

## **APPENDIX L**

### **RESOURCE CONCERNS AND ASSOCIATED PROTECTION MEASURES PROPOSED UNDER ALTERNATIVE C**

APPENDIX L – RESOURCE CONCERNS AND ASSOCIATED  
PROTECTION MEASURES PROPOSED UNDER ALTERNATIVE C

Data Source Resource Concern	Protection Measure	Justification Assumptions for Analysis/Comments
<b>Water and Soil Management</b>		
Steep Slopes >25%, From 30 meter DEM data. These less steep slopes present more complexity in planning, road design, and can require larger pads. <b>Appendix M Maps: Alternative C--Slopes &gt;25%</b>	1) No pad, compressor or water transfer sites can be located in these areas.	Wyoming Standard Mitigation Guidelines
Perennial Waters, Wetlands, Identified on National Wetlands Inventory or PFC with 500ft. Buffer on waters and PFC. <b>Appendix M Maps: Alternative C—Perennial Surface Waters and Wetlands</b>	1) No pad, compressor or water transfer sites can be located in these areas.	E.O. 11990 and 11988
Topsoils with excess salts providing difficulty with reclamation. Reclamation success is essential for modification of impacts to surface hydrology, especially the interim reclamation. Increasing reclamation success has many benefits to other resources. <b>Appendix M Maps: Topsoils with Excess Salts</b>	1) Pump reserve pit and do earth work for reclamation right after drilling, put in top soil and plant first good season, interim reclamation will be completed one year after spud date. 2) Low impact road design for resource roads (roads into individual pads) on slopes < 5%, if road can be built with no side slopes. This will include ditch-witching utilities within the ROW, brush beating, some type of fabric or matting and gravel. 3) Improve road surface on newly constructed or improved local and collector roads with 95% compaction on the road base and non-chlorine dust abatement product or suitable alternative treatment each year. 4) Put together seed mix that includes salt tolerant plants.	Cumulative Impacts; Salinity concerns in the Colorado River Basin.
Soils with high runoff potential contribute to higher peak flows and can cause hillslope erosion by forming rills and gullies. <b>Appendix M Maps: Alternative C--Soils with High Runoff Potential</b>	1) Reduce pad density to 4 locations per section and the associated infrastructure and limit initial disturbance (i.e. short-term) total to < 20 acres per section. 2) Place waddles in any potential flow path and at culvert entrances and exits. 3) Deep ripping (18 inches or more) before planting to increase percolation. 4) Closed system, pitless, or shared pit drilling. 5) Low impact road design for resource roads (roads into individual pads) on slopes < 5%. This will include ditch-witching utilities within the ROW, brush beating, some type of fabric or matting and gravel. 6) Crimped weed-free hay stubble mulch to increase surface roughness.	Cumulative Impacts; the Colorado River basin has been a focus for sediment delivery and soil loss since the 1930s.

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Soils with severe road rating typically dominated by one soil particle size component and road bases can become very unstable with insufficient maintenance. <b>Appendix M Maps: Soils with Severe Road Rating</b>	1) Low impact road design for resource roads (roads into individual pads) on slopes < 5%. This will include ditch-witching utilities within the ROW, brush beating, some type of fabric or matting and gravel. 2) Improve road surface on newly constructed or improved local and collector roads with 95% compaction on the road base and non-chlorine dust abatement product or suitable alternative treatment each year.	Cumulative Impacts; the Colorado River basin has been a focus for sediment delivery and soil loss since the 1930s.
Soils with poor topsoil ratings make reclamation difficult and can leave soils susceptible to erosion. Reclamation success is essential for modification of impacts to surface hydrology, especially the interim reclamation. Increasing reclamation success has many benefits to other resources. <b>Appendix M Maps: Soils with Poor/Fair Topsoil Ratings</b>	1) Pump reserve pit and do earth work for reclamation right after drilling, put in top soil and plant 1st good season, interim reclamation will be completed 1 year after spud date. 2) Crimped weed-free hay stubble mulch to increase surface roughness. 3) Use silt fencing to reduce wind erosion during construction. 5) Apply soil amendments to increase reclamation success unless testing demonstrates no need for amendments.	Cumulative Impacts; the Colorado River basin has been a focus for sediment delivery and soil loss since the 1930s.
<b>Vegetation Resources</b>		
Vegetation communities on >8% slopes present reclamation difficulties. <b>Appendix M Maps</b>	Reduced initial surface disturbance (i.e. short-term) total to < 20 acres per section	
The limited geographic extent of certain vegetation communities and their importance to a variety of wildlife species warrant special consideration. <b>Appendix M Maps: Project Area with Vegetation Communities</b>	1) Avoid surface disturbances within aspen, juniper-woodland, mahogany, and serviceberry communities. 2) Limit surface disturbances within the silver sagebrush/bitterbrush vegetation community to < 20 acres/mi <sup>2</sup> .	Standards and Guidelines assessment for Upper Colorado River Basin (BLM 2002)
<b>Rangeland Resources</b>		
Loss of livestock; disruption of management operations.	1) Operators shall establish and enforce speed limits throughout the project area 2) Erect signs in lambing/calving areas, shipping pastures, or adjacent to working corrals to warn vehicle operators	

