

**FINAL**  
**Supplemental Environmental Impact Statement**  
**for the Pinedale Anticline Oil and Gas**  
**Exploration and Development Project**  
**Sublette County, Wyoming**

**BLM**

**Pinedale Field Office**

**Volume 2 of 2**  
**Appendices**

**June 2008**



**MISSION STATEMENT**

It is the mission of the Bureau of Land Management to sustain the health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations.

**FINAL  
SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT  
PINEDALE ANTICLINE OIL AND GAS EXPLORATION AND DEVELOPMENT PROJECT  
SUBLETTE COUNTY, WYOMING**

**(Volume 2 of 2)**

**Bureau of Land Management  
Wyoming State Office  
Cheyenne, Wyoming**

**Pinedale Field Office  
Pinedale, Wyoming**

**In Cooperation with**

**State of Wyoming  
Sublette County  
Sublette County Conservation District**

**June 2008**

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## **APPENDIX 1**

### **Authorizations in the PAPA ROD**

## Authorizations in the PAPA ROD

**Table 1**  
**Location of Actionable Items in the PAPA ROD**

Resource/Issue	Location of Actionable Items in PAPA ROD					
	Required by Statute or Policy	Plan of Development Required	MOU or other Agreement	AM and/or Monitoring, Reporting	Limits or Controls Stipulated	Required or Suggested Mitigation
Transportation	Section 3	Section 3 Appendix B	Section 3	Section 3 Appendix C	Appendix A-2	Appendix A-3
Air Quality	Section 3	-	Section 3	Section 3 Appendix C	Section 3 Appendix A-1 Appendix A-2	Section 3 Appendix A-3
Special Status Species	Section 3	-	-	Section 3 Appendix C	Section 3 Appendix A-1 Appendix A-2	Section 3 Appendix A-3
Raptor Nest Protection	-	-	-	Section 3 Appendix C	Section 3 Appendix A-1 Appendix A-2 Appendix A-6	Section 3 Appendix A-3
Sage Grouse Protection	-	-	-	Section 3 Appendix C	Section 3 Appendix A-1 Appendix A-2 Appendix A-6	Section 3 Appendix A-3
Big Game Crucial Winter Range Protection	-	-	-	Section 3 Appendix C	Section 3 Appendix A-1 Appendix A-2 Appendix A-6	Section 3 Appendix A-3
Water Resources Protection/Monitoring	-	-	-	Section 3 Appendix C	Section 3 Appendix A-1 Appendix A-2	Section 3 Appendix A-3
Water Well Protection/Monitoring	-	-	-	Section 3 Appendix C	Section 3 Appendix A-2	Section 3 Appendix A-3
Paleontological Values Protection	-	-	-	-	Section 3 Appendix A-2	Appendix A-3
Soils Protection/Reclamation/Monitoring	Section 3	-	-	Section 3 Appendix C	Section 3 Appendix A-2	Appendix A-3
Vegetation Protection/Reclamation/Monitoring	-	-	-	Section 3 Appendix C	Section 3 Appendix A-2	Appendix A-3
Noise and Odor	-	-	-	-	Section 3 Appendix A-2	Appendix A-3
Night Lighting	-	-	-	-	Section 3	-
Cultural/Historical Resources Protection	Section 3	Section 3 Appendix E	Section 3 Appendix E	Section 3 Appendix C	Section 3 Appendix A-1 Appendix A-2	Appendix A-3
Socioeconomics	-	-	-	-	Section 3 Appendix A-6	-
Land Use	-	-	-	Section 3 Appendix C	-	Section 3
Livestock Grazing	-	-	-	Section 3 Appendix C	Appendix A-2 Appendix A-3	Section 3
Hazardous Materials	-	-	-	-	Appendix A-2 Appendix D	-
Remedial Action/Compliance Monitoring	-	-	-	Section 3	-	-

**Table 2  
Management Area Description, Area, and Objectives**

<b>Management Area Description, Area, and Objectives</b>	<b>Allowable Level of Development</b>
<p><b>MA 1 - Lander Trail – 3,460 acres or 5.41 square miles</b></p> <p><b>Management Area Objectives:</b></p> <ul style="list-style-type: none"> <li>• Preserve the integrity of the trail and the trail viewshed.</li> </ul>	<ul style="list-style-type: none"> <li>• 0 average pads/square mile</li> <li>• 0 maximum pads/square mile</li> <li>• 0 total producing pads threshold</li> </ul>
<p><b>MA 2 - Mesa Breaks – 7,366 acres or 11.51 square miles</b></p> <p><b>Management Area Objectives:</b></p> <ul style="list-style-type: none"> <li>• Maintain the existing quality, suitability and habitat effectiveness of the Mesa Breaks deer crucial winter range. These breaks provide thermal cover and forage during sever winters.</li> <li>• Retain the existing character of the landscape and sensitive viewshed.</li> <li>• Avoid disturbance on slopes 10 percent or greater and on sensitive soils to prevent erosion and altering the sensitive viewshed.</li> </ul>	<ul style="list-style-type: none"> <li>• 0 average pads/square mile</li> <li>• 0 maximum pads/square mile</li> <li>• 0 total producing pads threshold</li> </ul>
<p><b>MA 3 - Unleased Federal Minerals – 1,347 acres or 2.10 square miles</b></p> <p><b>Management Area Objectives:</b></p> <ul style="list-style-type: none"> <li>• These federal minerals have been closed to mineral lease. They include federal minerals under the industrial park west of Pinedale, several tracts near Boulder that were withdrawn at the request of the Department of Defense, Native American sensitive sites, etc. The management objective of this MA will be to continue to hold these parcels closed to development.</li> </ul>	<ul style="list-style-type: none"> <li>• 0 average pads/square mile</li> <li>• 0 maximum pads/square mile</li> <li>• 0 total producing pads threshold</li> </ul>
<p><b>MA 4 - Sensitive Viewshed – 8,686 acres or 13.57 square miles</b></p> <p><b>Management Area Objectives:</b></p> <ul style="list-style-type: none"> <li>• Protect the sensitive viewshed by retaining the existing character of the landscape.</li> <li>• Protect/maintain winter and crucial winter deer range.</li> <li>• Protect and maintain existing raptor nesting habitat.</li> </ul>	<ul style="list-style-type: none"> <li>• 2 average pads/square mile</li> <li>• 4 maximum pads/square mile</li> <li>• 28 total producing pads threshold</li> </ul>
<p><b>MA 5 - Big Game Winter Range and Sage Grouse Strutting and Nesting Habitat – 67,801 acres or 105.94 square miles</b></p> <p><b>Management Area Objectives:</b></p> <ul style="list-style-type: none"> <li>• Limit surface disturbance and human activity which could displace deer and antelope from winter ranges and sage grouse from strutting and nesting habitat resulting mortalities and reduced population levels.</li> <li>• Implement measures to screen activities and facilities so they do not attract the attention of a casual observer in VRM Class III on either side of the New Fork and Green Rivers.</li> </ul>	<ul style="list-style-type: none"> <li>• 2 average pads/square mile</li> <li>• 16 maximum pad/square mile</li> <li>• 212 total producing pads threshold</li> </ul>
<p><b>MA 6 - Sage Grouse Strutting and Nesting Habitat – 39,205 acres or 61.26 square miles</b></p> <p><b>Management Area Objectives:</b></p> <ul style="list-style-type: none"> <li>• Protect this area from unnecessary surface disturbance and human activities which could displace sage grouse from crucial strutting and nesting habitat resulting in mortalities and reduced population levels.</li> <li>• Ensure protection of the Green River and adjacent sub-basins from increased erosion and sedimentation.</li> <li>• Avoid activities and facilities that create barriers to the seasonal movements of antelope.</li> <li>• Partially retain the existing character of the landscape, on each side of U.S. Highway 191 and the Wind River Front Special Recreation Management Area (SRMA), by implementing measures which reasonably incorporate into the surface disturbance and/or facility, visual design considerations that will mitigate anticipated visual impacts so they do not dominate the view of the casual observer and so they replicate the existing characteristics of the landscape.</li> </ul>	<ul style="list-style-type: none"> <li>• 3 average pads/square mile</li> <li>• 16 maximum pads/square mile</li> <li>• 183 total producing pads threshold</li> </ul>
<p><b>MA 7 - Ross Butte/Blue Rim – 10,953 acres or 17.11 square miles</b></p> <p><b>Management Area Objectives:</b></p> <ul style="list-style-type: none"> <li>• Avoid disturbance to the fossil-bearing formations on a site-specific basis and protect paleontological fossil resources.</li> <li>• Avoid disturbance on highly erodible soils and maintain soil stability and productivity.</li> <li>• Protect and maintain existing raptor nesting habitat and protect sensitive plant species.</li> <li>• Protect the visual quality of the unique badland area.</li> </ul>	<ul style="list-style-type: none"> <li>• 4 average pads/square mile</li> <li>• 16 maximum pads/square mile</li> <li>• 68 total producing pads threshold</li> </ul>

