Duchesne, Colorado, White, Gunnison, and San Juan Rivers. Portions of the Colorado, Gila, Salt, and Verde Rivers are designated in the Lower Basin. The primary constituent elements are the same as those described for Colorado pikeminnow.

Separate, objective recovery criteria were developed for each of two recovery units (the Upper Colorado and Lower Colorado River Basins as delineated at Glen Canyon Dam) to address unique threats and site specific management actions necessary to minimize or remove those

threats. This biological opinion's focus is on the Upper Colorado River Basin recovery unit and will therefore describe the status of the razorback sucker in that unit.

LIFE HISTORY

Except during periods before and after spawning, adult razorback sucker are thought to be relatively sedentary and have high fidelity to overwintering sites (U.S. Fish and Wildlife Service 2002d). Adults become sexually mature at approximately 4 years and lengths of 400 mm (16 in.) (Zelasko et al. 2009), at which time they travel long distances to reach spawning sites (U.S. Fish and Wildlife Service 2002d). Mature adults breed in spring (mostly April–June) on the ascending limb of the hydrograph, congregating over cobble/gravel bars, backwaters, and impounded tributary mouths near spawning sites (multiple references in U.S. Fish and Wildlife Service 2002d; Snyder and Muth 2004; Zelasko et al. 2009). Flow and water temperature cues may play an important role prompting razorback adults to aggregate prior to spawning (Muth et al. 2000).

Razorback sucker have high reproductive potential, with reported average female fecundity of approximately 50,000 to 100,000 eggs per fish (U.S. Fish and Wildlife Service 2002d). They are broadcast spawners that scatter adhesive eggs over gravel-cobble substrate (Snyder and Muth 2004). High springs flows are important to egg survival because they remove fine sediment that can otherwise suffocate eggs. Hatching is limited at temperatures less than 10°C (50° F) and best around 20°C (68° F) (Snyder and Muth 2004). Eggs hatch 6 to 11 days after being deposited and larval fish occupy the sediment for another 4 to 10 days before emerging into the water column. Larval fish occupy shallow, warm, low-velocity habitats in littoral zones, backwaters, and inundated floodplains and tributary mouths downstream of spawning bars for several weeks before dispersing to deeper water (U.S. Fish and Wildlife Service 2002d; Snyder and Muth 2004). It is believed that low survival in early life stages, attributed to loss of nursery habitat and predation by non-native fishes, causes extremely low recruitment in wild populations (Muth et al. 2000).

Razorback sucker in the Upper Basin tend to be smaller and grow slower than those in the Lower Basin, reaching 100 millimeters (4 in.) on average in the first year (U.S. Fish and Wildlife Service 2002b). Based on collections in the middle Green River, typical adult size centers around 510 mm (20 in.) (Modde et al. 1996). Razorback suckers are long-lived fishes, reaching 40+ years via high annual survival (U.S. Fish and Wildlife Service 2002d). Adult survivorship was estimated to be 71 to 73 percent in the Middle Green River from 1980-1992 (Modde et al. 1996; Bestgen et al. 2002) and 76 percent from 1990 to 1999 (Bestgen et al. 2002).

POPULATION DYNAMICS

Population estimates during the 1980 to 1992 period were on average between 300 and 600 wild fish (Modde et al. 1996). By the early 2000s, the wild population consisted of primarily aging adults, with steep decline in numbers caused by extremely low natural recruitment (U.S. Fish and Wildlife Service 2002d). Although reproduction was occurring, very few juveniles were found (U.S. Fish and Wildlife Service 2002d).

In the early part of the 2000s, population numbers were extremely low. Population estimates from sampling efforts in the Middle Green River had declined to approximately 100 by 2002, with researchers hypothesizing that wild fish in the Green River Basin could become extirpated

because of lack of recruitment (Bestgen et al. 2002). Similarly, in the upper Colorado River, razorback sucker were exceedingly rare. In the 2002 recovery plan, razorback sucker were considered extirpated in the Gunnison River, where fish were last captured in 1976 (U.S. Fish and Wildlife Service 2002d). Similarly, in the Grand Valley, only 12 fish were collected from 1984 to 1990, despite intensive sampling (Osmundson and Kaeding 1991 in U.S. Fish and Wildlife Service 2002d). No young razorback sucker were captured in the Upper Colorado River since the mid-1960s (Osmundson and Kaeding 1991 in U.S. Fish and Wildlife Service 2002d). In the San Juan River we know of only two wild razorback suckers that were captured in 1976 in a riverside pond near Bluff, Utah, and one fish captured in the river in 1988, also near Bluff (Ryden 2006). No wild razorback suckers were found during the 7-year research period (1991–1997) of the San Juan River Basin Recovery Implementation Program (Ryden 2006).

Because of the low numbers of wild fish and lack of recruitment, augmenting the remaining wild populations with hatchery-raised fish is a key step to creating self-sustaining populations. The Recovery Program is rebuilding razorback sucker populations with hatchery stocks. As populations increase, the Program expects to generate mark-recapture population estimates on adult razorback sucker comparable to the data reported for Colorado pikeminnow and humpback chub. Many stocked razorback sucker are being recaptured as part of other studies. Razorback sucker stocked in the Green and Colorado Rivers have been recaptured in reproductive condition and often in spawning groups. Captures of larvae in the Green, Gunnison, and Colorado Rivers document reproduction is occurring. Survival of larvae through their first year remains rare, largely due to a decrease in the availability of warm, food-rich floodplain areas and predation by a suite of nonnatives when the flood plain nursery habitats are available (Bestgen et al. 2011). However, occasional captures of juveniles (just over age-1) in the Green and Gunnison Rivers suggest that survival of early life stages is occurring. Collections of larvae by light trap in the middle Green River have generally increased since 2003; in 2012, the largest collection of light trapped larvae occurred (4,196; Figure 5). In 2011, researchers documented spawning by razorback sucker in the White River for the first time.

Since 1995, over 334,000 subadult razorback suckers have been stocked in the Green and upper Colorado River subbasins. Two reports on survival estimates of stocked razorback sucker recommended stocking larger fish during spring, fall and winter (Zelasko et al. 2009; 2011). From 2004–2007 approximately 96,400 fish were stocked and 1,511 recapture events from 1,470 unique individuals were encountered from 2005–2008. In 2012, tag-reading antennae were placed on a spawning bar in the middle Green River near Dinosaur National Monument in northeast Utah. Fifty-two unique razorback sucker stocked between 2004 and 2010 were detected, 88 percent of which had not been seen since stocking. During sampling for Colorado pikeminnow estimates, 938 and 765 razorback sucker were captured in 2011 and 2012, respectively, for the Ouray to Green River, Utah reach of the main channel of the Green River. In a monitoring plan (Bestgen et al. 2012), estimates of large juvenile to adult razorback sucker in three reaches of the Green River ranged from 474 to over 5,000 within a reach. Although these estimates are highly imprecise, they provide further confirmation that stocked fish are surviving in the wild.

Three razorback sucker stocked in the San Juan River near Farmington, New Mexico for the San Juan Recovery Program were captured between Moab, Utah and the state line with Colorado in

2008. This demonstrates that exchange of stocked razorback sucker between the San Juan River and the Upper Colorado River is certain, and may have ramifications for recovery.

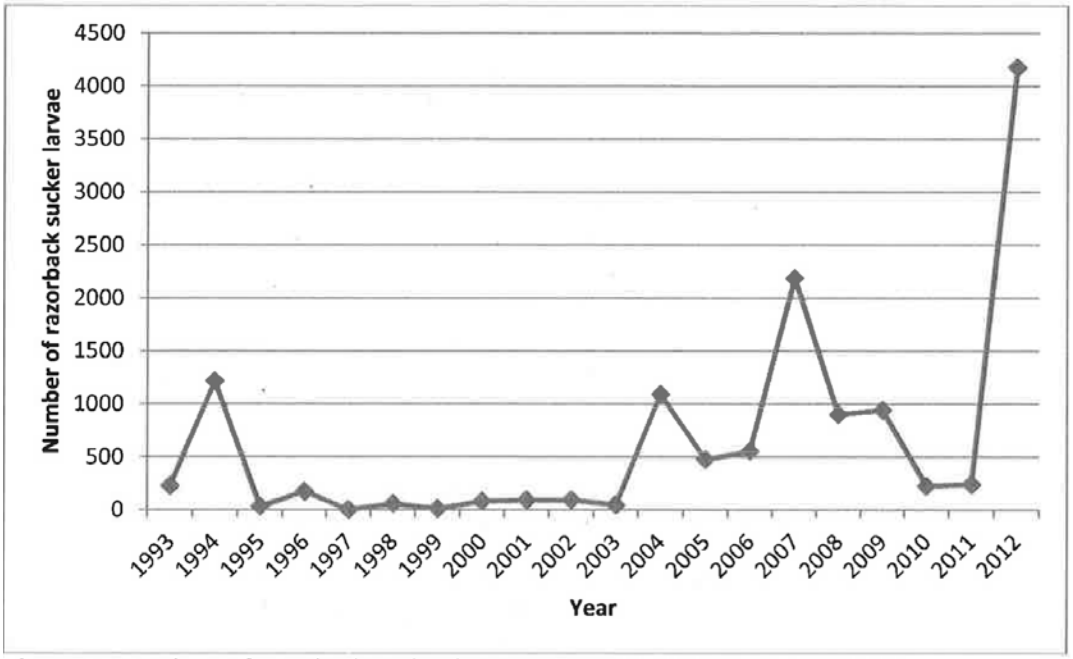

Figure 5. Numbers of razorback sucker larvae collected in light traps since 2000.

BASIN-WIDE STATUS AND DISTRIBUTION

The razorback sucker was designated as endangered under a final rule published on October 23, 1991 (56 FR 54957). Population conditions cited in the rule include little evidence of natural recruitment over the previous 30 years and a downward trend relative to historic abundance over the previous 10 years. Threats to species centered on significant changes to natural habitat conditions, including diversion and depletion of water, introduction of nonnative fishes, and construction and operation of dams.

Monitoring of wild razorback sucker in the Upper Colorado River Basin shows continued declines in abundance, hypothesized to be from a lack of recruitment. Therefore, recovery of the species has focused on augmentation of populations through hatchery-raised fish and habitat improvements.

According to the 2002 Recovery Goals for the species, the primary threats to razorback sucker populations are streamflow regulation and habitat modification (including cold-water dam releases, habitat loss, and blockage of migration corridors); competition with and predation by nonnative fish species; and pesticides and pollutants (U.S. Fish and Wildlife Service 2002d). No new threats have emerged since the completion of this document. The Service's status review of razorback sucker completed in 2012 (USFWS 2012b) reported that 85 percent of the downlisting recovery factor criteria (USFWS 2002c) have been addressed to varying degrees; however, nonnative fish species continue to be problematic.

HUMPBACK CHUB

SPECIES DESCRIPTION

The humpback chub (*Gila cypha*) is a medium-sized freshwater fish of the minnow family endemic to the Colorado River basin. The species evolved around 3 to 5 million years ago (Sigler and Sigler 1996). The pronounced hump behind its head gives the humpback chub a striking, unusual appearance. It has an olive-colored back, silver sides, a white belly, small eyes, and a long snout that overhangs its jaw (Sigler and Sigler 1996). This fish can grow to nearly 500 mm (20 in.) and may survive more than 30 years in the wild (U.S. Fish and Wildlife Service 2002c). The humpback chub does not have the swimming speed or strength of species such as the Colorado pikeminnow. Instead, it uses its large fins to "glide" through slow-moving areas, feeding on insects.

Historic distribution is surmised from various reports and collections that indicate the species inhabited canyons of the Colorado River and four of its tributaries: the Green, Yampa, White, and Little Colorado Rivers. Presently the species occupies about 68 percent of its historic habitat (U.S. Fish and Wildlife Service 2002c). Historic to current abundance trends are unclear because historic abundance is unknown (U.S. Fish and Wildlife Service 2002c).

Currently, five wild populations occur upstream of Glen Canyon Dam (Figure 6) and two downstream (U.S. Fish and Wildlife Service 2002c). In the Upper Colorado River Basin the two most stable populations are found near the Colorado/Utah border: one at Westwater Canyon in Utah; and one in an area called Black Rocks, in Colorado (Upper Colorado River Endangered Fish Recovery Program and San Juan River Basin Recovery Implementation Program 2010). Smaller numbers in the Upper Basin were found in the Yampa and Green Rivers in Dinosaur National Monument, Desolation and Gray Canyons on the Green River in Utah, and Cataract Canyon on the Colorado River in Utah (U.S. Fish and Wildlife Service 2002c). The two populations in the Lower Colorado River Basin occur in the mainstem Colorado and Little Colorado Rivers. The Little Colorado River population, found in the Grand Canyon, is the largest known population, harboring up to 10,000 fish (U.S. Fish and Wildlife Service 2002c).

The Office of Endangered Species first included the humpback chub in the List of Endangered Species on March 11, 1967 (32 FR 4001). Subsequently, it was considered endangered under provisions of the Endangered Species Conservation Act of 1969 (16 U.S.C. 668aa) and was included in the United States List of Endangered Native Fish and Wildlife issued on June 4, 1973 (38 FR No. 106). It is currently protected under the Endangered Species Act of 1973 as an endangered species throughout its range (ESA; 16 U.S.C. 1531 et. seq.). The Service finalized the latest recovery plan for the species in 2002 (U.S. Fish and Wildlife Service 2002d), but is currently drafting an updated revision.

The Service designated seven reaches of the Colorado River System as critical habitat for the humpback chub on March 21, 1994 (59 FR 13374). These reaches total 610 km (379 mi) as measured along the center line of each reach. Designated critical habitat makes up about 28 percent of the species' original range and occurs in both the Upper and Lower Colorado River Basins. In the Upper Colorado River Basin, critical habitat includes portions of the Yampa, Green, and Colorado Rivers, primarily including canyon habitats, such as Yampa, Desolation

and Gray, Westwater, and Cataract Canyons. Although humpback chub life history and habitat use differs greatly from the other endangered Colorado River fish, the primary constituent elements (water, physical habitat, and biological environment) of their critical habitat are the same (see above).

Figure 6. Locations of humpback chub populations in the Upper Colorado River Basin. Taken from Page 12 of Upper Colorado River Endangered Fish Recovery Program and San Juan River Basin Recovery Implementation Program 2010).

Separate, objective recovery criteria were developed for each of two recovery units (the Upper Colorado and Lower Colorado River Basins as delineated at Glen Canyon Dam) to address unique threats and site-specific management actions necessary to minimize or remove those threats. This biological opinion's focus is on the Upper Colorado River Basin recovery unit and will therefore describe the status of the humpback chub in that unit.

LIFE HISTORY

Like other large desert river fishes, the humpback chub is an obligate warm-water species that requires relatively warm temperatures for spawning, egg incubation, and survival of larvae. Unlike Colorado pikeminnow and razorback sucker, which are known to make extended migrations of up to several hundred miles to spawning areas, humpback chubs do not appear to make extensive migrations. Instead, humpback chub live and complete their entire life cycle in canyon-bound reaches of the Colorado River mainstem and larger tributaries characterized by deep water, swift currents, and rocky substrates (U.S. Fish and Wildlife Service 2002c). Individuals show high fidelity for canyon reaches and move very little.

Mature humpback chub typically spawn on the descending hydrograph between March and July in the Upper Basin (Karp and Tyus 1990). Humpback chub are broadcast spawners who may mature as young as 2 to 3 years old. Eggs incubate for three days before swimming up as larval fish (U.S. Fish and Wildlife Service 2002c). Egg and larvae survival are highest at temperatures close to 19 to 22 degrees Celsius (U.S. Fish and Wildlife Service 2002c). Unlike larvae of other Colorado River fishes (e.g., Colorado pikeminnow and razorback sucker), larval humpback chub show no evidence of long-distance drift (Robinson et al.1998).

Recruitment appears to be successful in all known Upper Basin populations (U.S. Fish and Wildlife Service 2002c). Survival of humpback chub during the first year of life is low, but increases through the first 2 to 3 years of life with decreased susceptibility to predation, starvation, and environmental changes. Survival from larvae to adult life stages was estimated at 0.1 percent (0.001) (Valdez and Ryel 1995, 1997 in U.S. Fish and Wildlife Service 2002c). Survival of adults is high, with estimates approximating 75 percent based on Grand Canyon adults (U.S. Fish and Wildlife Service 2002c).