APPENDIX L – RESOURCE CONCERNS AND ASSOCIATED  
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Disruption of management operations. <b>Appendix M Maps: Project Area with Grazing Allotments</b>	1) Operators shall provide a plan specific to pastures or regions so livestock operators can plan activities/work around development to reduce conflicts	
Dust on vegetation and erosion	1) Improve road surface on newly constructed or improved local and collector roads with 95% compaction on the road base and non-chlorine dust abatement product or suitable alternative treatment each year	
<b>Wildlife Resource Management</b>		
Disturbance of greater sage-grouse and Columbian sharp-tailed grouse nesting & brood rearing habitat. <b>Appendix M Maps: Alternative C – Greater Sage Grouse</b>	1) Limit initial disturbance (i.e. short-term) total to < 20 acres per section	Minimum programmatic standards recommended by the Wyoming Game and Fish Department to sustain wildlife habitats affected by oil and gas development (WGFD 2004)
Disturbance of winter relief habitats for greater sage-grouse and Columbian sharp-tailed grouse. <b>Appendix M Maps: Alternative C – Grouse Severe Winter Relief Habitat</b>	1) No surface disturbance	Vegetation and Habitat Analysis of Critical Wintering Areas for Greater Sage-Grouse (HWA 2004b)
Disturbance of big game crucial winter range. <b>Appendix M Maps: Seasonal pronghorn antelope, mule deer and elk ranges (3 Maps)</b>	1) Limit initial disturbance (i.e. short-term) total to < 20 acres per section	Minimum programmatic standards recommended by the Wyoming Game and Fish Department to sustain wildlife habitats affected by oil and gas development (WGFD 2004)
<b>Visual Resource Management</b>		

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<p>Failure to use special mitigations will result in a project that will exceed VRM Class III Management Objectives and therefore be out of compliance with Land Use Planning guidance. Minimizing surface disturbance and aboveground facilities will help minimize visual impacts. Maximizing facility distance from primary roads will help minimize visual impacts. Using any topographic screening available to hide facilities and roads will help minimize visual impacts.</p> <p><b>Appendix M Maps: Alternative C--Areas Visible from Main Roads in VRM Class III with Slopes &lt;5% Cow Butte/Wild Cow SMA</b></p>	<p>In visible portions of VRM Class III areas (Map 4.9), the following apply:</p> <ol style="list-style-type: none"> <li>1) Pads shall not be located on or near ridgelines - use subsurface or low-profile facilities to prevent protrusion above horizon line when viewed from any State, County or BLM road.</li> <li>2) Maximize pad distance from State, County or BLM roads.</li> <li>3) Low impact road design for resource roads (roads into individual pads) on slopes &lt; 5%, if road can be built with no side slopes. This will include ditch-witching utilities within the ROW, brush beating, some type of fabric or matting and gravel. (See Map 2.6)</li> <li>4) Minimize pad size - use pitless, shared pit or closed system drilling.</li> <li>5) Pump reserve pit and do earth work for reclamation right after drilling, put in top soil and plant first good season, interim reclamation will be completed one year after spud date.</li> </ol>	<p>VRM BMPs for Fluid Minerals, VRM H-8400-1, Land Use Planning H-1601-1</p>
<p>Existing road network</p> <p><b>Appendix M Maps: Alternative C—Special Management Areas Overview</b></p>	<ol style="list-style-type: none"> <li>1) Road density within the SMA targeted for less than 3 miles/mile<sup>2</sup>.</li> <li>2) Where existing road paths do not provide sufficient lease access or are located within highly erosive soils or in proximity to sensitive wildlife resources, reclamation of existing roads (either inside or outside the ARPA) would provide for the construction of new road paths</li> <li>3) Improvement of existing roads or construction of new roads would be designed to minimize hydrologic alteration. Specific road design criteria would be based on site-specific review and likely include a combination of mitigation options</li> </ol>	<p>Standards and Guidelines assessment for Upper Colorado River Basin (BLM 2002). These roads are currently known to cause accelerated erosion and hydrologic alteration. Upgrading these roads to improved or low-impact design specifications would decrease these impacts while allowing vehicular access to lease holdings. Additionally, utilization of appropriate road designs would increase the effectiveness of the existing transportation network.</p>