<b>Management Area Description, Area, and Objectives</b>	<b>Allowable Level of Development</b>
<b>MA 8 - Minimal Conflict Area – 26,605 acres or 41.45 square miles</b>  <b>Management Area Objectives:</b> <ul style="list-style-type: none"> <li>• Maintain antelope summer range and avoid activities and facilities that will create barriers to the seasonal movements of antelope.</li> <li>• Avoid highly erodible soils.</li> <li>• Partially retain the existing character of the landscape, on each side of U.S. Highway 191 (classified as VRM Class III) and the Wind River Front SRMA, by implementing measures which reasonably incorporate into the surface disturbance and/or facility, visual design considerations that will mitigate anticipated visual impacts so they do not dominate the view of the casual observer and so they replicate the existing characteristics of the landscape.</li> </ul>	<ul style="list-style-type: none"> <li>• 4 average pads/square mile</li> <li>• 16 maximum pads/square mile</li> <li>• 168 total producing pads threshold</li> </ul>
<b>MA 9 - Non-Federal Lands – 31,925 acres or 49.88 square miles</b>  <b>Management Area Objectives:</b> <ul style="list-style-type: none"> <li>• Private and state lands not under the jurisdiction of the BLM.</li> <li>• BLM cannot impose management objectives or restrictions/limitations on these lands. However, it was suggested during the public workshops that the operators voluntarily adopt the interrelated and interdependent objectives for these areas. Recommendations included maintenance, improvement and restoration of riparian habitat to provided enhanced wildlife and livestock forage/habitat; avoidance of disturbance to scrub-shrub or forested wetland types to protect water quality; survey for cultural and Native American sacred sites; cooperation with private landowners to avoid impacts to area residences; protecting raptor nesting habitat; and continuing the maintenance of livestock grazing and trailing operations.</li> </ul>	<ul style="list-style-type: none"> <li>• 4 average pads/square mile</li> <li>• 16 maximum pads/square mile</li> <li>• 200 total producing pads threshold</li> </ul>

**Table 3**  
**Exceptions Requests and Subsequent Decisions made by the BLM AO from 2001 to 2007**

<b>Stipulation</b>	<b>Number of Actions</b>	<b>Period of Applicable Stipulation</b>					
		<b>2001-02</b>	<b>2002-03</b>	<b>2003-04</b>	<b>2004-05</b>	<b>2005-06</b>	<b>2006-07</b>
Big Game Crucial Winter Range	Total Requested	46	50	63	81	40	35
	Granted	36	42	53	67	26	32
	Partially Granted	0	0	1	12	8	0
	Denied	10	8	9	2	6	3
Sage Grouse Lek, Winter, and Nesting	Total Requested	31	88	106	107	100	90
	Granted	31	86	98	72	64	77
	Partially Granted	0	2	0	7	12	0
	Denied	0	0	8	28	24	13
Raptor Nesting and Winter	Total Requested	8	12	24	49	65	58
	Granted	6	10	22	44	43	42
	Partially Granted	0	2	0	4	17	1
	Denied	2	0	2	1	5	15

**Table 4  
Approved Components in Decision Record**

<b>NEPA Document</b>	<b>Approved Components in Decision Record</b>	<b>Decision Conditioned on Requirements</b>
<p>Questar Year-Round Drilling Proposal WY-100-EA05-034 November 2004</p>	<ol style="list-style-type: none"> <li>1. Construction of a 107-mile long, 6-inch diameter condensate pipeline using the alignment shown in Appendix B of the EA. Approval of drilling operations between November 15, 2005 and April 30, 2006 would be contingent upon that pipeline and the produced water pipeline being operational by that date; if the pipelines were not operational by November 15, 2005, Questar would not winter-drill after that date unless and exception was granted. That exception would be considered on its own merits.</li> <li>2. Up to two rigs drilling on one well pad between November 15, 2004 and April 30, 2005. Pad location would be selected in coordination with BLM and WGFD.</li> <li>3. All mitigation described in Section 2.5 of the EA would be in place and operational by November 15, 2005, including initiation of habitat enhancement projects within Questar's leasehold in 2005, except for full implementation of EPA Tier II compliant or alternate fuel drilling rigs.</li> <li>4. As committed to by Questar, by January 1, 2007, all drilling rigs operating in Questar's leasehold would be either EPA Tier II compliant or would utilize alternate fuels engines whose emissions are equivalent to Tier II engines.</li> <li>5. Beginning in the winter of 2005-2006, Questar would implement an expanded mule deer research study to determine impacts of winter drilling on mule deer populations. Questar would provide a proposed expanded research design to BLM by July 1, 2005; BLM would submit that proposed design to the Pinedale Anticline Working Group (PAWG) and to the WGFD for review and recommendation. The PAWG and WGFD would make their recommendations to BLM by September 1, 2005; and BLM would approve the proposed or modified research design before September 1, 2005; and BLM would approve the proposed or modified research design before November 1, 2005. Questar must have implemented that research by November 15, 2005.</li> <li>6. Over a nine year period beginning November 15, 2005, through the winter of 2013-2014, Questar would be allowed to utilize up to six rigs (two rigs per well pad) drilling on up to three well pads between November 15 and April 30 each year. Between May 1 and November 15 of any year under the proposal, Questar could drill with as many rigs from as many of the 61 total well pads as is feasible, with appropriate authorization.</li> <li>7. Questar could construct and begin drilling from the winter-long well pads before November 15 of any year; however, continuation of activity on those pads after November 15 would be contingent upon all appropriate mitigation being in place and/or operational.</li> <li>8. This Decision Record authorized a maximum of 61 well pads (52 currently existing and 9 new well pads) within Questar's leasehold.</li> <li>9. Leasehold development and production would be based on performance objectives to allow Questar maximum flexibility to utilize innovation to maximize gas recovery while providing optimal short- and long-term protection for other resources in their leasehold.</li> </ol>	<ol style="list-style-type: none"> <li>1. Questar would fully implement the applicant-committed mitigation measures described in Section 2.5 of the EA and the original ROD for the PAPA EIS, except as modified by this decision, by November 15, 2005. Habitat enhancement activities could have begun prior to November 15, at the discretion of BLM and WGFD;</li> <li>2. Questar would be required to fully implement the performance-based development and production objectives, Conditions of Approval, mitigation, monitoring, and Best Management Practices listed in Appendix A of the Decision Record;</li> <li>3. The PAWG advisory committee would review and evaluate the above-referenced requirements and make recommendations to BLM on an annual basis regarding continuation, cessation, or addition to those requirements; and</li> <li>4. The BLM Pinedale Field Manager or designee was the Authorized Officer (AO) for the project. Mitigation and monitoring measures may be modified. Mitigation and monitoring requirements would be determined annually by the AO after receiving the results of on-site inspections, recommendations from the PAWG, and stakeholder consultations. BLM could require additional field studies or documentation in addition to those listed in Appendix A (of the DR) to ensure that reclamation and other resource protection goals are met.</li> </ol>

NEPA Document	Approved Components in Decision Record	Decision Conditioned on Requirements
<p>Questar Year-Round Drilling Proposal – Condensate Pipeline Modification (QYDP-CPM) WY-100-EA05-283 July 2005</p>	<ol style="list-style-type: none"> <li>1. Construction of the 14.4-mile long, 6-inch diameter condensate pipeline using the alignment shown in Appendix A of the EA. Approval of drilling operations between November 15, 2005 and April 30, 2006 would be contingent upon that pipeline and the produced water pipeline being operational by November 15, 2005; if the pipelines were not operational by November 15, 2005, Questar would not winter-drill after that date unless and exception was granted. That exception would be considered on its own merits.</li> <li>2. Construction of an underground power line to Stewart Point 16-18 CDP from an existing nearby power line.</li> <li>3. Construction of connecting pipelines between the NGL Stabilizer and Water Handling Facility and Gobblers Knob Compressor Station, and the associated power line.</li> <li>4. Placement of one blowdown tank on each well pad within the Questar leasehold.</li> <li>5. Tier II-compliance (or equivalent, or better) of drilling rig engine emissions on all year-round drilling rigs operating in Questar's leasehold by January 1, 2008, as committed to by Questar.</li> </ol>	<ol style="list-style-type: none"> <li>1. The Questar Year-Round Drilling Proposal (QYDP) Decision Record and its Appendix A (see above) would be in full force and effect except where modified by this Decision Record and its Appendix A.</li> <li>2. Questar and QGM would fully implement the applicant-committed mitigation measures described in Section 2.5 of the QYDP EA (WY-100-EA05-034) and the original ROD for the PAPA EIS except as modified by the QYDP DR (see above), by November 15, 2005.</li> <li>3. Questar would fully implement an expanded mule deer research study beginning in the winter of 2005-2006, which will continue existing research and add research into the physiological effects of winter drilling activity, to determine impacts of winter drilling on mule deer populations.</li> <li>4. Questar would provide a proposed expanded research design to BLM by September 1, 2005; BLM would submit that proposed design to the PAWG and to the WGFD for review and recommendation. Based on PAWG and WGFD recommendations (to BLM by October 15, 2005); BLM would approve an expanded study research design before November 1, 2005. Questar must have implemented that research by November 15, 2005. If BLM, PAWG, and WGFD agree that it is not feasible, a new expanded study implementation date would be set and the public would be notified.</li> <li>5. Blowdown tanks on all pads put into production after the date of the DR will be no bigger than 90 bbl, low-profile (6-foot high) tanks; blowdown tanks on pads put into production prior to the date of the DR would have existing blowdown tanks converted to these 90 bbl, low-profile (or smaller, technology permitting) tanks by August 1, 2007, as committed to by QGM.</li> <li>6. QGM would provide a paleontology monitor who would be present during pipeline construction within Bird Canyon; the monitor would coordinate with BLM prior to construction in that area;</li> <li>7. Questar and QGM would fully implement the performance-based objectives for development and production, Conditions of Approval, mitigation, monitoring, inventories, and Best Management Practices listed in Appendix A of the DR; habitat enhancement activities could begin prior to November 15, 2005, at the discretion of BLM and WGFD, and could be subject to additional NEPA analysis.</li> <li>8. The PAWG advisory committee would review and evaluate the above-referenced requirements and make recommendations to BLM on an annual basis regarding continuation, cessation, or addition to those requirements; and</li> <li>9. The BLM Pinedale Field Manager or designee was the Authorized Officer (AO) for the project. Mitigation and monitoring measures may be modified. Mitigation and monitoring requirements would be determined annually by the AO after receiving the results of on-site inspections, recommendations from the PAWG, and stakeholder consultations. BLM could require additional field studies or documentation in addition to those listed in Appendix A (of the DR) to ensure that reclamation and other resource protection goals are met.</li> </ol>