Growth rates of humpback chub vary by populations, with fish in the Upper Basin growing slower than those in the Grand Canyon (U.S. Fish and Wildlife Service 2002c). Individuals in Cataract Canyon were 50, 100, 144, 200, 251, and 355 mm total length from 1 to 6 years, respectively (Valdez 1990 in U.S. Fish and Wildlife Service 2002c). Based on sexual maturity and age-to-length ratios, adults are classified as those fish 200 mm or longer. Maximum life span is estimated to be 30 years in the wild.

Humpback chub move substantially less than other native Colorado River fishes, and studies consistently show high fidelity by humpback chub for specific riverine locales occupied by respective populations. Despite remarkable fidelity for given river regions, individual humpback chub adults are known to move between populations. Movement by juveniles is not as well documented but is also believed to be limited in distance. For example, no out-migration by young fish is seen from population centers such as Black Rocks and Westwater Canyon.

POPULATION DYNAMICS

Five wild populations of humpback chub inhabit canyon-bound sections of the Colorado, Green, and Yampa Rivers: Yampa Canyon; Desolation and Gray Canyons; Cataract Canyon; Black Rocks; and Westwater Canyon. Recovery goal downlisting demographic criteria (USFWS 2002c) for humpback chub require each of five populations in the upper Colorado River basin to be self-sustaining over a 5-year period, with a trend in adult point estimates that does not decline significantly. Secondarily, recruitment of age-3 (150–199 mm TL) naturally produced fish must equal or exceed mean adult annual mortality. In addition, one of the five populations (e.g., Black Rocks/Westwater Canyon or Desolation/Gray Canyons) must be maintained as a core population such that each estimate exceeds 2,100 adults (estimated minimum viable population number).

The Yampa River humpback chub population exists in the lower Yampa River Canyon and into the Green River through Split Mountain Canyon. This population is small, with an estimate of about 400 wild adults in 1998 2000. Sampling during 2003–2004 caught only 13 fish, too few to estimate population size (Finney 2006). In 2007, the Recovery Program brought 400 young-of-year *Gila* spp. caught in Yampa Canyon into captivity as a research activity to determine the best methods for capture, transport, and holding at two different hatchery facilities. Approximately 15 percent of the *Gila* species were tentatively identified as humpback chub by physical characteristics. Geneticists at Southwest Native Aquatic Resources and Recovery Center (SNARRC), Dexter, NM, have since provided preliminary results indicating that the Yampa fish in captivity were hybrids between humpback chub and roundtail chub (Wade Wilson, U.S. Fish and Wildlife Service, personal communication). These fish were considered unsuitable for broodstock and were released into the Green River in Dinosaur National Monument. Currently, it is not known if pure humpback chubs occur in Yampa Canyon.

The Desolation/Gray Canyons population of wild adults was estimated at 1,300 in 2001, 2,200 in 2002, and 940 in 2003 (Jackson and Hudson 2005). Sampling in 2001 and 2002 was conducted in summer, whereas beginning in 2003, sampling was shifted to fall to avoid capturing Colorado pikeminnow that use Desolation Canyon for spawning. In a report on 2006–2007 estimates, researchers (Badame 2012; Figure 7) indicated that this population was trending downward. The declining catch of humpback chub in the upper portions of Desolation Canyon in the 2006–2007 estimates was linked to increasing densities of nonnative smallmouth bass (Badame 2012). Researchers recommended securing a representative sample of adults in captivity. In 2009, 25 adults were taken to Ouray National Fish Hatchery. In 2011, six sites throughout Desolation Canyon were monitored for adults, 55 individual adults were encountered, but recaptures were too few to calculate a population estimate.

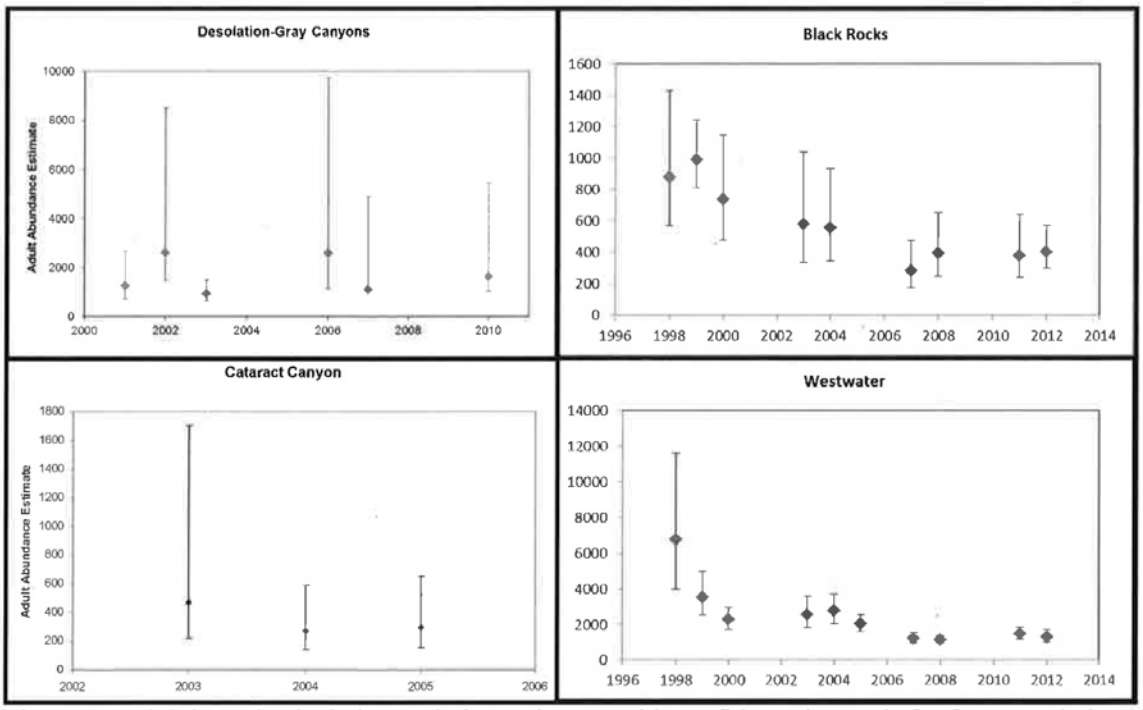

Figure 7. Adult humpback chub population estimates with confidence intervals for four populations in the upper Colorado River Basin (note: the scale differs among the graphs for the different populations). Clockwise from upper left: Desolation-Gray Canyons (Badame 2011, 2012); Black Rocks (Francis and McAda 2011); Westwater Canyon (Elverud 2011); and Cataract Canyon (Badame 2008).

On the Colorado River of the upper Colorado River basin, three humpback chub populations are recognized. Black Rocks and Westwater Canyon have enough exchange of individuals that they are considered a single core population. In Black Rocks, estimates of wild adults have varied from about 800 in 1998, 900 in 1999, and 500 in 2000 and 2003 (Figure 7) (McAda 2007). The most recent estimates, in 2007–2008 were 345 and 287, respectively. During the fall of 2011 and 2012, 78 and 112 individual adult humpback chub were caught respectively - similar to the numbers caught in 2007 and 2008 (61 and 74, respectively). Population estimates for Black Rocks for 2011 and 2012 were 379 and 403, respectively. Unfortunately, 78 largemouth bass were collected in Black Rocks in 2012, a ten-fold increase over the 2011 catch. The Westwater

Canyon estimates of wild adults range from about 4,700 in 1998 to 2,500 in 1999, 2000, and 2003 (Jackson and Hudson 2005). The 2007–2008 estimates were about 1,750 and 1,300. The large declines in humpback chub densities in both Black Rocks and Westwater Canyons occurred in the late 1990's and are not attributed to more recent increases of nonnative predators in the Colorado River.

In 2008, the core population (Black Rocks / Westwater combined) dropped below the population size downlist criterion (MVP = 2,100 adults) for the first time. In 2011, populations recovered slightly in Westwater Canyon where the adult estimate was 1,467; however, UDWR reported 1,315 adults in 2012. The core population estimates in 2011 and 2012 were 1846 and 1718, respectively (Figure 8). Population estimates in both Black Rocks and Westwater canyons declined dramatically during the first population estimation rotation in the late 1990s, but have remained relatively stable since that time. Colorado State University's recent robust population estimate analysis more clearly indicated that declines in the Westwater and Black Rock humpback chub populations are due to lapses in recruitment (i.e. adult survival rates have remained stable). Principle investigators agree that reinitiating an age-0 monitoring component is advisable. It should be noted that whatever is affecting humpback chub recruitment has not affected sympatric populations of native roundtail chub; populations of roundtail chub in both canyons have remained stable or have increased since population estimation started. In addition to the potential and recent negative interactions between humpback chub and nonnative predators discussed above, both the Westwater and Black Rocks populations are at risk of potential chemical contamination due to the proximity of a railroad located on the right bank of the Colorado River which at times transports toxic substances.

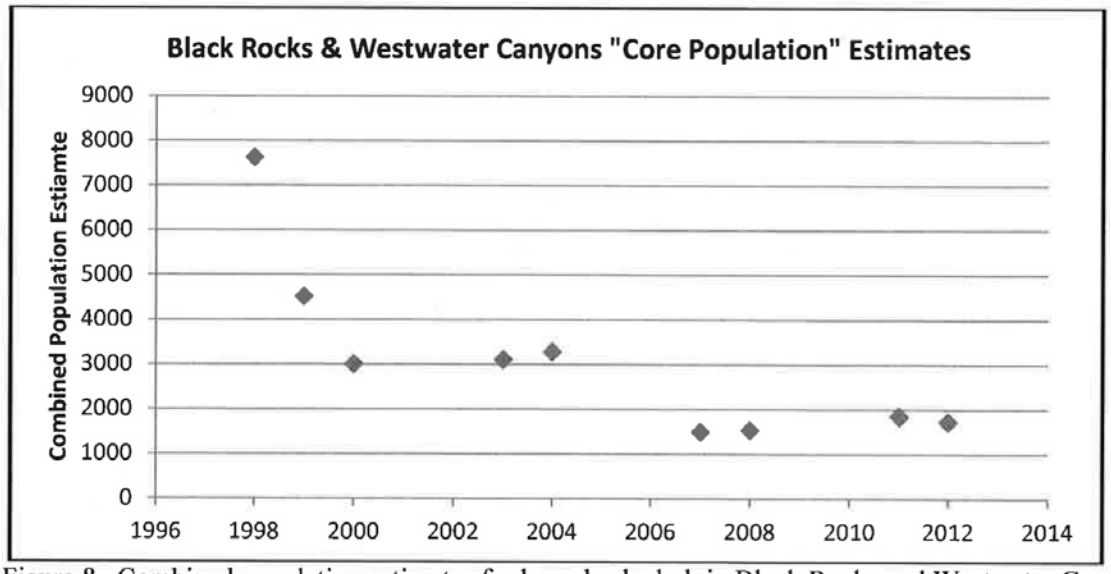

Figure 8. Combined population estimates for humpback chub in Black Rocks and Westwater Canyon based on a robust open model created by Dr.'s Bestgen and White, Colorado State University. The 2002 Recovery Goal downlist criteria for these combined ("core population") estimates is 2,100 adults.

The Cataract Canyon humpback chub population is small, with estimates of about 150 wild adults in 2003 and 66 in 2005 (Badame 2008). Estimates are difficult to obtain in Cataract; therefore, catch-per-unit-effort (CPUE) has been determined to be an effective replacement (began in 2008 on a 2 years on, 2-years-off sampling regime). In 2011, UDWR reported that the Cataract population appears to be stable with CPUE ranging between 0.010 and 0.035 fish/net-hour. Despite additional effort to sample below Big Drop Rapid, no additional humpback chub were encountered in the new riverine habitat created by low Lake Powell levels.

BASIN-WIDE STATUS AND DISTRIBUTION

The humpback chub was designated as an endangered species prior to enactment of the ESA, and therefore, a formal listing package identifying threats was not assembled. Construction and operation of mainstem dams, nonnative fish species, and local eradication of native minnows and suckers in advance of new human-made reservoirs in the early 1960's were recognized as early threats (U.S. Fish and Wildlife Service 2002c). According to the 2002 Recovery Goals for the species, the primary threats to humpback chub are streamflow regulation, habitat modification, predation by non-native fish species, parasitism, hybridization with other native *Gila* species, and pesticides and pollutants (U.S. Fish and Wildlife Service 2002c). No new threats have emerged since the completion of this document. The Service's status review of humpback chub completed in 2011 (USFWS 2011b) reported that 60 percent of the recovery factor criteria (USFWS 2002c) have been addressed to varying degrees; however, nonnative fish species and issues dealing with the potential chemical contamination of the river from spills and pipelines continue to be problematic.

As described in previous sections, humpback chub are restricted to a portion of their historical range. Within currently occupied habitat in the Upper Basin, population trends are variable, with one core population remaining quite robust, but other populations threatened with extirpation.

BONYTAIL

SPECIES DESCRIPTION

The bonytail (*Gila elegans*) is a medium-sized freshwater fish in the minnow family, endemic to the Colorado River Basin. The species evolved around 3 to 5 million years ago (Sigler and Sigler 1996). Individuals have large fins and a streamlined body that typically is very thin in front of the tail. They have a gray or olive-colored back, silver sides, and a white belly (Sigler and Sigler 1996). The mouth is slightly overhung by the snout and there is a smooth low hump behind the head that is not as pronounced as the hump on a humpback chub. A very close relative to the roundtail chub (*Gila robusta*), bonytail can be distinguished by counting the number of rays in the fins, with bonytail having 10 dorsal and anal fin rays (Sigler and Sigler 1996). The fish can grow to be 600 mm (24 in.) and are thought to live as long as 20 to 50 years (Sigler and Sigler 1996). Little is known about the specific food and habitat of the bonytail because the species was extirpated from most of its historic range prior to extensive fishery surveys, but it is considered adapted to mainstem rivers, residing in pools and eddies, while eating terrestrial and aquatic insects (U.S. Fish and Wildlife Service 2002a).

Bonytail were once widespread in the large rivers of the Colorado River Basin (multiple historic references in U.S. Fish and Wildlife Service 2002a). The species experienced a dramatic, but

poorly documented, decline starting in about 1950, following construction of mainstem dams, introduction of nonnative fishes, poor land-use practices, and degraded water quality (U.S. Fish and Wildlife Service 2002a). Population trajectory over the past century and reasons for decline are unclear because lack of basin-wide fishery investigations precluded accurate distribution and abundance records.

Bonytail are now rarely found in the Green and Upper Colorado River sub-basins and are the rarest of all the endangered fish species in the Colorado River Basin. In fact, no wild, self-sustaining populations are known to exist upstream of Lake Powell; this fish is nearly extinct. In the last decade only a handful of bonytail were captured on the Yampa River in Dinosaur National Monument, on the Green River at Desolation and Gray canyons, and on the Colorado River at the Colorado/Utah border and in Cataract Canyon. In the lower basin, bonytail exist in Lake Mohave and Lake Havasu.

The bonytail is currently listed as endangered under the Endangered Species Act of 1973, as amended (ESA; 16 U.S.C. 1531 et. seq.), under a final rule published on April 23, 1980 (45 FR 27710). The Service finalized the latest recovery plan for the species in 2002 (U.S. Fish and Wildlife Service 2002a), but is currently drafting an updated revision.

The Service designated seven reaches of the Colorado River as critical habitat for the bonytail on March 21, 1994 (59 FR 13374). These reaches total 499 km (312 mi) as measured along the center line of each reach. Portions of the Green, Yampa, and Colorado Rivers are designated as critical habitat, representing about 14 percent of the species' historic range. The primary constituent elements are the same as those described for Colorado pikeminnow, razorback sucker, and humpback chub.

Separate, objective recovery criteria were developed for each of two recovery units (the Upper Colorado and Lower Colorado River Basins as delineated at Glen Canyon Dam) to address unique threats and site specific management actions necessary to minimize or remove those threats. This biological opinion's focus is on the Upper Colorado River Basin recovery unit and will therefore describe the status of the humpback chub in that unit.