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Human presence	<ol style="list-style-type: none"> <li>1) Existing levels of public access would be maintained. In most cases, this would require new and improved roads be gated.</li> <li>2) Remote monitoring of well locations would be required where feasible.</li> </ol>	Minimum programmatic standards recommended by the Wyoming Game and Fish Department to sustain wildlife habitats affected by oil and gas development (WGFD 2004). There is currently no public access to the majority of the SMA. Maintaining a limited human presence within this area would help to maintain a movement corridor for big game and limit disturbance of leks and raptor nests.
Wildlife movements	<ol style="list-style-type: none"> <li>1) Convert fences to BLM standards or designs (e.g., rail top fence) to facilitate big game movement throughout the SMA, and in coordination with grazing permittees.</li> </ol>	Standards and Guidelines assessment for Upper Colorado River Basin (BLM 2002). Improving big game movement through or across fences would help to mitigate the additional stresses of development within the ARPA.
Limited vegetation communities. <b>Appendix M Maps: Project Area with Vegetation Communities</b>	<ol style="list-style-type: none"> <li>1) No surface disturbances within aspen, mahogany, and serviceberry communities.</li> </ol>	Standards and Guidelines assessment for Upper Colorado River Basin (BLM 2002)
<b>Historic Trails SMA</b>		
Historic trail corridors <b>Appendix M Maps: Alternative C--Historic Trails and 2-Mile Visibility</b>	<ol style="list-style-type: none"> <li>1) Brush hog and gravel surface for temporary roads at the drilling phase instead of constructing crowned and ditched roads on all locations.</li> <li>2) Begin reclamation at the time most optimal to regenerate the native species. Replace native shrubs to decrease visibility.</li> <li>3) Use existing roads/two-tracks if doing so would minimize visibility otherwise construct roads in minimally visible areas.</li> <li>4) Limit trail crossings to existing corridors.</li> <li>5) Construct smaller well pads.</li> <li>6) Construct low-impact roads.</li> <li>7) Require multiple well locations per pad in order to decrease visibility.</li> </ol>	Wyoming State Protocol - Approved procedures for the implementation of Section 106 NHPA and 36 CFR 800
Historic trails within the ARPA	<ol style="list-style-type: none"> <li>1) Allow no surface disturbance within ¼ mile of contributing segments of historic trails, including the Overland and Rawlins to Baggs Freight Road or the trail's associated sites.</li> <li>2) Limit trail crossings to existing disturbance corridors.</li> </ol>	Wyoming State Protocol - Approved procedures for the implementation of Section 106 NHPA and 36 CFR 800