NEPA Document	Approved Components in Decision Record	Decision Conditioned on Requirements
<p>ASU Year-Round Drilling Demonstration Project WY-100-EA05-254 September 2005</p>	<ol style="list-style-type: none"> <li>1. ASU would fully implement the applicant-committed measures described in Section 2.6 of the EA and the ROD for the PAPA EIS, except as modified by this decision, by November 15, 2005.</li> <li>2. ASU would be required to fully implement the performance-based development and production objective, Conditions of Approval, mitigation, monitoring, and Best Management Practices listed in Appendix A of the DR.</li> <li>3. As committed to by Shell, catalytic aftertreatment technology would be installed on both of their existing Tier I EPA compliant rigs proposed for the Mesa 7-29 pad to demonstrate EPA Tier II equivalent emissions. Shell would conduct monitoring of rig emissions as discussed in the EA and provide a report to BLM on the effectiveness of the catalytic aftertreatment technology by April 30, 2006.</li> <li>4. As committed to by Anschutz and Ultra, bi-fuel technology would be installed on the two rigs proposed for the Mesa 10-35 pad and the two rigs proposed for the Mesa 7-34 pad to demonstrate EPA Tier II equivalent emissions. Anschutz and Ultra would conduct monitoring of rig emissions as discussed in the EA and provide a report to BLM on the effectiveness of the catalytic aftertreatment technology by April 30, 2006.</li> <li>5. The PAWG advisory committee would evaluate and monitor the effectiveness of the above-referenced requirements and make recommendations to BLM regarding continuation, cessation, or addition to those requirements; and</li> <li>6. The BLM Pinedale Field Manager or designee was the Authorized Officer (AO) for the project. Mitigation and monitoring measures may be modified. Mitigation and monitoring requirements would be determined by the AO after receiving the results of on-site inspections, recommendations from the PAWG, and stakeholder consultations. BLM could require additional field studies or documentation in addition to those listed in Appendix A (of the DR) to ensure that reclamation and other resource protection goals are met.</li> </ol>	<ol style="list-style-type: none"> <li>1. ASU would fully implement the applicant-committed measures described in Section 2.6 of the EA and the ROD for the PAPA EIS, except as modified by this decision, by November 15, 2005.</li> <li>2. ASU would be required to fully implement the performance-based development and production objective, Conditions of Approval, mitigation, monitoring, and Best Management Practices listed in Appendix A of the DR.</li> <li>3. As committed to by Shell, catalytic aftertreatment technology would be installed on both of their existing Tier I EPA compliant rigs proposed for the Mesa 7-29 pad to demonstrate EPA Tier II equivalent emissions. Shell would conduct monitoring of rig emissions as discussed in the EA and provide a report to BLM on the effectiveness of the catalytic aftertreatment technology by April 30, 2006.</li> <li>4. As committed to by Anschutz and Ultra, bi-fuel technology would be installed on the two rigs proposed for the Mesa 10-35 pad and the two rigs proposed for the Mesa 7-34 pad to demonstrate EPA Tier II equivalent emissions. Anschutz and Ultra would conduct monitoring of rig emissions as discussed in the EA and provide a report to BLM on the effectiveness of the catalytic aftertreatment technology by April 30, 2006.</li> <li>5. The PAWG advisory committee would evaluate and monitor the effectiveness of the above-referenced requirements and make recommendations to BLM regarding continuation, cessation, or addition to those requirements; and</li> <li>6. The BLM Pinedale Field Manager or designee was the Authorized Officer (AO) for the project. Mitigation and monitoring measures may be modified. Mitigation and monitoring requirements would be determined by the AO after receiving the results of on-site inspections, recommendations from the PAWG, and stakeholder consultations. BLM could require additional field studies or documentation in addition to those listed in Appendix A (of the DR) to ensure that reclamation and other resource protection goals are met.</li> </ol>
<p>Questar Year-Round Drilling Proposal, Addendum WY-100-EA06-043 November 2005.</p>	<ol style="list-style-type: none"> <li>1. Winter drilling of Mesa 15C-20D after November 15, 2005. The well is on a pad approved in the QYDP EA (WY-100-EA05-034). Well completion was approved with mitigation.</li> <li>2. Mesa 6-7D would be completed before November 15, 2005. Some equipment would remain on-site, then moved after November 15, 2005.</li> <li>3. Winter drilling and completion of Mesa 9B-7D and 10-7D from one pad was allowed, with mitigation.</li> <li>4. Addition on a third rig to drill on the approved Mesa 3-20 winter drilling pad. Well completions were not included.</li> </ol>	<ol style="list-style-type: none"> <li>1. The accelerated winter development on the Mesa would be monitored for compliance and project effectiveness consistent with the mitigation measures and management requirement described in the Questar Year-Round Drilling Environmental Assessment and Decision Record, November 2004. In addition the attached required mitigation activities would be monitored for compliance during the winter season 2005-2006 (Attachment #1 – Required Mitigation).</li> </ol>

NEPA Document	Approved Components in Decision Record	Decision Conditioned on Requirements
<p>Ultra 2006-2007 Big Game/Sage Grouse Exception for the Mesa 10D-33 Deep Well WY-100-EA07-006 November 2006.</p>	<p>1. Approval of drilling operations between November 15, 2006 and May 17, 2007. Seasonal restrictions limiting actions within big game winter range, greater sage-grouse nesting and brood-rearing habitat do not apply to this Deep Well Project.</p>	<ol style="list-style-type: none"> <li>1. Ultra will fully implement the applicant-committed measures described in the Proposed Action section of this EA.</li> <li>2. Ultra will be required to fully implement the performance-based development and production objective, Conditions of Approval, mitigation, monitoring, and Best Management Practices listed in Appendix I of this Decision Record.</li> <li>3. As committed to by Ultra, natural gas fired turbines will be utilized for the drilling rig proposed for the Mesa 10D-33. Ultra will conduct monitoring of rig emissions as discussed in the EA and provide a report to BLM on the effectiveness of the bi-fuel technology within 30 days following completion of the drilling operations.</li> <li>4. The Pinedale Anticline Working Group advisory committee will evaluate and monitor the effectiveness of the above-referenced requirements and make recommendations to BLM on an annual basis regarding continuation, cessation, or addition to those requirements.</li> <li>5. The BLM Pinedale Field Manager or designee is the Authorized Officer (AO) for this project. Mitigation and monitoring measures may be modified. Mitigation and monitoring requirements will be determined annually by the AO after receiving the results of on-site inspections, recommendations from the Pinedale Anticline Working Group (PAWG), and stakeholder consultations. BLM may require field studies or documentation in addition to those listed in Appendix I to ensure that resource protection goals are met.</li> </ol>

## **APPENDIX 2**

### **Scoping Comments**

## Scoping Comments

### Air Quality

- provide a detailed air quality analysis.
- include modeling scenarios with mitigation measures that will result in no impacts to visibility in nearby Class I and Class II wilderness areas.
- include water and condensate gathering as mitigation for air analysis.
- address stabilization of rig numbers.
- disclose potential impacts to Class I and II areas from drilling, completion, and flaring in cold winter conditions.
- provide for project and cumulative – a comparison of emissions from original PAPA and the proposed action; discuss and evaluate mitigation measures to reduce emissions.
- provide a complete cumulative analysis of southwest Wyoming.
- reduce air emissions.
- use Tier 2 technology.
- address regional haze issues and potential mitigation for visibility impairment in Class I areas.
- should include project specific and cumulative effects air quality analysis.
- include effectiveness of ASU emissions mitigation.
- include latest monitoring results for ozone in Pinedale area and statement of compliance with NAAQS.
- include modeled ozone concentrations resulting from development in the PAPA.
- conduct extensive air modeling.
- evaluate effectiveness of Naughton Power Plant Unit 3 retrofit on air quality in area.
- companies should be striving to use best available technology to reduce emissions right now regardless of winter access.
- concerns about impacts to high mountain lakes resulting in impacts to trout and downstream water users.
- identify and analyze cumulative impacts including visibility in Class I areas.