LIFE HISTORY

Natural reproduction of bonytail was last documented in the Green River in 1959, 1960, and 1961 at water temperatures of 18°C (U.S. Fish and Wildlife Service 2002a). Similar to other closely related *Gila* species, bonytail in rivers probably spawn during spring over rocky substrates. While age at sexually maturity is unknown, they are capable of spawning at 5 to 7 years old. Recruitment and survival estimates are currently unknown because populations are not large enough for research to occur.

Individuals in Lake Mohave have reached 40 to 50 years of age (U.S. Fish and Wildlife Service 2002a), but estimates for river inhabiting fish are not available.

POPULATION DYNAMICS

Bonytail are so rare that it is currently not possible to conduct population estimates. In response to the low abundance of individuals, the Recovery Program is implementing a stocking program

to reestablish populations in the Upper Basin; stocking goals were met or exceeded the past three years (Upper Colorado River Endangered Fish Recovery Program and San Juan River Basin Recovery Implementation Program 2010). Since 1996, over 380,000 tagged bonytail subadults have been stocked in the Green and upper Colorado River subbasins.

To date, stocked bonytail do not appear to be surviving as well as stocked razorback sucker. Researchers continue to experiment with pre-release conditioning and exploring alternative release sites to improve their survival. Since 2009, an increasing number of bonytail have been detected at several locations throughout the Upper Colorado River Basin where stationary tag-reading antennas are used. During high spring flows in 2011, more than 1,100 bonytail (16.6% of the 6,804 stocked in early April of that year) were detected by antenna arrays in the breach of the Stirrup floodplain on the Green River. The Price Stubb antenna array on the Colorado River detected 138 bonytail between October 2011 and September 2013. The fish detected in fall 2011 had been stocked above Price-Stubb in Debeque Canyon, but in spring 2012, some of those fish were moving upstream through the fish passage.

BASIN-WIDE STATUS AND DISTRIBUTION

The bonytail was designated as an endangered species under a final rule published April 23, 1980 (45 FR 27710–27713). Reasons for decline of the species were identified as the physical and chemical alteration of their habitat and introduction of exotic fishes. The 1990 Bonytail Chub Recovery Plan further stated that the decline of the bonytail is attributed to stream alteration caused by construction of dams, flow depletion from irrigation and other uses, hybridization with other *Gila*, and the introduction of nonnative fish species. Hence, the primary threats to bonytail populations are streamflow regulation and habitat modification (including cold-water dam releases, habitat loss, and blockage of migration corridors); competition with and predation by nonnative fish species; hybridization; and pesticides and pollutants (U.S. Fish and Wildlife Service 2002a). No new threats have emerged since the 2002 recovery goals were published. The Service's status review of bonytail in 2012 (USFWS 2012a) reported that 72 percent of the recovery factor criteria (USFWS 2002d) have been addressed to varying degrees.

No known wild, self-sustaining populations of bonytail exist in the Upper Basin. Since listing, bonytail were stocked in the Upper Basin to augment populations, but recruitment and natural reproduction have not been documented. Recent recaptures of bonytail in the Green River a year after stocking provide promising results that individuals are surviving.

DESIGNATED CRITICAL HABITAT FOR LISTED COLORADO RIVER FISHES

HABITAT DESCRIPTION

In the Upper Colorado River Basin, portions of the White, Yampa, Gunnison, Green, Colorado, and San Juan Rivers and their 100-year floodplain are designated as critical habitat for one or more of the federally listed species described above. Critical habitat is defined as specific geographic areas, whether occupied by a listed species or not, that are essential for its conservation and that are formally designated by rule. In the State of Utah, immediately downstream of Wyoming, many of these critical habitat reaches overlap. Critical habitat for the humpback chub and bonytail are primarily canyon-bound reaches, while critical habitat for the

Colorado pikeminnow and razorback sucker include long stretches of river required for migration corridors and larval fish drift.

Concurrently with designating critical habitat, the Service identified primary constituent elements (PCEs) of the habitat. PCEs are physical or biological features essential to the conservation of a species for which its designated or proposed critical habitat is based on, such as: space for individual and population growth, and for normal behavior; food, water, air, light, minerals, or other nutritional or physiological requirements; cover or shelter; sites for breeding, reproduction, rearing of offspring, germination, or seed dispersal; and habitats that are protected from disturbance or are representative of the species historic geographic and ecological distribution.

The Service has identified water, physical habitat, and the biological environment as the primary constituent elements of critical habitat for listed Colorado River fish species (59 FR 13374). Water includes a quantity of water of sufficient quality delivered to a specific location in accordance with a hydrologic regime required for the particular life stage for each species. The physical habitat includes areas of the Colorado River system that are inhabited or potentially habitable for use in spawning and feeding, as a nursery, or serve as corridors between these areas. In addition, oxbows, backwaters, and other areas in the 100-year floodplain, when inundated, provide access to spawning, nursery, feeding, and rearing habitats. Food supply, predation, and competition are important elements of the biological environment.

HABITAT USAGE

The four listed fish species are adapted to a hydrologic cycle characterized by large spring peaks of snowmelt runoff and low, relatively stable base flows (U.S. Fish and Wildlife Service 2002b). High spring flows maintain channel and habitat diversity, flush sediments from spawning areas, rejuvenate food production, form gravel and cobble deposits used for spawning, and rejuvenate backwater nursery habitats (U.S. Fish and Wildlife Service 2002b).

Throughout most of the year, juvenile, subadult, and adult Colorado pikeminnow use relatively deep, low-velocity eddies, pools, and runs that occur in near-shore areas of main river channels (multiple references in U.S. Fish and Wildlife Service 2002b). Adults require pools, deep runs, and eddy habitats maintained by high spring flows. In spring, however, adults use floodplain habitats, flooded tributary mouths, flooded side canyons, and eddies that are available only during high flows (multiple references in U.S. Fish and Wildlife Service 2002b). Newly hatched larval fish drift downstream to backwaters in sandy, alluvial regions, where they remain through most of their first year of life (multiple references in U.S. Fish and Wildlife Service 2002b). Because of their mobility and environmental tolerances, adult Colorado pikeminnow are more widely distributed than other life stages.

Similar to Colorado pikeminnow, razorback sucker use a variety of habitats throughout their life cycle. Outside of the spawning season, adult razorback suckers occupy a variety of shoreline and main channel habitats including slow runs, shallow to deep pools, backwaters, eddies, and other relatively slow velocity areas associated with sand substrates (U.S. Fish and Wildlife Service 2002d). In spring and winter adult razorback sucker require deeper, low-velocity habitat, but are known to occupy shallow sandbars in summer (McAda and Wydoski 1980 in Zelasko et

al. 2009). Reproductive activities are believed to take place in off-channel habitats and tributaries because razorback sucker aggregations were reported in these areas. Off-channel habitats are much warmer than the mainstem river and razorback suckers presumably move to these areas for spawning and other activities, such as, feeding, resting, or sexual maturation.

Off channel and floodplain habitat is also important to young razorback sucker. After hatching, razorback sucker larvae drift downstream to low-velocity floodplain or backwater nursery habitat. The absence of seasonally flooded riverine habitats is believed to be a limiting factor in the successful recruitment of razorback suckers in their native environment. Starvation of larval razorback suckers due to low zooplankton densities in the main channel and loss of floodplain habitats which provide adequate zooplankton densities for larvae food is one of the most important factors limiting recruitment.

Unlike Colorado pikeminnow and razorback sucker, humpback chub show high site fidelity for canyon-bound reaches of mainstem rivers. Past captures of adults were associated with large boulders and steep cliffs. Reproductive habitat is not defined because although humpback chub are believed to broadcast eggs over mid-channel cobble and gravel bars, spawning in the wild has not been observed for this species. It is believed that upon emergence from spawning gravels, humpback chub larvae remain in the vicinity of bottom surfaces near spawning areas. As larval fish mature, backwaters, eddies, and runs were reported as common capture locations for young-of-year humpback chub.

While bonytail are closely related to humpback chub, their habitat usage may be slightly different. Bonytail are observed in pools and eddies in mainstem rivers, but recent information collected by the Recovery Program suggests that floodplain habitats may be more important to the survival and recovery of the bonytail than originally thought. Although spawning events in river habitat has not been documented, bonytail probably spawn in rivers over rocky substrates because spawning is observed in reservoirs over rocky shoals and shorelines. Recent hypotheses surmise that flooded bottomlands may provide important bonytail nursery habitat.

ENVIRONMENTAL BASELINE

Regulations implementing the ESA (50 CFR 402.02) define the environmental baseline as the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed State or Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation process..

STATUS OF THE SPECIES IN THE ACTION AREA

While the Project occurs in Wyoming, depletions associated with the Project from Little Snake River, a tributary to the Green and Colorado Rivers, adversely affect all four endangered fish species within the Upper Colorado River Basin Recovery Unit. The use of water from the Upper Colorado River Basin affects the habitat quantity and quality downstream of the Project location, for many miles.

Within this Recovery Unit, specific recovery criteria are established for the Green River sub-basin for all four species, including population demographics. Self-sustaining and stable populations of these species in the Green River sub basin are required for full species recovery (U.S. Fish and Wildlife Service 2002a, 2002b, 2002c, 2002d). The entire length of the Green River and its 100 year floodplain are designated as critical habitat for at least one species between the Yampa River confluence and the Colorado River confluence (Federal Register: 59 FR 13374).

The largest, most productive and most robust population of Colorado pikeminnow occurs in the mainstem Green River (combining the lower Green River, Desolation/Gray Canyon, and middle Green River populations). Higher abundance of Colorado pikeminnow juveniles and recruits in the 2006 to 2008 sampling period is attributed to a relatively strong year class of age-0 Colorado pikeminnow produced in the lower Green River in 2000 (Bestgen et al. 2010). Length frequency histograms, especially in the Desolation-Gray Canyon and lower Green River reaches, indicate that abundance of Colorado pikeminnow recruits was much higher in period 2006 to 2008 than from 2000 to 2003 (Bestgen et al. 2010). The importance of Green River populations is also evident because increased abundance of adult Colorado pikeminnow in the White River and middle Green River through 2008 almost certainly derived from upstream movement (high transition rates) of large numbers of juvenile and recruit-sized Colorado pikeminnow that originated in downstream reaches of the Green River in 2006 and 2007 (Bestgen et al. 2010). Colorado pikeminnow spawn in two principal sites: Gray Canyon in the lower Green River, and the lower Yampa River (U.S. Fish and Wildlife Service 2002b).

The action area includes the largest concentration of razorback suckers in the Upper Colorado River Basin, found in low-gradient flat-water reaches of the middle Green River between and including the lower few miles of the Duchesne River and the Yampa River. Known spawning sites for razorback sucker are located in the lower Yampa River and in the Green River near Escalante Ranch, but other, less-used sites are probable, such as Desolation Canyon (U.S. Fish and Wildlife Service 2002d). Both Colorado pikeminnow and razorback sucker are migratory spawners, whose young emerge as larval fish from spawning locations and drift downstream. Because Colorado pikeminnow and razorback sucker spawning locations occur downstream of the Project, all life stages are present within the action area.

Humpback chub occur in Westwater Canyon, Desolation/Gray Canyons and Cataract Canyon, but not in other river reaches in the action area. Preliminary population estimates in 2002 approximate 2,000 to 5,000 humpback chub in Westwater Canyon, 1,500 in Desolation/Gray Canyons, and 500 in Cataract Canyon (USFWS 2002c).

Bonytail are so rare that it is currently not possible to conduct population estimates. However, the action area includes the middle Green River, which is part of the current stocking program area (along with the Yampa River in Dinosaur National Monument).

STATUS OF CRITICAL HABITAT IN THE ACTION AREA

The action area includes critical habitat units, which are identified as essential for the species' recovery (U.S. Fish and Wildlife Service 2002a, 2002b, 2002c, 2002d). While historical water depletions do not occur within all critical habitat units, historical changes in Green River and

Colorado River water volume have nonetheless affected critical habitat by changing the amount of water flowing into these designated habitat units. The action area includes critical habitat units on the mainstem Green River and Colorado River below the Green River confluence.

As previously described, all four of the listed Colorado River fish require the same Primary Constituent Elements (PCEs) essential for their survival. Water, physical habitat, and the biological environment are the PCEs of critical habitat. This includes a quantity of water of sufficient quality that is delivered to a specific location in accordance with a hydrologic regime that is required for the particular life stage for each species. The physical habitat includes areas of the Colorado River system that are inhabited or potentially habitable for use in spawning and feeding, as a nursery, or serve as corridors between these areas. In addition, oxbows, backwaters, and other areas in the 100-year floodplain, when inundated, provide access to spawning, nursery, feeding, and rearing habitats. Food supply, predation, and competition are important elements of the biological environment.

Historically, the Green River produced high spring turbid flows that maintained critical habitat by inundating floodplains, maintaining side channels, flushing fine sediment, and creating backwaters (Muth et al. 2000). However, with the completion of Flaming Gorge Dam in 1962, the mainstem Green River became highly regulated. The dam and reservoir physically altered the Green River and surrounding terrain and modified the pattern of flows downstream (Muth et al. 2000). Most notably, the construction of the dam created a fish passage barrier and transformed miles of riverine habitat into lacustrine habitat. These two changes isolated fish populations and decreased the amount of native habitat.

Operation of the dam also results in effects to native fish communities. Historically, water releases from Flaming Gorge Dam did not mimic natural flow patterns and introduced colder water into the river from the deep pool behind the dam (Muth et al. 2000). Alteration of the natural flow regime affects stream vegetation communities and channel morphology, which modify native fish habitat (Muth et al. 2000). Natural flow regimes may act as cues for important life history events, like spawning. Life history events are similarly affected by water temperature, with colder temperatures disrupting the temporal spawning regime of native fish.

Additionally, Flaming Gorge Dam created new water resource impacts, such as irrigation potential, municipal use, and recreational fisheries of introduced non-native species. Water storage provided by the dam allowed local communities to increase water usage for agriculture and municipal purposes. Increased water depletion from the Green River decreases native fish habitat and limits the amount of backwater nursery habitat for juvenile fish. Also, increased water supply for agriculture and municipal purposes increases the likelihood of degraded water quality from agricultural runoff (pesticides, fertilizers, etc.) and wastewater inputs.

All four federally listed species evolved in desert river hydrology, relying on high spring flows and stable base flows for habitat conditions essential to their survival (see Status of the Species and Critical Habitat). In addition to main channel migration corridors, Colorado pikeminnow, bonytail and razorback sucker rely on floodplain and backwater habitats for various stages of their life history. High spring flows also act as spawning queues. In contrast, humpback chub rely more on canyon-bound reaches with swift currents and white water.

Currently, two primary reaches of Colorado pikeminnow nursery habitat are present in the Green River system. The lower reach occurs from near Green River, Utah, downstream to the Colorado River confluence. The upper reach occurs from near Jensen, Utah, downstream to the Duchesne River confluence. Larvae from Desolation Canyon colonize flooded backwater areas in the lower Green River area. These backwaters are especially important during the Colorado pikeminnow's critical first year of life. The Project is located upstream of both nursery habitat reaches and floodplain habitat.

Bottomlands, low-lying wetlands, and oxbow channels flooded and ephemerally connected to the main channel by high spring flows appear to be important habitats for all life stages of razorback sucker. These areas provide warm water temperatures, low-velocity flows, and increased food availability.

Humpback chub occur in Desolation/Gray Canyons, and within the action area. Adults require eddies and sheltered shoreline habitats maintained by high spring flows. These high spring flows maintain channel and habitat diversity, flush sediments from spawning areas, rejuvenate food production, and form gravel and cobble deposits used for spawning. Flow recommendations were developed that specifically consider flow-habitat relationships in habitats occupied by humpback chub in the upper basin, and were designed to enhance habitat complexity and to restore and maintain ecological processes.