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<p><b>Upper Muddy Creek Watershed/Grizzly SMA</b></p> <p>Additional road development would alter hydrologic conditions that create and maintain key habitat features of importance to BLM sensitive fishes (Bower 2005). Given the limited distribution of these fishes, alteration of the suitability of habitats within the SMA would likely increase the validity of listing petitions under the Endangered Species Act.</p> <p><b>Appendix M Maps: Alternative C—Special Management Areas Overview</b></p>	<ol style="list-style-type: none"> <li>1) Road density within the SMA targeted for less than 3 miles/mile<sup>2</sup>.</li> <li>2) Transportation and well access roads would utilize existing road paths where feasible.</li> <li>3) Where existing road paths do not provide sufficient lease access or are located within highly erosive soils or in proximity to sensitive wildlife resources, reclamation of existing roads within the SMA (either inside or outside the ARPA) would provide for the construction of new road paths</li> <li>4) Improvement of existing roads or construction of new roads would be designed to minimize hydrologic alteration. Specific road design criteria would be based on site-specific review and likely include a combination of mitigation options</li> <li>5) Detailed development, transportation, and reclamation plans, including road design, specific to those areas within the SMA will be required.</li> </ol>	<p>BLM Wyoming Sensitive Species List (USDI-BLM 2002a), BLM 6840 policy for special status species, Range-wide Conservation Agreement for Roundtail Chub, <i>Gila robusta</i>, Bluehead Sucker, <i>Catostomus discobolus</i>, and Flannelmouth Sucker, <i>Catostomus latipinnis</i> (UDNR 2004). These roads are currently known to cause accelerated erosion and hydrologic alteration. Upgrading these roads to improved or low-impact design specifications would decrease these impacts while allowing vehicular access to lease holdings. Additionally, utilization of appropriate road designs would increase the effectiveness of the existing transportation network.</p>
<p>Slopes &gt; 8% within the Upper Muddy Creek Watershed/Grizzly SMA boundary from 30-m DEM. Road construction on steep slopes would exacerbate the alteration of hydrologic conditions that create and maintain key habitat features of importance to BLM sensitive fishes. <b>Appendix M Maps: Alternative C—Muddy Creek SMA Slopes &gt;8%</b></p>	<ol style="list-style-type: none"> <li>1) No surface disturbance</li> <li>2) Detailed transportation plan required in order to avoid areas of &gt; 8% slope</li> </ol>	<p>BLM Wyoming Sensitive Species List (USDI-BLM 2002a), BLM 6840 policy for special status species, Range-wide Conservation Agreement for Roundtail Chub, <i>Gila robusta</i>, Bluehead Sucker, <i>Catostomus discobolus</i>, and Flannelmouth Sucker, <i>Catostomus latipinnis</i> (UDNR 2004). Improved road designs frequently result in alteration of hydrologic conditions. Given the limited feasibility of utilizing low-impact road designs on slopes greater than 8%, these areas will be avoided.</p>

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1:24,000 NHD within the Upper Muddy Creek Watershed/Grizzly SMA boundary. The fragmentation of fish habitats and wildlife corridors as well as risks posed by the increased probability of exotic species introductions warrant avoidance of additional road crossings of Muddy Creek.	1) No new road crossings of Muddy Creek 2) Detailed development and transportation plan required in order to design access routes that avoid Muddy Creek	BLM Wyoming Sensitive Species List (USDI-BLM 2002a), BLM 6840 policy for special status species, Range-wide Conservation Agreement for Roundtail Chub, <i>Gila robusta</i> , Bluehead Sucker, <i>Catostomus discobolus</i> , and Flannelmouth Sucker, <i>Catostomus latipinnis</i> (UDNR 2004). Sufficient access to lease holdings can be provided through the transportation planning process.
Maintaining a limited human presence within this area would help to maintain a movement corridor for big game and limit disturbance of sage-grouse leks and raptor nests.	1) Existing levels of public access would be maintained. In most cases, this would require new and improved roads be gated. 2) Remote monitoring of well locations would be required where feasible.	BMP's, Minimum programmatic standards recommended by the Wyoming Game and Fish Department to sustain wildlife habitats affected by oil and gas development (WGFD 2004). There is currently no public access to the majority of the SMA.
Chloride deicing agents are toxic to a variety of plants, fish, and other aquatic organisms and tend to increase the mobility of chemical elements in soil, such as heavy metals (Amrhein 1992; National Research Council 1991).	1) Use only non-chlorine deicing and dust control agents within the Upper Muddy Creek Watershed/Grizzly SMA.	BLM Wyoming Sensitive Species List (USDI-BLM 2002a), BLM 6840 policy for special status species, Range-wide Conservation Agreement for Roundtail Chub, <i>Gila robusta</i> , Bluehead Sucker, <i>Catostomus discobolus</i> , and Flannelmouth Sucker, <i>Catostomus latipinnis</i> (UDNR 2004). Alternative, non-chloride deicing and dust control products are readily available.
The limited geographic extent of certain vegetation communities and their importance to a variety of wildlife species warrant special consideration.	1) No surface disturbances within aspen, juniper-woodland, true mountain mahogany, and serviceberry communities.	Standards and Guidelines assessment for Upper Colorado River Basin (BLM 2002)
The combination of increased disturbance of big game resulting from development activities and existing fragmentation of movement corridors by fences would likely result in increased mortality	1) Convert fences to BLM standards or designs (e.g., rail top fence) to facilitate big game movement throughout the SMA, and in coordination with grazing permittees.	BMP's, Standards and Guidelines assessment for Upper Colorado River Basin (BLM 2002). Improvement of big game movement through fences would help to mitigate the additional stresses of development within the ARPA.