- consider impact of project on ozone concentrations and compare to NAAQS.
- address balance between directional drilling and increased air quality impacts.
- low emission drill rigs should be used and should comply with WDEQ regulations on flaring.
- requests that strictest possible standards for emissions be applied.
- public health issue of air quality.
- concerned about dust and truck emissions.
- winter inversions can trap air pollutants.
- operators should use natural gas or clean diesel engines on all rigs.
- road construction and dust should be minimized.
- monitoring should be increased.
- monitoring should be used and pollutions should be decreased.
- air pollution, air pollution mitigation, air pollution modeling and air quality monitoring should all be addressed. Include necessary compression and gas processing plants (Granger).
- evaluate air quality impacts and detail mitigation steps to minimize impacts, identify types of fuels to be used during construction, increased traffic, and related VOC and NO<sub>x</sub> emissions.

**Alternatives**

- should include at least one conservation alternative.

**Cultural**

- the integrity of trail and trail viewshed should be preserved.
- confirm compliance with the national Historic Preservation Act Section 106 consultation with the Wyoming SHPO Officer.

**Environmental Justice**

- disclose and evaluate these aspects. Coordinate with potentially impacted Native American tribes.

**General**

- BLM should require adaptive management strategies.
- companies should be bound to commitments and responsibilities as well as successor companies.

- there should be full coordination for all activities between the operators.
- supports year-round drilling to shorten development time.
- no arbitrary restrictions on development activities.
- any restrictions should provide for waivers, modifications, or exceptions.
- request a map of all private and public lands and current leases in the document.
- concern about pace of development outside of PAPA ROD.
- document should be thorough in investigating technical and managerial “best practices”.
- include findings of pilot and demonstration projects; address directional drilling reach of 3,000 feet; establish peer review procedures.
- interagency collaboration should occur.
- identify adaptive approach to impacts from any waivers of wildlife stipulations and define measures for reinstating them.
- BLM must address unnecessary or undue degradation of the lands; maintain adaptive environmental management.
- BLM should implement PAWG’s recommendations.
- BLM must independently verify accuracy of information submitted by proponents.
- acknowledge precedents that this approval will set.
- cautions that directional drilling is not applicable everywhere.
- limit scope of analysis to potential impact on wildlife species from year-round drilling.
- objects to analysis of anything except for impacts to wildlife as a result of year-round drilling.
- why does BLM have to consider proposal; should consider Questar’s test winter drilling before this proposal is approved.
- operators should incorporate same proposals into summer drilling; technological improvements should be made in any case – not only to benefit wildlife.
- concern that RMP is not yet available; why is human access limited but not gas company access.

- public should have access to maps in review process.
- benefits of proposal should be implemented without lifting winter restrictions.
- monitoring should involve real action to prevent negative impacts.
- technological mitigation measures should be in place for all drilling on the Mesa including summer months.
- concern over meeting existing regulatory environmental compliance standards with regard to air quality and water quality.
- concern over implementation of adaptive management.
- discuss technological advances in document (especially drilling and casing techniques to eliminate blowouts).
- discuss potential for “connected actions” within the entire Green River Basin.
- discuss monitoring and enforcement within the anticline.
- concerned about setting precedents in the Green River Basin (take time to get it right).
- opposes the project.
- slow pace of development until realistic evaluation can be done on effects to wildlife, residential water wells, the river, etc.
- opposes removal of winter drilling restrictions.
- pace of development is too fast – concern over aquifer/groundwater contamination.
- surface disturbance should be reduced regardless of waivers of winter stipulations.
- pace of development is too fast.
- monitoring data should be analyzed and changes made accordingly.
- slow pace of development; require mitigation in only summer months.
- opposes winter drilling.
- operators should implement directional drilling and gathering systems regardless of winter drilling approval.
- hold operators to one well per section and pipe condensate and water.

- address all changes in development made in recent NEPA documents to determine adequacy of existing monitoring and research.
- evaluate how monitoring and research will be used to modify development once impact is demonstrated.
- support of the project – should place no arbitrary restrictions on development – any restrictions should provide for waivers, modifications or exceptions.
- supports the proposal, pipeline should follow existing corridors, NEPA process should be streamlined with analysis of real not perceived issues, reasonable alternatives should be analyzed, mitigation and lease stipulations should use sound science.
- address road construction and dust control, identify crossing methods for streams.
- Vegetation, Wildlife Habitats, and Area Hunting and Fishing – address the effects of the pipeline project activities on area ecology.
- pipeline through crucial winter range should not be constructed in the winter.

**Geology**

- address “shifting geology” and need to drill year-round.
- companies should be required to get more gas out of their existing wells before drilling additional wells.

**Land Use**

- address impacts to ranchers and landowners as a result of wildlife being displaced to their lands.
- BLM should consider property rights.
- increased presence of displaced animals on ranchers.
- multiple use objectives are being overlooked.
- concerned about gas companies industrializing private lands to avoid restrictions on BLM land.
- address required permits for pipeline crossings or approaches to the highway.
- address additional policies regarding split estate lands.
- include an analysis of potential effects of the proposed action and alternatives to reclamation lands and facilities.

**Noise**

- use mitigation in crucial winter range.
- discuss short-term and long-term noise pollution and detail mitigation measures.

**Public Health**

- address hand washing and waste elimination for large number of people – other than portable-potties.

**Range and Grazing**

- mule deer will be pushed to private land.
- should be offsite mitigation to landowners.
- need plan for handling livestock permits.
- concerned about AUM decrease as a result of offsite mitigation.
- supports alternative which would reduce surface disturbance.
- need more coordination between operators and livestock producers who graze the Mesa.
- concerned that offsite mitigation will pressure cattle use on the rest of the Mesa.

**Reclamation**

- encourage BLM to insure reclamation areas are successfully restored and provide wildlife benefits.
- need timely reclamation.
- encourage BLM to insure reclamation areas are successfully restored and provide wildlife benefits.
- surface should be revegetated in manner that prevents the invasion of noxious weeds, use surface fill that supports native ground cover, prevent erosion, and riling of soil down slopes.

**Recreation**

- address impacts to hunting and fishing communities as a result of lifting winter restrictions.
- populations have declined making hunting more difficult.
- public should have use of the Mesa if gas companies do.
- concerned about populations declining for hunting.

- construction should not interfere with water recreations.

**Socioeconomic**

- increase coordination with public.
- support for the project – will provide stability for working citizens in Sublette County.
- address impacts to local and adjacent communities as a result of lifting winter restrictions.
- effects to citizens of Pinedale should be considered.
- in support of proposal to establish stable economy.
- BLM should consider impacts to the human environment (winter restrictions allow Pinedale to return to pre-gas industry ways for the winter).
- concern over man camps, too much development and potential for “bust”.
- concern over “bust’ when drilling ceases.
- concerned about seasonal employment and safety associated with winter restrictions.
- look at impacts to local communities.
- supports winter drilling to stabilize economy.

**Transportation**

- reduce impacts by busing, stockpiling, or convoys.
- truck traffic is dangerous on E. Green River Rd – CR 110 – only intended for ranch activity.
- concerned that winter drilling will create a safety hazard on County Road 23-110.
- concerned about safety of County Road 23-100 and increased risk during winter.

**Vegetation**

- minimize disturbance; multiple wells from one pad should be standard procedure.

**Visual**

- evaluate impacts and detail mitigation steps that will be taken to minimize associated impacts. Address light pollution.

**Water Resources**

- address heavy metal concentrations (mercury and selenium) in production waters.

- concern about aquifer contamination from drilling and fracing.
- discuss methods to prevent, monitor and mitigate impacts to groundwater.
- concern over groundwater/aquifer contamination.
- potential for impacts to downstream water users.
- must evaluate subsurface water zones by additional investigational drilling.
- SEIS should contain level of information and analysis to support and comply with the 404 Guidelines.
- address any TMDL plans, produced water disposal, pretreatment of stormwater and mitigation plans. Address hydrostatic testing of the pipeline and the requirements for NPDES Clean Water Act Section 402 storm water permits.
- address potential for impact to drinking water aquifers and protection from cathodic protection structures.

### **Wetland and Riparian Areas**

- identify all wetlands and waters of the U.S. that would be crossed or impacted including farmed wetlands and prior converted wetlands. Address need for buffer areas and commitments to reestablish wetlands and the need for compensatory mitigation.

### **Wildlife**

- concerned with the request to remove all wildlife stipulations.
- ensure that large unfragmented areas are left undisturbed; expand wildlife studies.
- complement initial mule deer study.
- oppose waiving wildlife habitat protection stipulations on the leases in the PAPA; do not support winter well completions.
- recommends that BLM consider short-term impacts (5 to 20 years) to wildlife and their habitats as well as long-term impacts to wildlife (mule deer, antelope and sage grouse).
- recommend that BLM consider an alternative that protects wildlife habitat on portions of the PAPA while allowing gas development in other portions.
- discuss effectiveness of mitigation for loss of critical winter range.
- include discussion on directional drilling to preserve crucial winter range.