PRIMARY CONSTITUENT ELEMENT – WATER - The quality and quantity of water in the action area of the Green River has decreased from water projects, most notably Flaming Gorge Dam and the Central Utah Project. A number of tributaries to the Green River appear on the State of Utah's 303(d) list of impaired streams for various reasons (Utah Division of Water Quality 2004). Tributaries and sections of the Price, San Rafael, and Duchesne Rivers are listed for elevated salinity, TDS, and chlorides, as are portions of Ashley and Pariette Draw Creeks. Brush, Pariette Draw, and Lower Ashley Creeks are listed for elevated selenium. Willow and Indian Canyon Creeks are listed for elevated total dissolved solids. Ninemile Creek is listed for elevated temperature. Lake Fork Creek is listed for elevated sediments. Lastly, Pariette Draw Creek is listed for elevated boron. These elevated pollutants pose a risk to this PCE. As these tributares reach the main stem, these pollutants are introduced to the Green River as well. Currently the Green River acts as a dilution for these pollutants, as is evident by the Green River not appearing on the State of Utah's impaired water list. However, these pollutants still occur in the river and as new water depletions occur, these pollutants will be found in higher concentrations.

Large water diversion projects, large-scale agricultural water use, and climate change have all altered the water quantity in the Green River over the past 150 years. Most notably, Flaming Gorge Dam has altered the magnitude and timing of flows in endangered fish habitat. Peak spring flows in the Green River at Jensen, Utah, have decreased 13 to 35 percent and base flows have increased 10 to 140 percent due to regulation by Flaming Gorge Dam (Muth et al. 2000). However, since 2006 changes were made in the operation of Flaming Gorge Dam that provide flow and meet temperature requirements for native fish. The next major step in providing adequate habitat for the endangered fish is determining how to protect flows to consistently meet demands and endangered fish flow recommendations (see Flow Protection in the Green River,

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management are northern pike, smallmouth bass, walleye, and burbot (*Lota lota*). These nonnative fish species pose significant threats to the endangered fishes because of their high or increasing abundance and range expansion, their habitat and resource requirements overlap with those of the endangered fish species, and their predatory impact;

- Participating in the Flaming Gorge Technical Workgroup, which manages releases from Flaming Gorge Dam to benefit endangered fish species while meeting other legal purposes of the dam. This technical team establishes base flow and spring peak release criteria from Flaming Gorge that meet the Flow Recommendations (Muth et al. 2000); and
- Stocking of bonytail and razorback sucker into the middle and lower Green River.

FLOW PROTECTION IN THE GREEN RIVER - Recovery cannot be accomplished without securing, protecting, and managing sufficient habitat to support self-sustaining populations of the endangered fishes. Identification and protection of instream flows are key elements in this process. The first step in this process, identifying instream flows needed for recovery, was completed for the action area with the publication of the Flow Recommendations (Muth et al. 2000). However, there is no legal protection of flows in the Utah portion of the Green River. The process for meeting this recovery goal is ongoing, as described below.

Several approaches may be taken under Utah water law to protect instream flows, including: 1) acquiring existing water rights and filing change applications to provide for instream flow purposes; 2) withdrawing unappropriated waters by governor's proclamation; 3) approving presently filed and future applications subject to minimum flow levels; and 4) with proper compensation, preparing and executing contracts and subordinating diversions associated with approved and perfected rights.

Although Utah water law may not fully provide for all aspects of instream-flow protection, the State believes they can provide an adequate level of protection. Utah examined available flow protection approaches in the 1990's and determined that their primary strategy will be to condition the approval of presently filed and new applications, making them subject to predetermined streamflow levels. To accomplish this, the State Engineer adds a condition of approval to post-1994 water right applications above Jensen filed after the policy is adopted. The condition states that whenever the flow of the Green River (or other streams) drops below the predetermined streamflow level, then diversions associated with water rights approved after the condition is imposed are prohibited. Based on past legal challenges to the State's authority to impose conditions associated with new approvals, it was determined that this is within the authority of the State Engineer.

This approach does not specifically recognize an instream-flow right; however, it does protect the flows from being diverted and used by subsequently approved water rights. This approach was adopted as policy by the State Engineer. The policy requires that presently filed and new applications to be approved are subject to the summer and fall flow recommendations. As flow recommendations are finalized and accepted, Utah will review options for protecting the recommended flows. In 2009, Utah determined that the aforementioned "subordination" method of flow protection may not be feasible below Jensen. The Recovery Program's Water Acquisition Committee formed a task force to develop other options for protecting fish flows on the Green River. In 2010, modeling began (and is ongoing) to determine the volume of water

that would be needed to protect fish flow targets under current demands and projected future demands. Preliminary results of modeling indicate that under current and future demands the lowest flow years may not meet the flow recommendation targets in Reach 3 without additional protected volumes of water. The volume of water needed and flow protection are planned to be determined by 2017.

PARTICIPATION IN THE FLAMING GORGE TECHNICAL WORKGROUP - The Flaming Gorge Technical Working Group (FGTWG) was established pursuant to the Operation of Flaming Gorge Dam Final Environmental Impact Statement (FEIS) as recommended in the Flow and Temperature Recommendations for Endangered Fishes in the Green River Downstream of Flaming Gorge Dam (Flow Recommendations) (Muth et al. 2000). Members of the FGTWG include biologists and hydrologists from the Recovery Program, Bureau of Reclamation (BOR), the U.S. Fish and Wildlife Service, and Western Area Power Administration. The Record of Decision on the FEIS clarified the purpose of the FGTWG as limited to proposing specific flow and temperature targets for each year's operations based on current year hydrologic conditions and the conditions of the endangered fish. The FGTWG was also charged with integrating, to the extent possible, any flow requests from the Upper Colorado River Endangered Fish Recovery Program (Recovery Program) into the flow proposal so that Recovery Program research could also be facilitated. This process concurrently serves the informal consultation and coordination requirements of the ESA for the action agencies as committed to in the ROD.

Flaming Gorge operations greatly impact the hydrologic conditions found in the action area. The BOR sets Flaming Gorge releases to support target flows at the Jensen gauge (Reach 2 from the FEIS), which in turn substantially affect the flows at the Green River, Utah gauge (Reach 3). Recommended base flows in Reach 3 are measured immediately downstream of the Project; therefore adequate base flows in Reach 3 would support all Project features (water use, boat passage, fish passage, etc). However, BOR and the Service recognize that between Flaming Gorge and Green River, Utah, there are many stream miles, inputs and withdrawals, and disparate weather patterns. T herefore, BOR does not manage Flaming Gorge to attempt to meet Reach 3 targets; instead they assume that managing for Reach 2 targets should adequately meet Reach 3 targets. While meeting Reach 2 targets may not always cause Reach 3 targets to be met, water supplied for Reach 2 does support higher base flows in Reach 3. As long as hydrology and climatic patterns supply adequate runoff, continued cooperation between the FGTWG members to release adequate base flows for Reach 2 will support conditions at the Project area.

ENDANGERD FISH STOCKING - Each year tens of thousands of bonytail and razorback sucker are stocked into the main stem Green River. Two primary stocking locations are in the middle Green River near Ouray National Wildlife Refuge and in the lower Green River at Green River State Park. Stocking these fish in the main stem river is designed to supplement the population and eventually create a self-sustaining population.

EFFECTS OF THE ACTION

EFFECTS TO ENDANGERED SPECIES

The Project will adversely affect Colorado pikeminnow, razorback sucker, bonytail, and humpback chub by reducing the amount of water in the river system upon which they depend by up to 650 acre-feet per year. The effects to all four species primarily result from the effects of the action upon their habitats. In general, the proposed action will adversely affect the four listed fish by reducing the amount of water available to them, increasing the likelihood of water quality issues, increasing their vulnerability to predation, and reducing their breeding opportunities by shrinking the amount of breeding and nursery habitat within their range.

Removing 650 acre-feet per year from the Colorado River Basin will alter the natural hydrological regime that creates and maintains important fish habitats, such as spawning habitats, and reduces the frequency and duration of availability of these habitats of the four endangered fish. The reduction of available habitats will directly affect individuals of all four species by decreasing reproductive potential and foraging and sheltering opportunities. Many of the habitats required for breeding become diminished when flows are reduced. As a result, individual fish within the action area may not find suitable breeding locations or will deposit eggs in less than optimal habitats more prone to failure or predation. In addition, reduction in flow rates lessens the ability of the river to inundate bottomland, a source of nutrient supply for fish productivity. Water depletions also exacerbate competition and predation by nonnative fishes by altering flow and temperature regimes toward conditions that favor non-natives.

The proposed depletions affect the water quality in the action area by increasing concentrations of heavy metals, selenium, salts, pesticides, and other contaminants. Increases in water depletions will cause associated reductions in assimilative capacity and dilution potential for any contaminants that enter the river. The Project depletions will cause a proportionate decrease in dilution, resulting in an increase in heavy metal, selenium, salts, pesticides, and other contaminant concentrations in the Colorado River system. An increase in contaminant concentrations in the river can result in an increase in the bioaccumulation of these contaminants in the food chain which could adversely affect the endangered fishes. Selenium is of particular concern due to its effects on fish reproduction and its tendency to concentrate in low velocity areas that are important habitats for Colorado pikeminnow and razorback sucker.

The proposed Project will affect the physical condition of habitat for the four listed fish by resulting in a reduction of water. This reduction will contribute to the cumulative reduction in high spring flows, which are essential for creating and maintaining complex channel geomorphology and suitable spawning substrates, creating and providing access to off-channel habitats, and possibly stimulating Colorado pikeminnow spawning migrations. Adequate summer and winter flows are important for providing a sufficient quantity of preferred habitats at a duration and frequency necessary to support all life stages of viable populations of all endangered fishes. To the extent that the proposed Project will reduce flows, the ability of the river to provide these functions will be reduced. This reduction of water affects habitat availability and habitat quality.

To the extent that it will reduce flows and contribute to further habitat alteration, the proposed project may contribute to an increase in nonnative fish populations. The modification of flow regimes, water temperatures, sediment levels, and other habitat conditions caused by water depletions has contributed to the establishment of nonnative fishes. Endangered fishes within the action area will experience increased competition and predation as a result.

EFFECTS TO CRITICAL HABITAT

All four of the listed Colorado River fish require the same primary constituent elements (PCEs) essential for their survival. Therefore, we are combining our analysis of all four species into one section. Because the amount of designated critical habitat varies for each of the four species, the amount of critical habitat will vary; however, the effects will be the same for all critical habitats within the action area.

Water, physical habitat, and the biological environment are the PCEs of critical habitat. This includes a quantity of water of sufficient quality that is delivered to a specific location in accordance with a hydrologic regime that is required for the particular life stage for each species. The physical habitat includes areas of the Colorado River system that are inhabited or potentially habitable for use in spawning and feeding, as a nursery, or serve as corridors between these areas. In addition, oxbows, backwaters, and other areas in the 100-year floodplain, when inundated, provide access to spawning, nursery, feeding, and rearing habitats. Food supply, predation, and competition are important elements of the biological environment.

Primary Constituent Element – Water

he subject action would deplete up to 650 acre-feet per year from the Colorado River Basin. Removing water from the river system changes the natural hydrological regime that creates and maintains important fish habitats, such as spawning habitats, and reduces the frequency and duration of availability of these habitats of the four endangered fish. In addition, reduction in flow rates lessens the ability of the river to inundate bottomland, a source of nutrient supply for fish productivity and important nursery habitat for razorback sucker. Water depletions change flow and temperature regimes toward conditions that favor nonnative fish, thus adding to pressures of competition and predation by these nonnative fishes as discussed above.

Changes in water quantity would affect water quality, which is a PCE of critical habitat. Contaminants enter the Colorado River from various point and non-point sources, resulting in increased concentrations of heavy metals, selenium, salts, pesticides, and other contaminants. Increases in water depletions will cause associated reductions in assimilative capacity and dilution potential for any contaminants that enter critical habitat in the Colorado River. The subject depletions will cause a proportionate decrease in dilution, which in turn would cause a proportionate increase in heavy metal, selenium, salts, pesticides, and other contaminant concentrations in the Upper Colorado River Basin, affecting water quality.

Primary Constituent Element - Physical Habitat

The subject action will affect the physical condition of habitat for the four listed fish by resulting in a reduction of water. This reduction will contribute to the cumulative reduction in high spring flows, which are essential for creating and maintaining complex channel geomorphology and

suitable spawning substrates, creating and providing access to off-channel habitats, and possibly stimulating Colorado pikeminnow spawning migrations. Adequate summer and winter flows are important for providing a sufficient quantity of preferred habitats for a duration and at a frequency necessary to support all life stages of viable populations of all endangered fishes. To the extent that the subject action will reduce flows, the ability of the river to provide these functions will be reduced. This reduction of water affects habitat availability and habitat quality.

Primary Constituent Element - Biological Environment

To the extent that it will reduce flows and contribute to further habitat alteration, the Project may contribute to an increase in nonnative fish populations. The modification of flow regimes, water temperatures, sediment levels, and other habitat conditions caused by water depletions has contributed to the establishment of nonnative fishes. Endangered fishes within the action area would experience increased competition and predation as a result.

CUMMULATIVE EFFECTS

Cumulative effects include the effects of future State, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA. In Wyoming, most water depletions within the Colorado River Basin include a Federal nexus and will be addressed in future section 7 consultations.

CONCLUSION

After reviewing the current status of the Colorado pikeminnow, humpback chub, bonytail, and razorback sucker, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that the Project, as described in this biological opinion, is not likely to jeopardize the continued existence of endangered fish and is not likely to destroy or adversely modify designated critical habitat.

INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and Federal regulation pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the USFWS to include significant habitat modification or degradation that results in death or injury of listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass means an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the ESA

provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

Colorado pikeminnow, humpback chub, bonytail, and razorback sucker are harmed from the reduction of water in their habitats resulting from the subject action in the following manner: (1) individuals using habitats diminished by the proposed water depletions could be more susceptible to predation and competition from non-native fish, and (2) habitat conditions may be rendered unsuitable for breeding because reduced flows would impact habitat formulation and maintenance as described in the biological opinion.

Estimating the number of individuals of these species that would be taken as a result of water depletions is difficult to quantify for the following reasons: (1) determining whether an individual forwent breeding as a result of water depletions versus natural causes would be extremely difficult to determine; (2) finding a dead or injured listed fish would be difficult, due to the large size of the action area and because carcasses are subject to scavenging; (3) natural fluctuations in river flows and species abundance may mask depletion effects, and (4) effects that reduce fecundity are difficult to quantify. However, we believe the level of take of these species can be monitored by tracking the level of water reduction and adherence to the Recovery Program. Specifically, if the Recovery Program (and relevant RIPRAP measures) is not implemented, or if the current anticipated level of water depletion is exceeded, we fully expect the level of incidental take to increase as well. Therefore, we exempt all take in the form of harm that would occur from the removal of 650 acre-feet of water per year. Water depletions above the amount addressed in this biological opinion would exceed the anticipated level of incidental take and are not exempt from the prohibitions of section 9 of the Act.

The implementation of the Recovery Program is intended to minimize impacts of water depletions; therefore, support of Recovery Program activities by the BLM as described in the proposed action exempts the BLM and project proponent from the prohibitions of section 9 of the ESA. The BLM is responsible for reporting to the Service if the amount of average annual depletion is exceeded.

REASONABLE AND PRUDENT MEASURES

In addition to the conservation measures identified earlier in this document, we believe the following reasonable and prudent measures are necessary and appropriate to minimize the impacts of incidental take of Colorado pikeminnow, humpback chub, bonytail, and razorback sucker.

1. The BLM and Project proponents must implement a monitoring and reporting program to ensure that the annual depletion does not exceed 650 acre-feet and that the cumulative depletion for the Project does not exceed 9,750 acre-feet (i.e., 650 acre-feet for 15 years of development).

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the ESA, the BLM and Project proponent must comply with the following terms and conditions, which implement the

reasonable and prudent measures described above and outline required reporting/monitoring requirements. These terms and conditions are nondiscretionary.

In order to implement a monitoring and reporting program:

1. The BLM and Project proponent will identify those wells pulling water from the Wasatch Formation within that portion of the Washakie Structural Basin that loses groundwater to the southeast toward the Little Snake River, a tributary of the Colorado River.
2. The Project proponent will regularly (e.g., quarterly) provide a written report of water withdrawn from the wells identified above.
3. The BLM will track annual and cumulative depletions and will work with the Project proponent to identify alternate water sources if depletions approach the amounts identified above in the reasonable and prudent measures.