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<b>Sand Hills SMA</b>		
There is currently an extensive road network within the SMA including those portions within the ARPA. Reducing the density of roads within the area and incorporating appropriate designs when improving existing roads would help to reduce disturbance of the unique vegetation community important to big game, greater sage-grouse, and Columbian sharp-tailed grouse.	<ol style="list-style-type: none"> <li>1) Net reduction in road density within the SMA to a target of less than 3 miles/mile<sup>2</sup></li> <li>2) Transportation and well access roads would utilize existing road paths where feasible</li> <li>3) Where existing road paths do not provide sufficient lease access or are located within sensitive vegetation, highly erosive soils, or in proximity to sensitive wildlife resources, reclamation of existing roads (either inside or outside the ARPA) would provide for the construction of new road paths</li> <li>4) Improvement of existing roads or construction of new roads would be designed to minimize alteration of sensitive vegetation communities.</li> <li>5) Detailed development, transportation, and reclamation plans, including road design, specific to those areas within the SMA will be required.</li> </ol>	Standards and Guidelines assessment for Upper Colorado River Basin (BLM 2002). These roads are currently known to cause accelerated erosion of active dune complexes and associated disturbance of rare plant communities. Creation of new road paths would increase the potential for loss of rare vegetation communities through wind erosion of active dune complexes. The use of existing roads and appropriate designs for road improvement would allow for rapid revegetation and limit the disturbance of rare plant communities. Additionally, utilization of appropriate road designs would increase the effectiveness of the existing transportation network.
Maintaining a limited human presence within this area would help to maintain a movement corridor for big game and limit disturbance of leks and raptor nests.	<ol style="list-style-type: none"> <li>1) Existing levels of public access would be maintained. In most cases, this would require new and improved roads be seasonally closed.</li> <li>2) Remote monitoring of well locations would be required where feasible.</li> </ol>	Minimum programmatic standards recommended by the Wyoming Game and Fish Department to sustain wildlife habitats affected by oil and gas development (WGFD 2004). There is currently no public access to the majority of the SMA.
Chloride deicing agents are toxic to a variety of plants and tend to increase the mobility of chemical elements in soil, such as heavy metals (Amrhein 1992; National Research Council 1991).	<ol style="list-style-type: none"> <li>1) Use only non-chlorine deicing and dust control agents within the Sand Hills SMA</li> </ol>	To protect the silver sagebrush/bitterbrush community. Alternative, non-chloride deicing and dust control products are readily available.
The limited geographic extent of certain vegetation communities and their importance to a variety of wildlife species warrant special consideration.	<ol style="list-style-type: none"> <li>1) Limit surface disturbances within the silver sagebrush/bitterbrush community of the Sand Hills to &lt; 20 acres/mi<sup>2</sup>.</li> </ol>	Standards and Guidelines assessment for Upper Colorado River Basin (BLM 2002). The Sand Hills plant community is unique within the State of Wyoming. It also provides important seasonal and crucial winter habitats to a variety of wildlife species.

APPENDIX L – RESOURCE CONCERNS AND ASSOCIATED  
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The combination of increased disturbance of big game resulting from development activities and existing fragmentation of movement corridors by fences would likely result in increased mortality.	1) Convert fences to BLM standards or designs (e.g., rail top fence) to facilitate big game movement throughout the SMA, and in coordination with grazing permittees.	Standards and Guidelines assessment for Upper Colorado River Basin (BLM 2002). Improvement of big game movement through fence crossings would help to mitigate the additional stresses of development within the ARPA.
Historic Trails SMA	See Historic Trails SMA for special protective measures.	Wyoming State Protocol - Approved procedures for the implementation of Section 106 NHPA and 36 CFR 800
JO Ranch property <b>Appendix M Maps: Alternative C— Special Management Areas Overview</b>	1) No surface disturbance within the 18 acres surrounding JO Ranch Headquarters.	Wyoming State Protocol - Approved procedures for the implementation of Section 106 NHPA and 36 CFR 800