- BLM should look outside of administrative boundaries for better mitigation strategies; continue research on mule deer.
- look at offsite mitigation as a regional issue.
- deal with human component to wildlife effectively.
- look at larger ecosystem for species.
- monitoring should be actively in place and should be long-term commitment (20 years or the life of the gas field).
- include an analysis of effectiveness of wildlife stipulations.
- explain monitoring; clarify intention of Proponents request to remove seasonal stipulations for all species in all habitat types.
- must provide scientific support before abandonment of any seasonal stipulations or claim that they are unnecessary or ineffective or that removal of them can be compensated for.
- address any deviations from the “Minimum Recommendations for Development of Oil and Gas Resources within Crucial and Important Wildlife Habitats on BLM Lands.”
- concern for removal of seasonal stipulations.
- concern that management objectives of MA 2 have not been met.
- do not remove winter restrictions.
- buying back suspended leases in the Upper Bridger Teton and Wyoming Range should be mitigation for removal of winter restrictions in the Pinedale Anticline.
- the quantitative data on the impacts of winter drilling on wildlife should be made available to the public.
- concern over winter drilling due to potential negative impacts.
- should include data on roadkills on U.S. Highway 191 between Boulder and Pinedale; winter drilling should not be approved until effects are fully understood.
- opposes consideration for expansion of year round drilling.
- opposes approval of additional winter drilling on the Mesa.
- in offsite mitigation, consider potential for conflicts with people and other wildlife.
- address chronic wasting disease in ungulates.

- winter drilling exceptions should only be made on a case-by-case basis.
- against winter drilling, concerned about CWD, increased roadkills.
- opposes year round access on the Mesa; concerned for mule deer populations disruption of sage grouse leks and antelope populations.
- concerned about declining deer population on the Mesa.
- no drilling should be allowed in the wintering areas; sage grouse should be protected.
- supports offsite mitigation; should buy back leases in the South Rim Unit and not allow drilling there.
- issues are a concern to the community.
- does not support elimination of seasonal restrictions; concerned about mule deer, sage grouse, and antelope.
- concerned about roadkill from increased winter traffic on County Road 23-100.
- provide documentation of operators' assertion that the proposed action (including completions) provides protection at least to the level of existing stipulations; provide GIS-based evaluation of habitat on and off the PAPA.
- evaluate effects of current development with current knowledge of effects to wildlife to allow better management of development and operation.
- adopt an objective of no further loss of key wildlife habitats and specify how to achieve the objective.
- evaluate trends in sage grouse on impacted and non-impacted areas, including winter habitats with a plan for sage grouse conservation in the region.
- evaluate implementation and effectiveness of applicant-committed mitigation measures.
- develop a management plan to address wildlife and continued development.
- address impact to summer range used by mule deer wintering on the PAPA.
- too late for mitigation to work on the Mesa for mule deer.
- opposes drilling on big game winter range during critical periods.

## **APPENDIX 3**

### **Review of Impacts to Socioeconomics, Air Quality, and Wildlife Based Upon Various Levels of Drilling Rigs**

## **Review of Impacts to Socioeconomics, Air Quality, and Wildlife Based Upon Various Levels of Drilling Rigs**

The purpose of this appendix is to provide the reader with information on the degree to which the number of drilling rigs operating in the PAPA impacts key resources. The need for this discussion and the identification of these key resources was determined by comments received on the Draft SEIS.

Further, the BLM has determined that this discussion would be based upon the year-round development Alternatives, because these Alternatives contain mitigation measures that could result in changes to the number of drilling rigs operating in the PAPA. The reader should keep in mind that the impacts described in Chapter 4 for the various Alternatives assumed 48 drilling rigs would be operating in the PAPA at any one time, for purposes of analysis.

### **Socioeconomic**

Of all the resources presented in this appendix, the socioeconomic impacts have the most distinction between the impacts from 20 drilling rigs and 60 drilling rigs.

The reader will recall from Chapter 4 that the number of development jobs is expressed as AJE, or annual job equivalents, not as number of workers. An estimated 47.4 annual job equivalents are associated with developing a gas well in the PAPA. Using 48 rigs to drill an average of 232 wells per year means that there would be approximately 10,997 development jobs, with development lasting for 19 years through 2025. This would generate approximately \$563,801,528 per year (based on an estimated \$2,430,179 earnings per well for drilling). The current peak number of drilling rigs (estimated at 34 drilling rigs) has created current conditions, with a tight housing market, an increase in housing costs, and a greater need for emergency services, traffic control, and infrastructure. It has also brought the economic benefits that have made the renovations and projects described in Section 3.5.1 of Chapter 3 possible, as well as a low unemployment rate. It has also lead to the current strain on infrastructure as expressed by the Town of Pinedale.

Using 20 drilling rigs to drill an average of 96 wells per year would create approximately 4,550 development jobs, with development lasting through 2052, or 46 years. This would generate the lowest amount of yearly earnings, at \$233,297,184. It may also depend more heavily on a continuing demand for gas, with the need for good market conditions for a longer period of time than that required by 48 drilling rigs. The number of production jobs would be lower than for those required for 48 drilling rigs because the number of wells producing at any one time would be lower. This number of drilling rigs is even less than the number of drilling rigs that have been operating in the past 2 years. Decreasing to this number could create something of a bust, as the need for workers would be reduced, resulting in businesses closing, and empty housing, as people would move elsewhere to find employment. The crime rate would also be expected to decrease from current levels. It may also bring decreases in federal mineral royalties and ad valorem taxes because of slower rates of production.

Using 60 drilling rigs to drill an average of 289 wells per year would result in approximately 13,888 development jobs, with development lasting for 15 years through 2061. This would generate about \$712,042,447 in earnings per year, more than under 48 rigs. This pace generates the highest number of development jobs and lasts the shortest amount of time. The number of production jobs would be higher than those needed with 48 drilling rigs because the

number of wells producing at any one time would be higher. This pace would create a greater need for services, as more people would move to the area to fill jobs. This would likely increase the strain on infrastructure. There would be more traffic resulting in more wear on the roads and increased demand for housing and emergency services. The crime rate would be expected to increase from current levels. However, it may also bring greater economic benefits, including higher federal mineral royalties and ad valorem taxes, due to the increased rate of production.

### Air Quality

Air quality impact assessment modeling conducted for Alternative B indicated a maximum of 67 days per year of visibility impairment over 1.0  $\Delta$  deciviews (dv) at the Bridger Wilderness Area. The modeling was performed with the CALPUFF dispersion model using 3 years (2001, 2002, and 2003) of hourly windfields which were developed with the CALMET meteorological model. CALPOST method 6 for visibility processing combined with FLAG natural background data and regional haze rule monthly relative humidity factors applicable to the Bridger Wilderness Area were used (BLM visibility test).

Alternative B emissions were based on a maximum emissions scenario that included both construction and production activities expected to occur in year 2009. This scenario included emissions from 48 drilling rigs of which four were assumed to have Tier 0 emissions levels, 15 at Tier 1 levels, and 29 at Tier 2 levels.

Three additional CALPUFF model runs were performed for Alternative B modeling scenario that included “scaling” the drill rigs emissions modeled for 48 drill rigs to account for the emissions from 10, 20, and 60 drill rigs. Visibility impacts were modeled at the Bridger Wilderness Area. The modeling results are shown below:

Number of Drilling Rigs	Days of Visibility Impairment at the Bridger Wilderness Area over 1 dv
10	13
20	26
48	67
60	77

This analysis indicates the effect that drilling rig emissions have on visibility impacts at the Bridger Wilderness Area. Using a fleet of 10 drilling rigs in the PAPA with a mix of Tier 0, Tier 1, and Tier 2 emissions levels would not achieve the BLM’s goal of 0 days of visibility impairment over 1.0 dv.

Using a fleet of drill rigs with refined emissions controls would have a larger effect on visibility impacts. Shown below are the emission factors and emission rates in pounds per hour (lb/hr) for a typical size drill rig (3,875 hp) used in the Pinedale Anticline area.

Emissions Level	Emission Factor (g/hp-hr)	Emission Rate (lb/hr) <sup>1</sup>
Tier 0	10.89	39.07
Tier 1	6.90	24.76
Tier 2	4.5	16.15
Tier 4 (Natural Gas)	1.0	3.59

<sup>1</sup> Includes a 0.42 load factor.

This table indicates that the emissions from a natural gas-fired drilling rig are more than a factor of 10 less than the emissions from a drilling rig with Tier 0 controls, and more than 4 times less than a drilling rig with Tier 2 controls.

### **Wildlife**

Current plans for utilizing 48 rigs per year to drill 4,399 wells require 19 years, from 2007 to 2025. That drilling intensity means that, on average, 232 wells would be drilled each year. Production would end in 2065.

If drilling was restricted to 20 rigs per year, an estimated 46 years would be required to drill 4,399 wells. Consequently, wellfield development would extend through 2052 with an average of 96 wells drilled each year. Production is expected to last through 2092.

With 60 drilling rigs allowed to operate each year, development would require only 15 years, ending in 2021. Year-round development by 60 rigs per year would average 293 wells drilled per year. At that pace of development, production would be expected to last through 2061.

Regardless of the number of rigs per year, the same amount of surface disturbance would occur although within the different timeframes estimated, above.

Any increase in traffic, noise, and associated human presence within seasonal wildlife habitats during otherwise seasonally restricted periods is likely to increase effects to wildlife. This expectation is based on observations of wildlife responses to wellfield development through 2006, most of which have occurred without year-round development. The responses were reviewed in Chapter 3. At the very least, effects to wildlife similar to observed levels with minimal year-round development are possible but increased levels of effect seem a more reasonable expectation.