REINITIATION NOTICE

This concludes formal consultation on the action outlined in the request. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded, (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion, (3) the action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion, or (4) a new species is listed or critical habitat designated that may be affected by the action.

We appreciate your efforts to ensure the conservation of endangered, threatened, and candidate species and migratory birds. If you have questions regarding this letter or your responsibilities under the Act, please contact Nathan Darnall of my office at the letterhead address or phone (307) 772-2374, extension 246.

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APPENDIX R: GUIDANCE FOR BEST MANAGEMENT PRACTICES BI-ANNUAL REPORTS

This Appendix provides guidance regarding the submission of the bi-annual Best Management Practice (BMP) reports as required by Alternative B and Alternative F. When implemented effectively and maintained on a consistent basis, BMPs can be extremely effective in controlling sediment movement. Initial stabilization of soil through the use of BMPs can reduce sediment runoff and prevent sediment delivery to drainages, and can accelerate re-vegetation of a site. In the Continental Divide-Creston (CD-C) project area, typical BMPs include wattles, check dams, sediment fences, and erosion control blankets. Culvert outlets are often armored with rip-rap to disperse the velocity of water, and sediment basins are sometimes used to reduce the amount of sediment traveling in runoff.

Submission of data from industry inspections of erosion control BMPs would be required as a component of Alternative B and Alternative F. These data would be submitted in electronic format and would include Geographic Positioning System (GPS) locations, BMP type, condition (good, fair, poor, needs to be replaced), and maintenance needed (if any). In addition, an electronic map depicting locations of these BMPs would be submitted. These data would be submitted to the Rawlins Field Office bi-annually. Data would be collected once in the spring, following spring runoff, and once in the fall, prior to winter weather conditions. Additional monitoring is recommended following a precipitation event of greater than ½ inch in one hour as measured by the nearest weather monitoring station. The BLM would maintain collections of the data submittal records and compile this information into a database. The coordination and consultation group would review these data and determine whether the threshold identified below is being exceeded:

- A 20-percent failure rate of BMPs or a 5-percent recurring failure rate of individual BMPs.

A failed BMP is defined as one that is no longer effective in retaining sediment or serving the purpose it was designed to achieve. For example, if a hay wattle that was placed in a ditch to control sediment is no longer controlling the movement of sediment, then the wattle has failed as a BMP and must be replaced. In addition, crushed or smashed culverts are also examples of failed BMPs. If a BMP is determined to have failed, it must be remedied as soon as possible by the operator(s).

If the consultation and coordination group determines that the above-identified threshold has been exceeded, the group would convene and attempt to determine what is contributing to the failure and require that additional measures are implemented to ensure that continued recurring failures do not occur.

Figure 1. Example table

Location (UTM)	Associated wellpad/ pipeline	BMP Type	BMP condition	Action needed	Action taken	Date action taken
12345,1232456	1791-25-32	Wattle	Poor; smashed and sediment is not being retained	Replacement	Replaced	10.15.2013
12346,123467	1791-45-32	Culvert	Smashed at downstream end	Replacement	Replaced	10.15.2013
12347, 1234678	1791-55-32	Check dam	Good	None needed	N/A	N/A

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APPENDIX S: LANDSCAPE SCALE MITIGATION

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Introduction

The EIS analyzed the effects of the project's proposed 8,950 infill natural gas wells and field development within a project area consisting of approximately 1.1 million acres. The locations of the proposed wells have not been identified at this time. The BLM will review and authorize each component of the project that involves the disturbance of federal lands on a site-specific basis. Surface-disturbing activities are generally authorized by the BLM through the approval of an Application for Permit to Drill (APD), right-of-way grant, and/or Sundry Notice, with supporting environmental analysis in accordance with the NEPA process. Evaluations at this level include site-specific analyses of proposed construction, including well locations, pipelines, access roads, and other facilities associated with natural gas development. These analyses would be tiered to the broad-scale level analysis included in this EIS and would be completed prior to the authorization of any construction.

This appendix has been developed as a mitigation plan for the CD-C project area, and identifies opportunities to apply landscape-scale mitigation in order to address reasonably foreseeable impacts, identified in the EIS NEPA analysis, that may occur as a result of the development.

This appendix summarizes impacted resources, the avoidance and minimization mitigation measures to address those impacts, and remaining reasonably foreseeable residual impacts to those resources after the mitigation measures are applied, based on the analysis in the CD-C EIS. Residual impacts are those impacts that remain after all appropriate BMPs, COAs, RDFs have been implemented; they can also be referred to as unavoidable impacts. This appendix identifies those resources that were determined to have residual impacts that warrant compensatory mitigation. It outlines how the BLM would include avoidance, minimization, rectification, reduction/elimination (some of which were already identified in Chapter 4 of the CD-C EIS), and compensatory mitigation (for those resources that were determined to have residual impacts that warrant compensatory mitigation) for future actions that tier to this EIS. These actions will have site-specific NEPA analysis completed that will include the necessary mitigation measures, in accordance with this appendix. Finally, this appendix identifies example opportunities for implementing compensatory mitigation.

Based on the summarization of the NEPA analysis within the EIS and identification of reasonably foreseeable residual impacts that warrant compensatory mitigation, this appendix contains a mitigation strategy to address reasonably foreseeable residual impacts to pronghorn antelope, mule deer, and Greater Sage-Grouse for the CD-C project. Through the Rawlins Resource Management Plan (RMP) (BLM 2008) and the Wyoming Approved Resource Management Plan Amendments for Greater Sage-Grouse (ARMPA) (BLM 2015), areas for avoidance of impacts to these species were identified. Additionally, the RMP, ARMPA, and this EIS contain measures appropriate for minimizing the impacts to these species associated with this type of development.

During analysis of actions that tier to this EIS, the BLM will identify, analyze and require compensatory mitigation to address the reasonably foreseeable impacts to these resources that remain and/or when certain circumstances (e.g. valid existing rights, lack of technologic capabilities) make it impossible to avoid/minimize the impacts to these species' habitats and, therefore, require replacement or substitute resources or environments for these species. The need for compensatory mitigation will be based on applicable mitigation standards and what is appropriate and commensurate with the reasonably foreseeable residual effects. The Rawlins RMP indicates a no net loss mitigation standard for antelope and mule deer. The Wyoming ARMPA identifies a net conservation gain mitigation standard within PHMA and the Rawlins RMP indicates a no net loss within GHMA for Greater Sage-Grouse.

In the event, in the site-specific EA and/or other APD-level analysis, residual impacts to pronghorn antelope, mule deer, or Greater Sage-Grouse are identified, the BLM will:

1. Describe the residual effects.
2. Calculate the compensatory mitigation obligation associated with the residual effects.

a. Determine the base amount of compensatory mitigation (debits). (Section F.2 of this Appendix)

b. Adjust the amount of compensatory mitigation (debits) with consideration to risk or other relevant factors as determined by the authorized officer.

c. Describe the potential type of compensatory mitigation appropriate for mitigating the residual impacts, including each of the mitigation measures and their required outcome.

d. Determine the site(s) of the compensatory mitigation measures that will provide for the appropriate types and amount of compensatory mitigation measures (commensurate with the debit), and achieve the maximum benefit toward the mitigation standard to the impacted resources within the context or the conditions and trends of those resources, at all relevant scales.

i. Additional adjustments to the amount of compensatory mitigation may be necessary to account for issues related to the compensatory mitigation measures and sites, such as differences between the quality of resources at the impacted site and those expected to be produced at the compensatory mitigation site, any lack of timeliness, the degree of durability of the compensatory mitigation site, and the type of compensatory mitigation.

e. If NEPA analysis has not already been completed, analyze the compensatory mitigation measures, sites and mechanisms necessary to meet the compensatory mitigation obligation, including length of durability and monitoring and reporting requirements.

f. Determine the compensatory mitigation mechanism(s). The BLM should discuss the compensatory mitigation mechanism options (choosing from the list of potential compensatory mitigation projects identified in the process described in **Section G** of this Appendix) with the land use authorization's applicant. The BLM will determine the mechanism(s), taking into account the preferences of the applicant.

g. Identify the required outcomes and responsible parties for each mitigation measure, site, and/or mechanism. The BLM may need to ensure that the proponent provides the BLM with an adequate performance bond or similar financial instrument. The BLM will include any costs for implementation and effectiveness monitoring and other applicable administration of the chosen mitigation measures.

3. In the decision document, the BLM will approve, deny, or approve with the additional mitigation (8.b) the proposed land use activity.

a. If approving the land use activity, the BLM will clearly identify in the decision document(s) the required mitigation measures (i.e. mitigation obligation) with rationale from and reference to the associated NEPA analysis.

b. The BLM must incorporate any mitigation obligations from the decision document(s) into the land use authorization via stipulations, terms and conditions, conditions of approval, etc., so that they become requirements of the land use authorization.

This approach is consistent with Secretarial Order No. 3330, *Improving Mitigation Policies and Practices of the Department of the Interior*, and the BLM's obligations under FLPMA, National Environmental Policy Act (NEPA) of 1969, Mineral Leasing Act of 1920, as amended, Council on Environmental Quality (CEQ) Regulations, and WO IM 2013-142: Interim Policy, Draft – Regional Mitigation Manual Section – 1794.

This appendix includes the following elements (A, B, C, and D provide summary information from the CD-C EIS, the Rawlins Field Office Resource Management Plan (RMP) and other relevant documents and policies):

A. Affected Resources: A description of the land use activities expected in the geographic area of the EIS and the resources that may be reasonably foreseeably impacted by those land use activities.

B. Management Goals and Objectives: A description of the relevant management goals and objectives (e.g. BLM's land use plan objectives, a State agency's resource objectives, etc.) for these resources, at all relevant scales.

C. Baseline Conditions and Trends: A description of baseline conditions and trends of these resources, at all relevant scales, including how the conditions and trends are expected to change due to the reasonably foreseeable impacts.

D. Mitigation Measures: A description of mitigation measures to avoid, minimize, rectify, and/or reduce/eliminate over time the reasonably foreseeable impacts to these resources.

E. Residual Effects: A description of the reasonably foreseeable residual effects to these resources, including the identification of which of these residual effects may warrant compensatory mitigation.

F. Compensatory Mitigation Measures and Defined Outcomes: An evaluation and prioritization of appropriate compensatory mitigation measures for the resources that warrant compensatory mitigation, including clearly-defined and measurable outcomes.

G. Draft CD-C Compensatory Mitigation Measures and Sites List: An evaluation and prioritization of compensatory mitigation sites that will maximize the benefit for the resources that may warrant compensation, including considerations of each site's ability to provide benefits to multiple resources, importance in the geographic area, durability, and additionality.

H. Durability and Monitoring of Mitigation: A description of actions necessary to achieve durability of, and to monitor, adapt (if necessary), and report on, mitigation.

A. Affected Resources

The Continental Divide-Creston (CD-C) Natural Gas Development Project and other land use activities expected in the geographic area are described in Chapter 3 of the Continental Divide-Creston Natural Gas Development Project Final EIS. The resources listed below are those that were determined through the EIS process to be reasonably foreseeably impacted. These resources are described under four categories: physical, biological, human, and management environments.

- **Physical Environment**

  Geology, Paleontologic Resources, Soils, Water Resources, Air Quality
- **Biological Environment**

  Vegetation, Invasive, Non-native Plant Species, Wildlife, Special Status Species and Wild Horses
- **Human Environment**

  Visual Resources, Recreation, Lands with Wilderness Characteristics, Cultural and Historical Resources, Socioeconomics, Transportation and Access, Noise
- **Management Environment**

  Range Resources, Oil and Gas and other Minerals, Health and Safety, Waste and Hazardous Materials Management

B. Management Goals and Objectives

A description of the relevant management goals and objectives for these resources, at all relevant scales, is provided in the following locations:

- **Physical Environment**
  - Geology: RMP Section 2.3.16 Water Quality, Watershed, and Soils Management
  - Paleontologic Resources: RMP Section 2.3.9 Paleontology
  - Soils: RMP Section 2.3.16 Water Quality, Watershed, and Soils Management
  - Water Resources: RMP Section 2.3.16 Water Quality, Watershed, and Soils Management
  - Air Quality: RMP Section 2.3.1 Air Quality
- **Biological Environment**
  - Vegetation: RMP Section 2.3.14 Vegetation
  - Invasive Non-native Plant Species: RMP Section 2.3.14 Vegetation
  - Wildlife: RMP Section 2.3.18 Wildlife and Fisheries
  - Special Status Species: RMP Sections 2.3.14 Vegetation; 2.3.18 Wildlife and Fisheries
  - Wild Horses: RMP Section 2.3.17 Wild Horses
- **Human Environment**
  - Visual Resources: RMP FEIS No Action Alternative, Visual Resource Management
  - Recreation: RMP Sections 2.3.8 Off-Highway Vehicles; 2.3.10 Recreation and Visitor Services
  - Lands with Wilderness Characteristics: BLM Manual Sections 6310 and 6320
  - Cultural and Historical Resources: RMP Section 2.3.2 Cultural Resources
  - Socioeconomics: RMP Sections 2.3.11 Socioeconomics

  - Transportation and Access: RMP Sections 2.3.13 Transportation and Access Management; 2.3.8 Off-Highway Vehicles
  - Noise: Rawlins RMP APPENDIX 15 - Best Management Practices For Reducing Surface Disturbance And Disruptive Activities
- **Management Environment**
  - Range Resources: RMP Section 2.3.6 Livestock Grazing,
  - Oil and Gas and other Minerals: RMP Section 2.3.7 Minerals
  - Health and Safety: RMP Sections 2.3.8 Off-Highway Vehicles; 2.3.7 Minerals
  - Waste and Hazardous Materials Management: RMP Section 2.3.7 Minerals

C. Baseline Conditions and Trends

A description of baseline conditions and trends (including consideration of change agents) of these resources, at all relevant scales, including how the conditions and trends are expected to change due to the reasonably foreseeable impacts is provided within this EIS in the following locations:

- **Physical Environment**
  - Geology: CD-C EIS Sections 3.1 and 4.1
  - Paleontologic Resources: CD-C EIS Sections 3.2 and 4.2
  - Soils: CD-C EIS Sections 3.3 and 4.3
  - Water Resources: CD-C EIS Sections 3.4 and 4.4
  - Air Quality: CD-C EIS Sections 3.5 and 4.5
- **Biological Environment**
  - Vegetation: CD-C EIS Sections 3.6 and 4.6
  - Invasive, Non-native Plant Species: CD-C EIS Sections 3.7 and 4.7
  - Wildlife: CD-C EIS Sections 3.8 and 4.8
  - Special Status Species: CD-C EIS Sections 3.9 and 4.9
  - Wild Horses: CD-C EIS Sections 3.10 and 4.10
- **Human Environment**
  - Visual Resources: CD-C EIS Sections 3.11 and 4.11
  - Recreation: CD-C EIS Sections 3.12 and 4.12
  - Lands with Wilderness Characteristics: CD-C EIS Sections 3.13 and 4.13
  - Cultural and Historical Resources: CD-C EIS Sections 3.14 and 4.14
  - Socioeconomics: CD-C EIS Sections 3.15 and 4.15
  - Transportation and Access: CD-C EIS Sections 3.16 and 4.16
  - Noise: CD-C EIS Sections 3.17 and 4.17
- **Management Environment**
  - Range Resources: CD-C EIS Sections 3.18 and 4.18
  - Oil and Gas and other Minerals: CD-C EIS Sections 3.19 and 4.19
  - Health and Safety: CD-C EIS Sections 3.20 and 4.20
  - Waste and Hazardous Materials Management: CD-C EIS Sections 3.21 and 4.21

Biological and physical components are often used as indicators of the functional status of ecological process and site integrity (Pellant et al. 2005). The assessment of three attributes (soil/site stability, hydrologic function, and biotic integrity) produces a qualitative assessment used by the BLM when evaluating rangeland health. These attributes are defined below:

- **Soil/Site Stability**: The capacity of an area to limit redistribution and loss of soil resources (including nutrients and organic matter) by wind and water.
- **Hydrologic Function**: The capacity of an area to capture, store, and safely release water from rainfall, run-on, and snowmelt (where relevant), to resist a reduction in this capacity, and to recover this capacity when a reduction does occur.
- **Biotic Integrity**: The capacity of the biotic community to support ecological processes within the normal range of variability expected for the site, to resist a loss in the capacity to support these processes, and to recover this capacity when losses do occur. The biotic community includes plants, animals, and microorganisms occurring both above and below ground.

There are key quantitative and qualitative assessment indicators used for the determination of each attribute (please see Pellant et al. 2005 for a complete discussion of these indicators).

The BLM and the Natural Resources Conservation Service (NRCS) have been working together to collect indicators of rangeland health data consistent with the national Assessment, Inventory, and Monitoring (AIM) framework/strategy (Toevs et al. 2011) in order to provide landscape level information that field and district offices can use in making land use decisions. The sampling framework is unbiased and statistically valid which will allow data collected at specific sites to be scaled to larger management units, watersheds, or landscapes otherwise identified and will allow locally collected data to be combined with regional (or national) level data for use at larger scales (Taylor et al. 2014). Through the Landscape Monitoring Framework (LMF), additional points are captured each year, both inside and outside of the CD-C project area, thereby making it possible to compare trends inside and outside of the CD-C project area to help inform whether resources are being unintentionally impacted as a result of the project.

Twenty-nine data points that fall within the CD-C project area have been monitored since 2011 as part of the BLM's Westside LMF and will provide the Rawlins Field Office (RFO) with baseline information for determining appropriate compensatory mitigation actions based on project location. These data and other local knowledge, such as that gathered through rangeland standards and guidelines assessments, will provide baseline information and form a component of the NEPA analysis that will be completed for an individual project. As APDs are received by the RFO, these data points, additional data points, and land health assessments can be utilized for the proposed project area to help inform baseline conditions for the project location. Data have also been collected adjacent to areas identified, in **Section H**, as potential landscape mitigation measure sites.

The RFO will consider the LMF monitoring data for the APD and/or associated infrastructure causing the residual impacts warranting compensatory mitigation. The baseline information and the value of the habitat in the proposed project area will help determine the amount of compensatory mitigation (i.e. to inform "q" in the equation in **Section F** of this appendix) and aid in the identification of compensatory mitigation sites with habitat value equal-to or higher-than the disturbance area as determined by the monitoring data points within these sites (i.e. to help ensure that the mitigation standard set for resources in **Section E** of this Appendix is met).

D. Mitigation Measures

Below is a description of where mitigation measures to avoid, minimize, rectify, and/or reduce/eliminate over time the reasonably foreseeable impacts to these resources as analyzed within the CD-C EIS may be found.

Appendix C "Conservation and Mitigation Measures" in the CD-C EIS describes Best Management Practices (BMPs), Conditions of Approval (COAs), terms and conditions, and Required Design features (RDFs) that may be applied to each APD and/or ROW grant as necessary. Also included in Appendix C is a reference to the Rawlins RMP BMPs (2008). Additional mitigation measure will be applied to authorizations that tier to this EIS, based on current law, regulation, and/or policy.

Additional mitigation measures within the CD-C EIS are listed below.

- **Physical Environment**
  - Geology: No additional mitigation measures were identified.
  - Paleontologic Resources: Mitigation measures are described in Appendix C, in Appendix D "Paleontological Resources Program Guidance," the Paleontological Resource Preservation Act (PRPA), and BLM IM No. 2009-011 "Assessment and Mitigation of Potential Impacts to Paleontological Resources" (BLM 2008d).
  - Soils: Additional mitigation measures would be required on a site-specific basis to minimize adverse impacts, and would include closed-loop drilling, immediate stabilization and other measures as necessary.
  - Water Resources: No additional mitigation measures were identified.
  - Air Quality: Additional mitigation of predicted air quality impacts could be implemented by the following control measures:
    - Use of Tier 4 or equivalent drill rig engines, reducing nitrous oxides, carbon monoxide, PM_{10}, $PM_{2.5}$, and volatile organic compound (VOC) emissions.
    - Use of Tier 2 or better construction equipment, reducing nitrous oxides, carbon monoxide, PM_{10}, $PM_{2.5}$, and VOC emissions.
    - Application of chemical suppressant on unpaved roads and additional watering during construction activities to minimize fugitive dust, reducing particulate (PM_{10}, $PM_{2.5}$) impacts.
    - Centralization of well pad production facilities (e.g., heaters, flares, dehydration units) and installation of liquids-gathering systems, reducing NOx, CO, PM_{10}, $PM_{2.5}$, VOC, and HAP emissions and reducing truck traffic.
    - Field electrification, reducing nitrous oxides, carbon monoxide, PM10, PM2.5, and VOC emissions. These and other mitigation options or control measures may already be in practice in the CD-C project area to varying degrees.
- **Biological Environment**
  - Vegetation: Mitigation measures are described in Appendices C, D, M, and P of the CD-C EIS.
  - Invasive, Non-native Plant Species: Mitigation measures are described in Appendices C, D, and M of the CD-C EIS.
  - Wildlife: Mitigation measures are described Appendices B, C, I, N, and P. The following additional measures were included in the CD-C EIS and could further minimize impacts:
    - Minimizing human presence at well sites after they have been put into production by remote monitoring of project facilities and gating of roads;
    - Development planning for an entire lease or several leases;
    - Noise-reduction technology, such as hospital grade mufflers, sound walls or soundproof buildings, or noise-reducing techniques for cooling fans;
    - Monitoring of migration corridors to determine which fences restrict movement and modify fences to reduce impacts to migrating big game species;

- Habitat improvement projects such as water developments and vegetation treatments; and
- Training programs for field workers to raise their awareness of activities that cause stress to big game, times of day when collisions are most likely, and other programs as necessary.

Big Game Crucial Winter Range

Habitat and species protection measures for big game are identified in the Rawlins RMP (BLM 2008). These protection measures are identified to reduce impacts to big game species within the CD-C project area (page 2-53 to 2-54, items 14–16). In addition, a portion of the Upper Muddy Creek/Grizzly Wildlife Habitat Management Area occurs within the CD-C project area (Rawlins RMP, page 2-41) which affords additional protection measures for elk and mule deer crucial winter range. Coordination with the WGFD will allow the Recommendations for Development of Oil and Gas Resources within Important Wildlife Habitats management actions to be implemented to reduce impacts to big game species. Crucial ranges are identified by Wyoming Game and Fish Department (https://wgfd.wyo.gov/Wildlife-in-Wyoming/Geospatial-Data/Big-Game-GIS-Data).

Big Game Migration Corridors

Big game migration corridor habitat protection measures are identified in the Rawlins RMP (pages 2-53 to 2-54, items 17–18). No big game migration corridors have been formally designated within the CD-C project area.

Mule Deer and Pronghorn Antelope Protection Measures

The conservation measures below provide the framework for avoiding and minimizing impacts to mule deer and pronghorn antelope. These measures will be used to assess the need for and amount of compensatory mitigation (see **Section E** and **Section F.1**).

- Surface-disturbing and disruptive activities within big game crucial winter range are prohibited during the period of November 15 to April 30.

Application of additional mitigation measures such as those listed below as well as a dust control plan (Appendix P) as required for transportation planning (Appendix N), could also work toward reducing the impacts to all wildlife species:

- Minimizing human presence at well sites after they have been put into production by remote monitoring of project facilities and gating of roads
- Development planning for an entire lease or several leases
- Noise-reduction technology, such as hospital grade mufflers, sound walls or soundproof buildings, or noise-reducing techniques for cooling fans
- Monitoring of migration corridors to determine which fences restrict movement and fences modified to reduce impacts to migrating big game species
- Habitat improvement projects such as water developments and vegetation treatments
- Training programs for field workers to raise their awareness of activities that cause stress to big game, times of day when collisions are most likely, and other programs as necessary

- Special Status Species: Mitigation measures are described in Appendices B, C, I, N and P of the CD-C EIS. Additional mitigation measures whose general application would benefit numerous Special Status Species include the following:
  - Minimizing human presence at well sites after they have been put into production by remote monitoring of project facilities and gating of roads;
  - Development of travel management plans;

- Utilization of noise-reduction techniques;
- Training programs for field workers to raise their awareness of activities that cause stress to wildlife, times of day when collisions are most likely; and
- Installation of devices to preclude raptor-perching near prairie-dog towns and pygmy rabbit burrows.
- Application of the BMPs found in Appendix 15 of the Rawlins RMP ROD

Projects located within the Wyoming Priority Habitat Management Areas (PHMA) identified in the ARMPA have additional protection measures attached to reduce and/or remove potential impacts to Greater Sage-Grouse. The underlying construct of the ARMPA and the Wyoming Core Area Strategy (Executive Order 2015-4) for Greater Sage-Grouse is the recognition that Core Areas represent landscapes of high value to the species relative to non-Core Areas. Likewise, within Core Areas, some locations are more ecologically important or "valuable" than others for protecting and sustaining the species. The conservation measures that are part of the Core Area Strategy are included to ensure that the impacts of certain activities are avoided and/or minimized within Core Areas.

Greater Sage-Grouse Conservation Measures

The conservation measures below provide the framework for avoiding and minimizing impacts to Greater Sage-Grouse. The measures will be used to assess the need for and amount of compensatory mitigation (see **Section E** and **Section F**).

- Outside Core Areas, surface disturbing and/or disruptive activities are prohibited from April 1 – July 15 to protect Sage-Grouse nesting and early brood-rearing habitats within 2 miles of the perimeter of occupied leks.
- Inside Core Areas, surface disturbing and/or disruptive activities are prohibited from April 1 – July 15 to protect Sage-Grouse nesting and early brood-rearing habitats.
- Surface disturbing and/or disruptive activities in mapped winter concentration areas are prohibited from December 1 – April 14 to protect Core Area populations of Sage-Grouse that use these winter concentration habitats.
- Inside Core Areas, the density of disturbance of an energy or mining facility is limited to an average of one site per square mile (640 acres) within the area defined by the DDCT, subject to valid existing rights.
- Inside Core Areas, cumulative disturbance within suitable habitats will not exceed 5 percent of the total suitable habitat within the area defined by the DDCT.
- Inside Core Areas, new roads that will have relatively high levels of activity (accessing multiple wells, haul roads, housing development) will be avoided within 1.9 miles of the perimeter of occupied Sage-Grouse leks.
- Outside Core Areas, surface occupancy and surface disturbing activities are prohibited within 0.25 mile of any occupied Sage-Grouse lek.
- Inside of Core Areas, surface occupancy and surface disturbing activities are prohibited within 0.6 mile of any occupied Sage-Grouse lek.

- Wild Horses: The Operators could enhance wild horse welfare by addressing the importance of the Wild Free-Roaming Horse and Burro Act of 1971 (Public Law 92-195) at all new-employee orientations.

- **Human Environment**
  - Visual Resources: Mitigation measures are described in Appendix C of the CD-C EIS.
  - Recreation Mitigation measures are described in Appendix C of the CD-C EIS.
  - Lands with Wilderness Characteristics Mitigation measures are described in Appendix C of the CD-C EIS.
  - Cultural and Historical Resources CD-C EIS Mitigation measures are described in Appendices C and J of the CD-C EIS. The following additional minimization measures would apply to development activities that affect Historic Properties for which setting is an Aspect of Integrity:
    - Construct roads in minimally visible areas.
    - Relocate project or hide disturbance.
    - Use matting on rights-of-way during construction to minimize surface disturbance and visibility.
    - Allow no surface disturbance within a quarter-mile or the visual horizon, whichever is closer, of contributing segments of historic trails or trail-associated sites.
    - Limit trail crossings to existing disturbance corridors or non-contributing segments, unless otherwise determined by BLM in consultation with the SHPO.
    - An additional BMP that may serve to minimize visual impacts to the setting of Historic Properties is the use of low-profile tanks.
  - Socioeconomics: Section 4.15.3 Other Planning Documents of the CD-C EIS. The following mitigation measures should be implemented to reduce adverse socioeconomic effects and enhance the beneficial effects:
    - To the extent practicable, the Operators should attempt to hire and train local workers from Carbon and Sweetwater counties.
    - The Operators should acquire and require their contractors, to the extent practicable, to acquire Carbon and Sweetwater County sales and use tax licenses and purchase all materials, equipment, and supplies to be used within the project area under these licenses so that proper attribution of sales and use tax payments can occur.
    - The Operators and their major contractors should ensure that adequate temporary housing resources are available to accommodate their temporary drilling, field-development, and ancillary facility construction workforces.
    - In order to allow local governments to effectively plan for the needed infrastructure and services to accommodate the workforce and population associated with this major development initiative, the Operators should meet annually with the BLM and representatives of local and state governments to discuss near-term and mid-term development plans. If events that would substantially accelerate or retard development in the project area become evident, the Operators should meet with the BLM and representatives of local and state governments to discuss the potential effects of such events.
  - Transportation and Access: Mitigation measures are described in Appendix C of the CD-C EIS.
  - Noise: Mitigation measures are described in Appendix C of the CD-C EIS.

- **Management Environment**
  - Range Resources: Mitigation measures found in Appendices C and E of the CD-C EIS. The addition of the following measures not found in Appendix C would further minimize impacts to the range:
    - Heavy equipment exceeding the recommended gross vehicle weight would not be allowed to use cattle guard crossings.
    - All gates within the project area would be left as they are found (i.e., open gates would be left open, closed gates would be closed).
    - The Operators could coordinate with affected livestock operators to minimize disruption during livestock operations, including lambing/calving season.
    - The BLM could require that off-road activity be minimized.
    - The BLM could require that no vehicle activity be allowed on recently reclaimed sites (including pipeline rights-of-way), wetland areas, or other sensitive sites.
    - Sites undergoing reclamation could be signed at all possible entry sites, especially gathering pipelines that connect several well pads. Signs should state "Authorized Vehicles Only" to allow maintenance work on valves, for example, by responsible Operators.
  - Oil and Gas and other Minerals: No additional mitigation measures were identified.
  - Health and Safety Mitigation: Mitigation measures found in Appendix C of the CD-C EIS. The addition of the following measures found in the CD-C EIS would further minimize impacts:
    - Cooperatively permit and operate in-field liquids-gathering pipelines and road systems
    - Waste and Hazardous Materials Mitigation measures found in Appendix C of the CD-C EIS
    - Cooperatively permit and operate in-field disposal facilities for solid waste, produced water, drilling mud, and other activities.

E. Residual Effects

The following is a description of the reasonably foreseeable residual effects to resources where they occur, including the identification of which of these residual effects may warrant compensatory mitigation.

E1. Resources with reasonably foreseeable residual effects not warranting compensatory mitigation

- Air Quality

  The reduction in emissions brought about by application of any of these measures could be estimated with additional modeling based on more detailed descriptions of the actual drilling and production processes used by the Operators. However, additional and more detailed information related to those practices would be needed from the Operators. Mitigation measures determined to be necessary to demonstrate compliance with the applicable NAAQS and WAAQS, as predicted in the revised modeling analyses, would be a required condition in the ROD.

E2. Resources with reasonably foreseeable residual effects warranting compensatory mitigation

- Wildlife: Pronghorn Antelope and Mule Deer

  Wildlife habitat would be unavoidably reduced on both a short- to long-term basis as a result of the surface disturbance related to the construction of well sites and their associated facilities on

public, state, and private lands within the CD-C project area. The quality and function of habitat would also be reduced due to intermediate- to long-term alterations in the vegetative composition of habitats and the continuing traffic and human presence associated with natural gas production activities. These impacts would be in addition to historical impacts from prior surface disturbance. Proposed and existing habitat alteration together would represent ten percent or more of the CD-C project area.

Due to the current "High" level of impact to pronghorn and mule deer Crucial Winter Range, any additive impacts would be "High" or "Extreme." Therefore, the impacts analysis in the EIS on mule deer and pronghorn habitat indicates that valid existing rights may result in development that would exceed significance under Criterion 2 (management actions that result in substantial disruption or irreplaceable loss of vital and high-value habitats). These impacts warrant compensatory mitigation as they are likely to "inhibit achieving an applicable land use plan's resource objectives."