If 20 drill rigs per year are utilized, development would take until 2052 and production-related activities would last approximately 40 years, until 2092. This would mean that the annual level of development activity would be reduced from what it is today (assumed 96 wells drilled per year). Under this scenario, fewer well pads would be active at any one time though that assumption may vary by Alternative. In any case, the progression of wellfield development across the PAPA landscape would probably be similar to that analyzed with 48 rigs per year for any of the Alternatives, but expected progressions would take longer.

There would be fewer noise sensitive receptors (greater sage-grouse leks) impacted at any given time because there would be fewer rig locations within each Alternative's core area at any one time. The slower pace of development would result in decreased production simultaneously with development and would probably not result in a spike of traffic compared to expected levels associated with 48 drilling rigs operating, particularly during winter. Declines in greater sage-grouse lek attendance would be expected to be less than predicted by drilling with 48 rigs per year, but would likely continue. Fewer numbers and subsequent locations of drilling rigs would allow for more functional wintering habitat for use by big game when compared to expected effects by of 48 rigs drilling year-round. This would result in less intense impacts to wildlife than those expected by year-round development with 48 rigs, but effects to wildlife would most likely exceed those observed through 2006. Effects would last over a longer period of time than development with 48 rigs per year. Also, impacts anticipated during the production phase would likely last though 2092.

If 60 drill rigs are utilized, development would take 15 years until 2021 and production-related activities would last approximately 40 years, though 2061. This is a considerable increase in the level of annual development from what it is today because an average of 293 wells would be drilled in each of the 15 years. More well pads would be active at any one time. The progression of wellfield development across the PAPA landscape would probably be similar to that analyzed with 48 rigs per year for any of the Alternatives, but expected progressions would advance relatively quickly.

Because the drilling rigs would occupy more places at any one time, there would be more noise sensitive receptors impacted at any given time. The increase in the pace of development would result in a spike in production-related traffic and this would correlate to a spike in the number of production-related vehicle trips compared to expected levels with 48 rig operating year-round. The decline in greater sage-grouse lek attendance would be expected to accelerate. More numbers and subsequent locations of drilling rigs would result in less functional wintering habitat for use by big game when compared to expected effects by 48 rigs drilling year-round. The increase in the traffic would result in more vehicle trips on roads, and likely cause mule deer to further avoid roads. This would result in more intense impacts compared to development with 48 rigs per year but development-related impacts would last for a shorter period of time. Impacts anticipated during the production phase would likely last though 2061.

## **APPENDIX 4**

### **BLM's Practices and Restrictions for the Pinedale Anticline Project Area**

## **BLM's Practices and Restrictions for the Pinedale Anticline Project Area**

These Practices and Restrictions for the Pinedale Anticline Project Area are available for application to APDs and right-of-ways during the site-specific review, where economically and technically feasible. This appendix is not an exhaustive list of all the restrictions BLM may impose on operations to reduce or eliminate impacts. These are subject to modification through adaptive management and are also subject to exception as outlined in the BLM RMP (BLM, 1988b) and Appendix A-6 of the PAPA ROD (BLM, 2000b).

Surveys listed in this Appendix would be used to determine resource absence or presence. The result of these surveys would be used to make decisions on pad placement once a pad has been approved at the Annual Planning Meeting. Ongoing annual monitoring would be used to determine whether additional clearances would be required.

### **General Requirements**

Proposed project development would require the appropriate level of environmental review in accordance with applicable federal, state, and local regulations.

Removal and disturbance of vegetation would be kept to a minimum through construction site management (e.g., using previously disturbed areas and existing easements, limiting equipment/materials storage yard and staging area size, etc.).

Where necessary, areas to be disturbed would require inventories or special studies to determine the extent of site-specific impacts and appropriate mitigation. Operators would be required to complete inventories or short-term special studies under guidelines provided by the BLM or as developed through the AM planning process.

There would be no well location or production facility surface occupancy within 0.25 miles of an occupied dwelling to prevent damage to human health and safety and/or other resources. Any surface use or occupancy within such special areas would be strictly controlled or, if absolutely necessary, prohibited.

No surface disturbance is recommended on slopes in excess of 25 percent unless erosion controls can be ensured and adequate revegetation is expected. Engineering proposals and revegetation and restoration plans would be required in these areas.

Unnecessary topographic alterations would be mitigated by avoiding, where possible, steep slopes, rugged topography, and perennial and ephemeral/intermittent drainages, and by minimizing the area disturbed. Alternative methods of construction in order to minimize environmental impacts may also be used.

### **Project Siting and Operation**

In conformance with Onshore Oil and Gas Order No. 1, Operators would prepare and submit individual comprehensive drill site design plans for BLM approval. These plans would show the drill location layout over the existing topography, dimension of the location, volumes and cross sections of cut and fill, location and dimensions of reserve

pits, existing drainage patterns, and access road egress and ingress. Plans would be submitted and approved prior to initiation of construction.

Prior to the onset of drilling, a "stock tight" fence would be installed on three sides of the reserve pit. This fence would be woven wire at least 28 inches high and within 4 inches of ground surface with two strands of barbed wire above the woven wire with 10-inch spacing. The fence corners would be double H-brace panels constructed with treated wood corner posts or steel pipe posts of at least 4-inch outside diameter (see Gold Book pgs 16-18). The corner brace posts would securely set a minimum of 30 inches in the ground. Metal T-posts are not allowed for corner panel construction, but may be used between corner panels. The fourth side of the reserve pit would be fenced after the drilling rig moves off the location. The fence would be located a maximum of 5 feet from the edge of the reserve pit. The double H-braces would be used on all corners of the pit area. The Operator would implement measures to prevent wildlife and livestock from entering the reserve area during drilling and well completion operations before the fourth side of the fence has been constructed.

Due to the location of the PAPA within the Colorado River Basin, all reserve pits must be lined. Reserve pit liners must have a mullen burst strength that is equal to or exceeds 300 pounds, a puncture strength that is equal to or exceeds 160 pounds, and grab tensile strengths that are equal to or exceed 150 pounds. There would be verified test results conducted according to ASTM test standards. The liner must be totally resistant to deterioration by hydrocarbons.

Liners must be installed over smooth fill subgrade which is free of pockets, loose rocks, or other materials which could damage the liner. Sand, sifted dirt, or bentonite are suggested.

Reserve pit slope would not exceed 1:1.

Procedures for use of oil-based mud should be environmentally acceptable.

All oil-based mud drilling operations would be completed through a closed mud system and all oil-based mud would be contained in the closed system.

The closed drilling system would be equipped with appropriate drip pans, liners and catchments under probable leak sources as needed to prevent the oil-based drilling mud and cuttings from reaching the reserve pit and/or ground surface of the drill pad.

Any cuttings dropped or mud spilled would be immediately cleaned up and placed in the approved containment device. All spills in excess of one barrel outside the containment devices would be reported to the BLM within 8 hours.

All BPO equipment, and all elastomers in the mud system would be suitable for oil based mud.

Well control training of all crews on rigs utilizing oil-based muds would include coverage of the additional hazards associated with oil-based muds.

The Operator would exercise extreme caution to avoid discharging oil-based drilling mud into the reserve pit. Should an event occur where it is necessary for oil-based mud to be

discharged to the reserve pit, the Operator would immediately initiate the following actions:

- The reserve pit would be secured to prevent birds and other wildlife from getting into the oil contaminated cuttings, fluids, and mud.
- The Operator would submit a plan to the BLM-PFO describing how the contaminated pit would be managed (i.e., would the contaminated material/fluids be treated in place, and if so by what method; or would the contaminants be removed to a WDEQ-approved disposal facility).

Submit a Sundry Notice describing how the oil contaminated drill cuttings would be treated to assure the oil stays contained in the cuttings and where the cuttings would be ultimately be stored (i.e., buried in the flare pit, buried in a separate "on-location" pit, or removed to a WDEQ-approved disposal site. Any on location disposal sites for the oil contaminated drill would be lined with a 12 mil or stronger impervious liner compatible with oils. A liner meeting this specification would also be placed under any temporary storage area for the oil contaminated cuttings.

Prior to skidding or moving the drill rig to another well or well pad, the pumps, pump lines and tanks would be cleaned to insure that **NO** oil-based mud is in the system during surface drilling operations of the new well.

Install and maintain siphons, catchments, and absorbent pads to keep hydrocarbons produced by the drill rig from entering the reserve pit. Ensure that hydrocarbons and contaminated pads are disposed of in accordance with WDEQ requirements.

If drilling fluids are transferred from this well to the next well in the drilling plan, then the fluids would be tested at the well logging stage of drilling operations using WDEQ Guideline 8 parameters. This water analysis standard is incorporated in a packet submitted by Western Environmental Services and Testing Inc. as part of their water analysis packages. Any other company doing water testing would also have to test for the elements listed in the WDEQ Guideline 8 parameters.

Operators would construct reserve pits with 2 feet of freeboard in cut areas or in compacted and stabilized fill. Reserve pits would not be located in areas where groundwater is less than 50 feet from the surface. A closed system would be required if water shows in the rat or mouse hole.

Produced water from oil and gas operations would be disposed of in accordance with the requirements of Onshore Oil and Gas Order #7.

Any pits with harmful fluids in them would be maintained in a manner that would prevent migratory bird mortality.