Rawlins RMP resource objectives of concern

- Maintain, restore, or enhance wildlife habitat in coordination and consultation with other local, state, and federal agencies and consistent with other agency plans, policies, and agreements. A full range of mitigation options will be considered when developing mitigation for project-level activities for wildlife and Special Status Species habitats.
- Maintain, restore, or enhance habitat function in crucial winter range.

Mitigation Standard

Consistent with valid existing rights and applicable law and to support achieving the objectives of the Rawlins RMP, for actions that tier to this EIS, the BLM will require and ensure mitigation that provides a **no net loss to pronghorn antelope and mule deer crucial winter range and migration corridors** as signified in the Rawlins RMP objectives, by avoiding, minimizing and compensating for unavoidable impacts from development of projects that tier to this EIS (BLM 2008).

- Special Status Species: Greater Sage-Grouse.
  The impacts analysis in this EIS indicates that valid existing rights may result in development occurring inside PHMA in areas that may exceed established disturbance thresholds and would result in residual impacts. These impacts would warrant compensatory mitigation as these they are likely to inhibit achieving the Wyoming RMP Amendment's resource objectives.

  Wyoming RMP Amendment resource objectives of concern

  - Maintain and enhance quality/suitable habitat to support the expansion of Sage-Grouse populations on federally-administered lands within the planning area.
  - Manage Sage-Grouse seasonal habitats and maintain habitat connectivity to support population objectives set by the State of Wyoming in cooperation with the agencies.
  - Protect PHMAs and GHMAs from anthropogenic disturbance that will reduce distribution or abundance of GRSG.

  Mitigation Standard

  Consistent with valid existing rights and applicable law and to support achieving the objectives of the Wyoming RMP Amendment, for actions that tier to this EIS, the BLM will require and ensure mitigation that provides a **net conservation gain to Greater Sage-Grouse habitat within PHMA and a no net loss to Greater sage-grouse habitat in GHMA** by avoiding, minimizing, and compensating for unavoidable impacts from development.

F. Compensatory Mitigation Measures and Defined Outcomes

The following is an evaluation and prioritization of necessary and effective compensatory mitigation measures for the resources that warrant compensatory mitigation (mule deer, pronghorn antelope, and Greater Sage-Grouse), including clearly-defined and measurable outcomes.

F1. Mitigation Measures

- Mule Deer and Pronghorn Antelope and Associated Habitats:
  There are several projects that can be implemented to improve habitat and use for big game species which include, but are not limited to: (1) sagebrush fertilization projects which help offset direct and indirect habitat losses by increasing sagebrush production, enhancing available winter forage and potentially increasing palatability and nutrient quality for wintering big game (specifically mule deer) (BLM 2012, BLM 2008c); (2) implement chemical thinning treatments (tebuthiuron, or Spike™) to increase forage variety, quantity and quality and improve the big sagebrush and mountain shrub age-class structure; (3) establish conservation easements on public or private land in high-quality habitat; (4) implement fence modification projects; (5) implement prescribed fire treatments for big game species (e.g., spring and fall ranges should focus on herbaceous component to help does with fawning and winter ranges should focus more on shrubs and shrub productivity); (6) seeding after fires; (7) mechanical treatments such as crushing with an aerator and including seeding in the treatment; (8) chaining, disking and imprinting pipe harrowing and aerating; (9) mowing; (10) other vegetation treatments such as planting of shrubs and aspen; and (11) control of invasive weeds (BLM 2012).

- Greater Sage-Grouse.

  There are several projects that can be implemented to improve habitat and use for Greater Sage-Grouse which include, but are not limited to:

  1. Fence Marking and Removal

     Christiansen (2009) estimated a 70-percent reduction in fence collision mortalities of Sage-Grouse could be expected along marked sections of fence. Stevens (2011) similarly predicted that marking fences with vinyl reflectors (flight diverters) reduced collision rates by up to 74 percent. To eliminate the threat of collisions, fences could be removed or marked with flight diverters similar to those used in the Christiansen (2009), Wolfe (2009), and Stevens (2011) studies to increase fence visibility to greater Sage-Grouse. Fences should be removed where possible, in consultation with and with concurrence of the grazing permittee. Where removal is not possible, two flight diverters should be installed between each fence span (4 m post-to-post). Priority areas for fence removal and marking should be: Sections of fence known to cause Sage-Grouse collisions; fences within 2 km (1.2 mi) of leks (Braun 2006; Stevens 2012) or other high risk area; fences in areas with low slope and terrain ruggedness (Stevens 2012); and fence segments bounded by steel t-posts with spans greater than 4 m (Stevens 2012). Once fences have been removed or marked, local annual mortality due to fence collisions would be substantially reduced.

  2. Sagebrush Restoration and Enhancement

     Sagebrush restoration and enhancement creates new habitat for Sage-Grouse and can be used to create corridors between existing sagebrush patches to produce larger areas of contiguous habitat. Habitat for Sage-Grouse consists of a mosaic of plant communities dominated by sagebrush and a diverse grass and forb understory across the landscape (WGFD 2003). This mitigation measure increases the quality and quantity of habitat within the landscape, contributing to the long-term survival and success of the Greater Sage-Grouse.

Sage-Grouse habitat would be restored by re-establishing sagebrush and understory grasses and forbs in disturbed areas (e.g., roads, unreclaimed and abandoned pipeline corridors, unreclaimed and abandoned well pads, burned areas, etc.). Treatment for mitigation credit is not planned for areas of Project disturbance, which will be restored as described in the plan of development, but in areas of high value and durability that is commensurate with the life of the impact of the authorized project. Sagebrush can be seeded, planted as seedlings, or transplanted (i.e., containerized stems). Because seeded sagebrush takes a long time to grow to a size that provides habitat for Sage-Grouse, planting containerized stems is the most economical option. Sagebrush restoration and enhancement projects should include understory (grass and forb) treatments. Where possible, projects will be placed strategically to decrease habitat fragmentation by connecting existing occupied habitats.

3. Juniper Removal

   Fire suppression and other post-settlement conditions have allowed western juniper to spread into areas previously dominated by grasses, forbs, and shrubs. Miller et al. (2005) reports that many areas have experienced an estimated 10-fold increase in juniper over the last 130 years. The expansion of juniper and other conifer species reduces habitat for Sage-Grouse and other sagebrush obligate species that depend on large patches of sagebrush-dominated vegetation. Sagebrush cover decreases with juniper encroachment as the vegetation transitions into woodland.

   Most juniper communities are still in a state of transition. Miller et al. (2005) characterized three stages of woodland succession: Phase I (early) – trees are present but shrubs and herbs are the dominant vegetation that influence ecological processes (hydrologic, nutrient, and energy cycles) on the site; Phase II (mid) – trees are co-dominant with shrubs and herbs and all three vegetation layers influence ecological processes on the site; Phase III (late) – trees are the dominant vegetation and the primary plant layer influencing ecological processes on the site. Sites in Phase I or II successional stages often retain a significant understory of sagebrush (i.e., grasses and forbs), so removal of Phase I or II can produce immediate habitat benefits for Sage-Grouse (NRCS 2010; USFWS recommendations).

   Juniper/conifer removal projects used for mitigation should focus primarily on the early successive stages of conifer/juniper stands (i.e., Phase I or Phase II juniper) with no cheatgrass component. Removal of juniper/conifer should be done by mechanical means without the use of fire or chemicals: Phase I juniper/conifer should be treated by having a field crew walk from tree-to-tree, cutting them into pieces and scattering them on-site (lop and scatter).

   Phase II juniper/conifer should be treated by using a masticator, a large mechanical device that goes from tree-to-tree and demolishes the tree with whirling blades; debris is then left on site (mastication). All juniper/conifer removal projects should include understory treatment, where needed, and vegetation monitoring until the understory vegetation is established.

4. Seeding of a Forb and Bunchgrass Understory

   Bunchgrasses are recognized as an important component of Sage-Grouse nesting and brood-rearing habitats (Connelly et al. 2000; Crawford et al. 2004). The structure and abundance of bunchgrasses influence the quality of a sagebrush/bunchgrass community site for nesting Sage-Grouse. Tall, dense, residual grass in nesting habitat improves hatching success by providing cover for incubating females (Cagney et al. 2009). Herbaceous cover may provide scent, visual, and physical barriers to potential predators (DeLong et al. 1995, as cited in Connelly et al. 2000). In addition to providing cover from predators, forbs are an important food source for Sage-Grouse broods. Sage-Grouse nesting and brood-rearing habitat is

improved by seeding native bunchgrasses and forbs into existing sagebrush stands or into adjacent disturbance, increasing nest and brood success.

5. Purchase of Conservation Easements

   Conservation easements may be purchased and managed to remove the threats of specific land uses to Sage-Grouse. The purchase of easements can prevent future Sage-Grouse habitat destruction or degradation near urban areas or oil and gas development. With appropriate management, conservation easements can reduce fragmentation in species core areas and key habitats. Conservation easements purchased for mitigation will be used in a strategic way with focus on areas/locations of highest demonstrable need leading to a reduction in habitat fragmentation.

F2. Debit Calculations

As the extent of the reasonably foreseeable residual effects from actions that tier to this EIS (e.g. APDs, right-of-way grants, Sundry Notices) is unknown at this time, the following provides a formula that would be used to calculate the magnitude of the residual effects and the compensatory mitigation obligation (i.e. debits). The formulas are a tool to help the BLM ensure that the mitigation standards for these resources are achieved and that the required compensation is commensurate with the impacts.

<u>Generic Debit Formula</u>

In determining how many debits (i.e. an assessment of the magnitude of the residual impacts; the compensatory mitigation obligation) are assigned to a particular residual impact, the **area** of residual effects (e.g. acres of direct and indirect impacts) is considered the *base* compensatory mitigation obligation.

This base compensatory mitigation obligation is then adjusted with consideration to the **quality** of the resource being impacted (e.g. suitable or unsuitable habitat) and **spatial characteristics** of the resource at the impact site within its relevant landscapes (e.g. critical nesting habitat or scarcely utilized habitat). These adjustments to the base compensatory mitigation obligation are calculated with the following formula:

$$\{[a+a(y_1)+a(y_2)+a(y_3)+\ldots]q\}x = \text{debits}$$

Where:

a = area (e.g. acres of direct and indirect impact)

> *Direct impacts are represented by the footprint of the project. A sigmoidal decay curve* (Weisstein, n.d.) *(applying the curve based on the specifics of the proposed project piece and the resource being impacted) is used to determine indirect impacts from, and in addition to, the project footprint*

y = spatial characteristics (e.g. critical nesting habitat or scarcely utilized habitat)

> *Relevant and important spatial characteristics of the resources within the resources' landscape are identified by scientists and the agencies responsible for managing those resources. The spatial characteristics are weighted based on the importance of these spatial characteristics and serve as multipliers.*

q = quality (e.g. suitable or unsuitable)

> *The quality of resource is determined by scientists and the agencies responsible for managing those resources. The quality is weighted based on the importance of that resource and serves as a multiplier.*

x = other

For some resources, additional considerations are necessary.

During future NEPA analysis for actions that tier to this EIS, the formula would be augmented to address timeliness, risk of compensatory mitigation failure, implementation and effectiveness monitoring, and administrative costs of the compensatory mitigation measure, as necessary.

Applying the Generic Debit Formula to Mule Deer and Pronghorn Antelope with resource-specific adjustments

The following formula will be used to calculate debits for residual impacts to mule deer and pronghorn antelope:

$$\{[a(y_\chi d_\chi)+a(y_\chi d_\chi)+a(y_\chi d_\chi)+\ldots]qt\} = \text{debits}$$

Where:

a = area (e.g. acres of direct and indirect impact)

Direct impacts are represented by the footprint of the project. A decay function is used to determine indirect effects.

y = spatial multipliers representing a range of important habitats (spatial characteristics) (WGFD 2010a)

y = 2 if High Use Migration Corridors

y = 3 if Stop Over Spots within High Use Migration Corridors

y = 3 if Crucial Winter Range

d^a = current density of development for pronghorn antelope

Current density can be determined through GIS analysis of well location per square mile (thresholds below are described in WGFD's Recommendations for Development of Oil and Gas Resources within Important Wildlife Habitats) (WGFD 2010a).

d^a = 2 if disturbance density over 1/640, but under 4/640 and/or under 3%

d^a = 4 if disturbance density over 5/640, but under 16/640 and/or over 3%, but under 12%

d^a = 8 if disturbance density over 16/640 and/or over 12%

d^m = current density of development for mule deer

Current density can be determined through GIS analysis of well location per square mile (thresholds below are described in WGFD's Recommendations for Development of Oil and Gas Resources within Important Wildlife Habitats) (WGFD 2010a).

d^m = 2 if disturbance density over 1/640, but under 2/640 and/or under 3%

d^m = 4 if disturbance density over 2/640, but under 4/640 and/or over 3%, but under 9%

d^m = 8 if disturbance density over 4/640 and/or over 9%,

q = quality (determination of general habitat condition)

q = 1 in suitable mule deer and/or pronghorn antelope habitat

q = 0.75 in unsuitable mule deer and/or pronghorn antelope habitat

The full debit is assessed in suitable habitat and "discounted" if in unsuitable / disturbed locations.

t = temporal scale of the impact (replaces "x" in the generic formula)

t = 1 if the impact is temporary (< 1 year)

t = 2 if the impact is permanent

Applying the Generic Debit Formula to Greater Sage-Grouse with resource-specific adjustments

The following formula will be used to calculate debits for residual impacts to Greater Sage-Grouse:

$$\{[a+a(y_\chi)+a(y_\chi)+a(y_\chi)+a(y_\chi)]q\}s = \text{debits}$$

Where:

a = area (e.g. acres of direct and indirect impact)

Direct impacts are represented by the footprint of the project. A decay function is used to determine indirect effects (applying the curve based on the specifics of the proposed project).

y = spatial multipliers representing a range of important habitats (spatial characteristics) (WGFD 2010a):

y_1 = 2 if in general habitat outside of PHMA (Core Areas)

y_2 = 4 if inside of PHMA (Core Areas)

Core Areas – areas identified as containing the concentration of Sage-Grouse populations in Wyoming (Holloran and Anderson 2005, Doherty 2008)

y_3 = 8 if inside of PHMA (Core Areas) and within 4 miles of a lek

4 miles surrounding a lek – the distance at which impacts to a single lek remain discernable (used as the distance for the DDCT analysis) (Holloran and Anderson 2005, Holloran et al. 2007)

y_4 = 16 if within PHMA (Core Areas), within 4 miles, and within 0.6 mile of a lek

0.6 miles surrounding a lek – the distance in which more than 90 percent of breeding season movements by male Grouse are found (Carr 1967, Wallestad and Schladweiler 1974, Rothenmaier 1979, Emmons 1980, Schoenberg 1982)

y_5 = 16 if outside of PHMA (Core Areas), but within 0.25 mile of a lek

0.25 miles surrounding a lek outside of PHMA (Core Areas)– half the distance in which more than 90 percent of breeding season movements by male Grouse are found (Carr 1967, Wallestad and Schladweiler 1974, Rothenmaier 1979, Emmons 1980, Schoenberg 1982)

q = quality (determination of general habitat condition).

q = 1 in suitable Greater Sage-Grouse habitat

q = 0.75 in unsuitable Greater Sage-Grouse habitat

The full debit is assessed in suitable habitat and "discounted" if in unsuitable / transitioning habitat or disturbed locations (Wyoming Executive Order 2011-5, Appendix I), based on LMF, DDCT, and other available data.

s = surface (above ground or below ground infrastructure).

s = 1 for above ground infrastructure

s = 0.5 for below ground infrastructure

The full debit is assessed for surface and/or tall structures and a "discount" is provided for buried infrastructure.

Greater Sage-Grouse example

- Project Description

  The proposed project is a well pad, pipeline, power line, and road. The proposed well pad will have two wells, Well #1 and Well #2, and disturb approximately 1.5 acres. The two-track would be upgraded to access the well locations from the southeast. The access to the proposed well would upgrade an existing two-track and will directly disturb approximately 2.5 acres (outside of 0.6 mile of Plant lek). Power lines would be buried with the flow line using a spider drill, following an existing road, but will still disturb approximately 2 acres (0.29 acres within 0.6 mile of Plant lek and 1.7 acres outside of 0.6 mile of Plant lek). The development phase would have a timing limitation condition of approval to prevent construction during the nesting season. Construction on the proposed project is due to begin August 1, 2015 and be completed by November 30, 2015. The expected life of the wells is 30 years. A Density and Disturbance Calculation Tool (DDCT) analysis was completed and the proposed disturbance is located in a DDCT analysis area that is was already disturbed at approximately 15 percent and has an energy development density of greater than 6.5/640. This project further exceeds the 5 percent disturbance and greater than 1 energy location per 640 acres cap.