Any drilling fluids pit that shows indications of containing hazardous wastes would be tested for the Toxicity Characteristic Leaching Procedure constituents. If analysis proves positive, the fluids would be disposed of in an approved manner. The cost of the testing and disposal would be borne by the potentially responsible party.

A controlled surface use stipulation would be applied for activities within 0.25 mile or the visual horizon (whichever is closer) of the Wilderness Study Area (WSA) boundary. Actions within or adjacent to the WSAs would be evaluated on a case-by-case basis to determine if appropriate mitigation would be necessary. According to the Pinedale Revised RMP, there are two WSAs in the Pinedale Planning Area, the Scab Creek WSA on the east side of the Wind River Range and the Lake Mountain WSA just north of Lincoln County. Therefore, at this time, this requirement is not known to apply to the PAPA.

Wells, pipelines, and ancillary facilities would be designed and constructed such that they would not be damaged by moderate earthquakes. Any facilities defined as critical according to the Uniform Building Code would be constructed in accordance with applicable Uniform Building Code Standards for Seismic Risk Zone 2B.

Before conducting any reserve pit evaporation, by means other than natural evaporation, the Operator would submit a Sundry Notice for Authorized Officer approval. The Sundry Notice would provide a detailed description of the drying method. The Operator is also required to obtain authorization from the WOGCC for pit fluid treatment by means other than natural evaporation.

Sewage disposal facilities would be in accordance with state and local regulations.

Trash would be contained in a portable covered trash cage. The trash cage would be emptied in a WDEQ approved sanitary landfill. BLM prohibits littering.

Slope, grade, and other construction control stakes (e.g., exterior boundary centerline, etc.) would be placed, as necessary, to ensure construction in accordance with the surface use plan. The cut and fill slopes and spoil storage areas would be marked with a stake and/or lath at a minimum of 50-foot intervals. The tops of the stakes or laths would be painted or flagged in a distinctive color. All boundary stakes and/or laths would be maintained in place until final construction cleanup is completed. If stakes are disturbed, they would be replaced before proceeding with construction.

Drilling, well completion, and workover lights would be shrouded and directed on to the drilling platform and/or well pad, to the extent allowed by safety requirements, so that lights/glare are not directed away from the well pad.

The Operator would submit to the BLM Authorized Officer within 30 days of pad construction a digital as-built file of the following: the perimeter of the pad measured at the base of fill slopes and at the head of cut slopes including all associated soil pile locations, and the centerline of the access road. Where possible, the Operator would also submit to the BLM Authorized Officer within 30 days of drilling, a digital file of the surface location of the well head(s). The digital depiction would be in one of the following file formats: shapefile format (\*.shp), geodatabase (\*.gdb), or AutoCADD (\*.dwg), and should come with defined projections in NAD83 UTM Zone 12 N. The Operator may be required to notify the BLM via a website no earlier than 15 days and no later than 3 working days prior to commencement of the well pad or access road construction activities. Notification would also be made via the same website at least 24 hours before well spudding and a written sundry notice of the well spud must be submitted within 5 working days.

Construction under adverse conditions may require additional mitigation measures.

### **Soil, Erosion, and Sediment Control**

Prudent use of erosion control measures, including diversion terraces, riprap, matting, temporary sediment traps, and water bars would be employed as necessary. These erosion control measures would be used as appropriate to control surface runoff generated at well locations. The type and location of sediment control structure, including construction methods, would be described in APD and ROW plans. If necessary, to reduce suspended sediment loads and remove potential contaminants, Operators may treat diverted water in detention ponds prior to release to meet applicable state or federal standards.

Best Management Practices (BMP's) would be required to control sediment from all construction sites. Because of concerns regarding potential sediment impacts to the New Fork and Green rivers, BLM would require Operators to provide more detailed plans, with their APD and/or right-of-way application, for erosion control, revegetation, and restoration on sites within 1 mile of the Green and New Fork rivers. These plans would be required prior to initiating any construction activities.

Before a surface disturbing activity is authorized, topsoil depth would be determined. The amount of topsoil to be removed, along with topsoil placement areas, would be specified in the authorization. The uniform distribution of topsoil over the area to be reclaimed would be required, unless conditions warrant a varying depth. On large surface-disturbing projects (e.g., gas processing plants) topsoil would be stockpiled and seeded to reduce erosion. Where feasible, topsoil stockpiles would be designed to maximize surface area to reduce impacts to soil microorganisms. Stockpiles remaining less than 2 years are best for soil micro-organism survival and native seed viability.

Emphasis would be placed on the reduction of soil erosion and sediment into the Green River Basin watershed. Of particular importance would be those areas with saline soils or those areas with highly erodible soils. Critical erosion condition areas would continue to be identified during soil surveys, monitoring, site specific project analysis, and activity plan development for the purpose of avoidance and special management.

Operators would avoid adverse impacts to soils by:

- minimizing disturbance, avoiding construction with frozen soil material,
- avoiding areas with high erosion potential (e.g., unstable soil, dunal areas, slopes greater than 25%, floodplains), where possible,
- salvaging and selectively handling topsoil from disturbed areas,
- adequately protecting stockpiled topsoil and replacing it on the surface during reclamation,
- leaving the soil intact (scalping only) during pipeline construction, where possible,
- using appropriate erosion and sedimentation control techniques including, but not limited to, diversion terraces, riprap, and matting,
- promptly revegetating disturbed areas using adapted species,
- applying temporary erosion control measures such as temporary vegetation cover,
- applying biodegradable mulch, netting, or soil stabilizers, and

- construction of barriers as appropriate in certain areas to minimize wind and water erosion and sedimentation prior to vegetation establishment.

Management of the soil resource would continue to be based upon the following: 1) Evaluation and interpretation of soils in relation to project design and development; 2) Identification and inventory of soils for baseline data; and 3) Identification and implementation of methods to reduce accelerated erosion.

Evaluation and interpretation involves identification of soil properties which would influence their use and recommendations for development while minimizing soil loss. Projects would be examined on a site-specific basis, evaluating the potential for soil loss and the compatibility of soil properties with project design. Stipulations and mitigating measures are provided on a case-by-case basis to ensure soil conservation and practical management. Projects requiring soil interpretations include: construction of linear right-of-way facilities (i.e., pipelines, roads, railroads, and power transmission lines); construction of water impoundments; rangeland manipulation through fire or mechanical treatments; construction of plant site facilities, pump stations, well pads and associated disturbances; and reclamation projects.

BLM would require each individual right-of-way, APD or other application to include a reclamation plan approved by the BLM. Each Master Development Plan for projects which cumulatively disturb more than 10 acres would be required to submit an Erosion, Revegetation and Restoration Plan (ERRP) consistent with BLM guidance. Prior to new disturbance, ERRP's would be approved by the BLM Authorized Officer. Operators would utilize existing disturbance where possible for field operations including but not limited to drilling, completions, and/or production operations. Each Operator would be required to supply in January and June of each year data indicative of well pad status including but not limited to new construction, expansion, and/or reclamation. Disturbance data submissions would be in conformance with the standards set forth in the Jonah Infill Record of Decision issued in March of 2006.

## **Roads**

The Operator would regularly maintain all lease roads in a safe, usable condition. A regular maintenance program would include, but not be limited to, blading, ditching, culvert installation, drainage installation, surfacing, and cattleguards, as needed. Design, construction, and maintenance of the road would be in compliance with the standards contained in BLM Manual, Section 9113 (Roads), and in the latest version of the "Gold Book", Oil and Gas Surface Operating Standards for Oil and Gas Exploration and Development.

At the discretion of the BLM Authorized Officer, road construction may be required to be monitored by a qualified individual agreed to by the BLM Authorized Officer and the Operator. A certified civil engineer is to submit a statement that the road was built as designed within 15 days after the road has been constructed. Compaction of the subgrade with water and heavy equipment to a density higher than the surrounding subsurface is required during construction.

Project-related travel would be limited to only that necessary for efficient project operation during periods when soils are saturated and excessive rutting could occur.

Roads would be constructed as described in BLM Manual 9113. New main artery roads would be designed to reduce sediment, salt, and phosphate loading to the Green and New Fork rivers. Where necessary, running surfaces of the roads would be graveled if the base does not already contain sufficient aggregate.

Where deemed necessary and effective by the BLM Authorized Officer, locked gates would be installed on oil field roads (with structures added to prevent drive-arounds) to reduce traffic and protect other resources (e.g., wildlife, cultural resources, etc.) from impacts caused by increased vehicle traffic and human presence. The need and location of locked gates would be determined during the transportation planning process. The selective use of locked gates, where practicable, could be used to protect any significant cultural sites found during inventories. This approach is more commonly used as a seasonal restriction to protect wildlife during winter months, but some applications may also present themselves from a cultural resources standpoint.

To control or reduce sediment from roads, guidance involving proper road placement and buffer strips to stream channels, graveling, proper drainage, seasonal closure, and in some cases, redesign or closure of old roads would be developed when necessary. Construction may also be prohibited during periods when soil material is saturated, frozen, or when watershed damage is likely to occur. BLM would require in-use roads to be redesigned or closed when unnecessary or undue environmental impacts (such as sedimentation) have not been alleviated through use of other mitigations and where the detrimental impacts of the existing road outweighs the impacts associated with new surface disturbance to rebuild the road.