  Residual impacts remain because the new project proposal is inside PHMA and the density of disturbance of an energy or mining facility would be over an average of one site per square mile (640 acres) within the DDCT. The calculation is applied to the energy facility (the well location).

- Calculation for well disturbance

  Well disturbance: a = 1.5 acres

  The well is within PHMA. Therefore, $y_1 = 0$, $y_5 = 0$, and $y_2 = 4$.

  The well is within PHMA and within 4 miles of a lek. Therefore, $y_3 = 8$.

  The well is within PHMA, within 4 miles, but not within 0.6 mile of a lek. Therefore, $y_4 = 0$.

  The well is within unsuitable (disturbed) habitat. Therefore, q = 0.75.

  The well infrastructure is above ground. Therefore, s = 1.

  {[1.5(4)+1.5(8)]0.75}1 = 13.5 debits

  Residual impacts remain because the project is inside PHMA and all suitable habitat disturbed will exceed 5 percent of suitable habitat within the DDCT area using the DDCT process. The calculation is applied to all components of the project, split out as proposed within each spatial characteristic.

- Calculation for access road impacts

  There will be 2.5 directly impacted acres and 160.98 indirectly impacted acres, for a total of 163.48 acres impacted outside 0.6 mile of the lek. Therefore, a = 163.48

The access road is within PHMA. Therefore, $y_1 = 0$, $y_5 = 0$, and $y_2 = 4$.

The access road is within PHMA, within 4 miles of a lek. Therefore, $y_3 = 8$.

The access road is within unsuitable (disturbed) habitat. Therefore, q = 0.75.

The access road is above ground. Therefore, s = 1.

{[163.48 (4)+163.48(8)]0.75}1 = 1,471.32 debits

- Calculation for pipeline / power line

  There will be 1.7 directly impacted acres outside 0.6 mile of the lek. Therefore, a = 1.7.

  The pipeline / power line is within PHMA. Therefore, $y_1 = 0$, $y_5 = 0$, and $y_2 = 4$

  The pipeline / power line is within PHMA and within 4 miles of a lek. Therefore, $y_3 = 8$.

  The pipeline / power line is within PHMA, within 4 miles, and 0.29 directly impacted acres inside 0.6 mile of the lek. Therefore, for this portion of the access road, a = 0.29 and $y_4 = 16$.

  The pipeline / power line is within unsuitable (disturbed) habitat. Therefore, q = 0.75.

  The pipeline / power line is below ground. Therefore, s = 0.5.

  {[1.7(4)+1.7(8)+0.29(16)]0.75}0.5 = 18.78 debits

- Total debits from the entire project as resubmitted: 1,517.1 debits

F. Draft CD-C Compensatory Mitigation Measures and Sites List

A CD-C discussion group (as described in the CD-C EIS, Chapter 2, Section 2.2.6) would be formed that would respond to evolving energy issues; respond to cooperator, local government, or landowner concerns related to the CD-C project; and discuss opportunities for compensatory mitigation measures and sites. This group would consist of the BLM, CD-C cooperators (state agencies, local governments, and conservation districts), local landowners, and permittees. The group would participate in a yearly site visit of the project area. Ideas and information shared at these meetings could be used by the BLM to implement adaptive management, in accordance with the DOI Adaptive Management Guidelines (USDI 2009) if and when necessary, to improve management of the area and mitigate additional or new impacts to sensitive resources.

BP America Production Company (BP), one of the principal operators on the field, expressed the need for a structured mitigation framework to complement the EIS that could be used to avoid potential conflicts between development and onsite wildlife values and identify opportunities to balance onsite impacts with additional conservation options to offset these impacts. BP invited The Nature Conservancy (TNC) to design such a plan. TNC sought to design an offset framework where the offsets are ecologically equivalent to the impacts (Appendix G to the CD-C EIS). The BLM would encourage the continuation of this effort in order to help inform the siting of compensatory mitigation measures, in coordination with the CD-C discussion group.

The CD-C discussion group would need to create and add to/ refine a list of projects / mitigation mechanisms that could be implemented as compensatory mitigation measures for residual impacts to Greater Sage-Grouse, pronghorn antelope, and mule deer as a result of development of the CD-C field.

The CD-C discussion group should consider the following with respect to compensatory mitigation sites:

- Each compensatory mitigation site will need to be considered with respect to achieving the maximum benefit, toward the mitigation standard, to the resource impacted by the CD-C

development and additionality, durability, landowner agreements, timeliness, risk, and administrative costs.

- Sites should be determined without preference to land ownership. If sited on BLM-managed lands, the BLM should consider other potential uses of that land that are compatible with the compensatory mitigation site. If sited on non-BLM-managed lands, there must be a formal and binding agreement with the willing land owner.
- To increase efficiency, one compensatory mitigation site can provide opportunities for compensatory mitigation measures that benefit multiple resources that have been impacted by a single land use activity. In some cases, a single compensatory mitigation measure can benefit multiple resources that have been impacted by a single land use activity.

The BLM considers appropriate any of the following compensatory mitigation mechanisms: mitigation banks, mitigation exchanges, mitigation funds, and authorized land user (proponent)-responsible compensatory mitigation measures.

The BLM must ensure that each compensatory mitigation mechanism, if used to meet a compensatory mitigation obligation required by the BLM, is held to equivalent and effective standards. Therefore, in order to be considered by the CD-C discussion group, at a minimum, each compensatory mitigation mechanism's sponsor must:

1. Establish and describe clearly-defined and measurable outcomes and performance standards for the compensatory mitigation measures, including the types and amounts of resources that will be restored, established, enhanced, and/or preserved, and describe how these outcomes will contribute to achieving established resources objectives and addressing landscape- scale needs.
2. Describe the factors considered during the site selection process, including how the sites will address landscape-scale needs.
3. Ensure and describe how the durability of the compensatory mitigation measures and sites will be maintained.
4. Assess and document the baseline conditions of the compensatory mitigation sites, with consideration to the conditions and trends of resources at all relevant scales.
5. Implement a robust monitoring program, which considers the conditions and trends of resources at all relevant scales, to assess the effectiveness of compensatory mitigation measures and identify any need for adaptive management to achieve the required mitigation outcomes.
6. Develop and implement a plan for compensatory mitigation measure(s) and site(s) that describes:
   a. Specifications for implementing the compensatory mitigation measures.
   b. The schedule and plan to maintain compensatory mitigation measures for the duration of the impacts.
   c. The triggers for adapting management, if necessary to achieve the required outcomes of the compensatory mitigation measures.
   d. The accounting, tracking and reporting of measures/funds/credits.
7. Obtain financial assurances, as appropriate, to guarantee the implementation and effectiveness of compensatory mitigation measures and cover administration, durability, monitoring and reporting.

Following analysis of compensatory mitigation in the NEPA analyses for actions that tier to this EIS, the BLM, in the decision document and land use authorization, will make the final determinations on the amount of compensatory mitigation, the types of compensatory mitigation measures selected, and the compensatory mitigation sites chosen.

The BLM will need to verify that any credits provided by mitigation banks, exchanges, in-lieu fee fund programs, or proponent-responsible projects used to offset impacts from actions that tier to this EIS are appropriate to address those impacts and fulfill the outcomes required by the formula from **Section F**. The BLM will review crediting methodologies developed by the sponsors of the compensatory mitigation mechanisms and/or other experts to help make this determination.

G. Durability and Monitoring of Mitigation

This section provides a description of actions necessary to achieve durability of, and to monitor, adapt (if necessary), and report on, mitigation.

The residual impacts that warrant compensatory mitigation are identified in **Section E** and appropriate compensatory mitigation measures and the formula to determine the amount of compensatory mitigation are identified in **Section F**. During future NEPA analysis for actions that tier to this EIS, additional consideration will be given to compensation to address timeliness, risk of compensatory mitigation failure, implementation and effectiveness monitoring, and administrative costs, as necessary.

The NEPA analysis, decision document, land use authorization (via stipulations, conditions of approval, and/or terms and conditions attached to authorizations or permits) for actions that tier to this EIS will clearly describe the compensatory mitigation obligations, as determine by following the framework provided by this EIS. These obligations will include the actual compensatory mitigation measures and sites and associated outcomes, as informed by this appendix and the recommendations of the CD-C discussion group. The obligations will also include a monitoring program, compatible with LMF, which considers the conditions and trends at all relevant scales, including the LMF data points used to determine baseline for each of the associated areas, to assess the effectiveness of the compensatory mitigation measure and to identify any need for adaptive management. Effectiveness monitoring reports would be generated by the responsible party, in coordination with the Rawlins Field Office and submitted to the CD-C discussion group for review.

The responsible party, requesting the land use authorization, will be required to acquire credits or fund mitigation measures that adequately achieve the compensatory mitigation obligation's outcomes identified in the land use authorization.

All compensatory mitigation measures and sites must be durable for the duration of the impact of the project, improve the baseline conditions of the impacted resources, be demonstrably new (additional) and would not have occurred without the compensatory mitigation measure.

For actions that tier to the EIS, the Authorized Officer will retain discretion to require additional mitigation measures, beyond those described in this EIS, as appropriate.

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Glossary

For additional descriptions of terminology used in the CD-C EIS, please see Chapter 8 of the Final EIS.

Additionality: a compensatory mitigation measure that improves the baseline conditions of the impacted resource, and is demonstrably new and would not have occurred without the compensatory mitigation measure.

Application for Permit to Drill (APD): official request submitted by a lessee or operator to the BLM for permission to drill a well. The approved APD is a contract between the operator and the Federal Government and cannot be changed or modified unless authorized by the BLM.

Baseline: the pre-existing condition of a resource, at all relevant scales, which can be quantified by an appropriate attribute(s). During environmental reviews, the baseline is considered the affected environment that exists absent the project's implementation, and is used to compare predictions of the effects of the proposed action or a reasonable range of alternatives.

Best management practices (BMPs): state-of-the-art, efficient, appropriate, and practicable mitigation measures for avoiding, minimizing, rectifying, and reducing or eliminating impacts over time.

Change agents: an environmental phenomena or human activity that can alter or influence the future condition and/or trend of a resource. Some change agents (e.g., roads) are the result of direct human actions or influence; others (e.g., climate change, wildland fire, and invasive species) may involve natural phenomena or be partially or indirectly related to human activities.

Commensurate: compensatory mitigation measures that are logically related and proportional to a land use activity's reasonably foreseeable impacts.

Compensation: compensating for the impact by replacing or providing substitute resources or environments (40 CFR 1508.20(e)).

Compensatory mitigation measure: an action that results in the restoration, establishment, enhancement, and/or preservation of resources in order to offset a residual effect.

Compensatory mitigation mechanism: a type of an arrangement where resources are restored, established, enhanced, and/or preserved (i.e. accrual of credits) for the purpose of compensating for residual effects to resources from land use activities (i.e. accrual of debits), and includes mitigation banks, mitigation exchanges, mitigation funds (also known as in-lieu fee programs), and authorized land user-responsible compensatory mitigation measures.

Conditions of approval (COA): conditions or provisions (requirements) under which a site-specific surface disturbing or human presence activity (Application for Permit to Drill, sundry notice, right-of-way, etc.) is approved.

Core Area: Executive Order 2008-2, which was superseded by Executive Order 2010-4 and again by 2011-5, issued by the Governor of Wyoming, delineated a Core Area to protect populations of greater Sage-Grouse in the state. The Order also outlines restrictions on the density of future development and other human activities that limit impacts to greater Sage-Grouse populations.

Crucial habitat: any particular range or habitat component (often winter or winter/year-long range in Wyoming) that is the determining factor in a population's ability to maintain and reproduce itself at a certain level (theoretically at or above the Wyoming Game and Fish Department's population objective) over the long term.

Crucial winter range: the portion of the winter range to which a wildlife species is confined during periods of heaviest snow cover.

Disruptive Activities: This term/phrase refers to those public land resource uses/activities that are likely to alter the behavior of, displace, or cause excessive stress to animal or human populations. This term/phrase does not apply to any physical disturbance of the features of the land surface. Examples of disruptive activities may include, among others: noise, human foot or vehicle traffic, or other human presence, regardless of the purpose of the activity. When administered as a land use restriction (e.g., No Disruptive Activities), or provision, this phrase prohibits or limits the physical presence of sound above ambient levels, lights, and the nearness of people and their activities. As a case in point, this restriction is often aimed at protecting wildlife during critical life stages, or during periods of severe winter weather conditions, although it could apply to any resource value on the public lands. Disruptive activities include both short- and long-term effects on species.

Durability: the maintenance of the effectiveness of a mitigation measure and/or a compensatory mitigation site, including resource, administrative, and financial considerations.

Duration of the impact: the time it takes to restore the resources impacted (including direct and indirect effects) by a land use activity, even if this time period extends beyond the expiration of the land use activity. The duration of some impacts may be perpetuity.

Fugitive Dust: airborne emissions of visible and nonvisible fine, dry particulate matter smaller than 100 micrometers (microns) that result from surface disturbance activities.

Habitat function: arrangement of habitat features and the capability of those features to sustain species, populations, and diversity of wildlife over time (WGFD 2010a).

Invasive species: A species that is not native (or is alien) to the ecosystem under consideration and whose introduction causes or is likely to cause economic or environmental harm or harm to human health (Executive Order 13112).

Landscape: a geographic area encompassing an interacting mosaic of ecosystems and human systems that is characterized by a set of common management concerns. The landscape is not defined by the size of the area, but rather by the interacting elements that are relevant and meaningful in a management context.

Mitigation: includes, avoiding the impact altogether by not taking a certain action or parts of an action; minimizing impacts by limiting the degree or magnitude of the action and its implementation; rectifying the impact by repairing, rehabilitating, or restoring the affected environment; reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and, compensating for the impact by replacing or providing substitute resources or environments (40 CFR 1508.20).

Mitigation standard: a component of a land use plan's resource objective that describes the extent to which mitigation will be applied (e.g. net gain, no net loss, net loss).

Minimization: minimizing impacts by limiting the degree or magnitude of the action and its implementation (40 CFR 1508.20(b)).

Net gain: when mitigation results in an improvement above baseline conditions.

Net loss: when the lack of mitigation results in a negative change to baseline conditions.

No net loss: when mitigation results in no negative change to baseline conditions (e.g. fully offset or balanced).

Practicable: available and capable of being done after taking into consideration existing technology, logistics, and cost in light of a mitigation measure's beneficial value and a land use activity's overall purpose, scope, and scale.

Rectification: rectifying the impact by repairing, rehabilitating, or restoring the affected environment (40 CFR 1508.20[c]).

Residual effects: any adverse foreseeable effect that are expected to remain after consideration of the first four steps in the mitigation hierarchy; also referred to as unavoidable impacts. The implementation of mitigation measures (e.g. rectification) at some point in the distant future does not eliminate a residual effect that will exist until that mitigation measure's outcome is achieved.

Significant Impact: effects of sufficient context and intensity that an environmental impact statement is required. The CEQ regulations at 40 CFR 1508.27(b) include ten considerations for evaluating intensity.

Special status species (SSS): Includes proposed species, listed species, and candidate species under the ESA; state-listed species; and BLM State-Director-designated sensitive species (BLM Manual 6840—Special Status Species Policy).

Surface-disturbing activities: Any authorized action that disturbs vegetation and surface soil, increasing erosion potential above normal site conditions. This definition typically applies to mechanized or mechanical disturbance. However, intense or extensive use of hand or motorized hand tools may fall under this definition. Examples of surface-disturbing activities include construction of well pads and roads, pits and reservoirs, pipelines and power lines, mining, and vegetation treatments.

Timeliness: the lack of a time lag between the impact to the resources and the achievement of the outcomes of the associated mitigation measures.