Available topsoil would be stripped from all road corridors prior to commencement of construction activities and would be redistributed and reseeded on backslope areas of the borrow ditch after completion of road construction activities. Borrow ditches would be reseeded in the first appropriate season after initial disturbance.

On newly constructed roads and permanent roads, the placement of topsoil, seeding, and stabilization would be required on all cut and fill slopes unless conditions prohibit this (e.g., rock). No unnecessary side-casting of material (e.g., maintenance) on steep slopes would be allowed. Snow removal plans may be required so that snow removal does not adversely affect reclamation efforts or resources adjacent to the road.

Reclamation of abandoned roads would include requirements for reshaping, recontouring, resurfacing with topsoil, installation of water bars, and seeding on the contour. Road beds, well pads, and other compacted areas would be ripped to a depth of two feet on 1.5 foot centers to reduce compaction prior to spreading the topsoil across the disturbed area. Stripped vegetation would be spread over the disturbance for nutrient recycling, where practical. Fertilization or fencing of these disturbances would not normally be required. Additional erosion control measures (e.g., fiber matting) and road barriers to discourage travel may be required. As deemed necessary by the BLM Authorized Officer, graveled roads, well pads, and other sites would be stripped of usable gravel and hauled to new construction sites prior to ripping. The removal of structures such as bridges, culverts, cattleguards, and signs usually would be required.

Main artery roads, regardless of primary user, would be crowned, ditched, drained, and, if deemed appropriate by the BLM Authorized Officer, surfaced with gravel to reduce sediment, salt, and phosphate loading to the Green and/or New Fork Rivers.

Road closures may be implemented during crucial periods (e.g., wildlife winter periods, spring runoff, and calving and fawning seasons, saturated soil conditions).

Individual road design plans for new and/or improved roads would be submitted for approval as components of APDs or ROW permits. Plans must be approved prior to initiation of work. Operators would schedule a review of plans with sufficient time to obtain BLM approval prior to commencement of work.

Existing roads would be used to the maximum extent possible and upgraded as necessary.

Operators would comply with existing federal, state, and county requirements and restrictions to protect road networks and the traveling public.

All development activities along approved ROWs would be restricted to areas authorized in the approved ROW.

Roads and pipelines would be located adjacent to existing linear facilities wherever practical.

As deemed necessary by the BLM Authorized Officer, Operators and/or their contractors would post appropriate warning signs and require project vehicles to adhere to appropriate speed limits on project-required roads.

The application of produced water on roads for use in dust suppression activities would not be allowed unless total dissolved solids (TDS) are less than 400 mg/l (state standard for the Colorado River drainage) and the water does not contain hazardous material. No produced water would be allowed on roads in Sublette County without an approved permit issued by the WDEQ and authorization granted by the BLM.

### **Production Facilities**

All storage tank batteries, including drain sumps and sludge holdings at compressor facilities, installed on location and designed to contain any oil, glycol, produced water, or other fluid which may constitute a hazard to public health or safety, would be surrounded by a secondary means of containment for the entire contents of the largest single tank in use plus one foot of freeboard for precipitation or 110 percent of the capacity of the largest vessel. The appropriate containment and/or diversionary structures or equipment, including walls and floor, to prevent discharged fluid from reaching ground, surface, or navigable waters, would be impervious to any oil, glycol, produced water, or other fluid for 72 hours and would be constructed so that any discharge from a primary containment system, such as a tank or pipe, would not drain, infiltrate, or otherwise escape to ground, surface, or navigable waters before cleanup is completed.

Treaters, dehydrators and other production facilities installed on location, that have the potential to leak or spill oil, glycol, produced water, or other fluid which may constitute a hazard to public health or safety, would be placed on or within appropriate containment and/or diversionary structure to prevent spilled or leaking fluid from reaching ground, surface, or navigable waters. The appropriate containment and/or diversionary structure would be sufficiently impervious to oil, glycol, produced water, or other fluid and would

be installed so that any spill or leakage, would not drain, infiltrate, or otherwise escape to ground, surface, or navigable waters before cleanup is completed.

All above ground permanent structures (permanent means on-site for longer than 90 days) not subject to safety requirements would be painted by the Operator to blend with the natural color of the landscape. New production facilities would be painted a non-contrasting color which is harmonious with the surrounding landscape as specified and approved by the BLM on a case-specific basis.

Stream sediment, phosphate, and salinity load would be reduced where possible. In areas where ground water exists 50 feet or less from the surface (WOGCC), produced water from oil and gas operations would be disposed of in an approved closed storage system or by other acceptable means complying with Onshore Order #7.

Where depth to groundwater is less than 100 feet and soil permeability is more than 0.1 foot/day, plants, mills, or associated tailings ponds and sewage lagoons would not be allowed.

Proper containment of oil and produced water in tanks, drilling fluids in reserve pits, as well as locating staging areas for storage of equipment away from drainages would prevent potential contaminants from entering surface waters.

All new production facilities construction which has open-vent exhaust stacks would be equipped to prevent bird and bat entry or perching on the stack.

A sundry notice must be submitted and approved prior to any pit closures or reclamation work.

In the event that any hydrocarbon material is released into the reserve or production pits, it would be removed within seven (7) days of the discharge event.

All secondary containment structures specifically used for methanol containment would be designed so as to prevent bird, animal, or livestock entry.

## **Pipelines**

Channel crossings by pipelines would be constructed so that the pipe is buried at a depth sufficient to ensure the pipeline does not become exposed as dictated by site specific conditions.

Channel crossings by roads and pipelines would be constructed perpendicular to flow. Streams/channels crossed by roads would have culverts installed at all appropriate locations as specified in the BLM Manual 9112-Bridges and Major Culverts (BLM 1990) and Manual 9113-Roads (BLM 1985) Streams would be crossed perpendicular to flow, where possible, and all stream crossing structures would be designed to carry the 25-year discharge event or other capacities as directed by the BLM.

Operators or pipeline contractors would comply with state and federal regulations for water discharged into an established drainage channel. The rate of discharge would not exceed the capacity of the channel to convey the increased flow. Waters that do not meet applicable state or federal standards would be evaporated, treated, or disposed of

at an approved disposal facility. The disposal of all water (hydrostatic test water, stormwater, produced water) would be done in conformance with WDEQ-Water Quality Division (WQD), BLM Onshore Oil and Gas Order No. 7, and WOGCC rules and regulations.

Wetland areas would be crossed during dry conditions (i.e., late summer, fall, or dry winters); winter construction activities would occur only prior to soil freezing or after soils have thawed.

On ditches exceeding 24 inches in width, 6 to 12 inches of surface soil would be salvaged where possible on the entire right-of-way. When pipelines and communication lines are buried, there would be at least 30 inches of backfill on top of the pipe. Backfill should not extend above the original ground level after the fill has settled. Guides for construction and water bar placement are found in the most current version of "Surface Operating Standards for Oil and Gas Exploration and Development".. Bladed surface materials would be re-spread upon the cleared route once construction is completed. Disturbed areas that have been reclaimed may need to be fenced when the route is near livestock watering areas.

Pipeline ROWs would be located to minimize soil disturbance. Mitigation would include locating pipeline ROWs adjacent to access roads to minimize ROW disturbance widths, or routing pipeline ROWs directly to minimize disturbance lengths.

Existing crowned and ditched roads would be used for access where possible to minimize surface disturbances. Clearing of pipeline and communication line rights-of-way would be accomplished with the least degree of disturbance to topsoil. Where topsoil removal is necessary, it would be stockpiled (wind-rowed) and re-spread over the disturbance after construction and backfilling are completed. Vegetation removed from the right-of-way would also be required to be re-spread to provide protection, nutrient recycling, and a seed source.

Temporary disturbances which do not require major excavation (e.g., small pipelines and communication lines) may be stripped of vegetation to ground level using mechanical treatment, leaving topsoil intact and root mass relatively undisturbed.

Trees, shrubs, and ground cover (not to be cleared from rights-of-way) would require protection from construction damage. Backfilling to preconstruction condition (in a similar sequence and density) would be required. The restoration of normal surface drainage would also be required.

To promote soil stability, the compaction of backfill over the trench would be required (not to extend above the original ground level after the fill has settled). Wheel or other method of compacting the pipeline trench backfill would be required at two levels to reduce trench settling and water channeling. Once after 3 feet of fill has been replaced and once within 6-12 inches of the surface. Water bars, mulching, and terracing would be required, as needed, to minimize erosion. In-stream protection structures (e.g., drop structures) may be required in drainages crossed by a pipeline to prevent erosion. The fencing of linear disturbances near livestock watering areas may be required.

The Operator, grantee, or lessee would be responsible for the control of all noxious weed infestations on surface disturbances. Prior to any treatment, the Operator,

grantee, or lessee would be responsible for submission of Pesticide Use Proposals and subsequent Pesticide Use Reports. Control measures would adhere to those allowed in the Final Vegetation Treatments Using Herbicides on BLM in 17 Western States Programmatic EIS (June 2007) and ROD (September 2007), Rock Springs District Noxious Weed Control EA (USDI 1982a) or the Regional Northwest Area Noxious Weed Control Program EIS (USDI 1987). Herbicide approvals and treatments would be monitored by the BLM Authorized Officer. Aerial application of chemicals would be prohibited within 1/4 mile of special status plant locations, and hand application would be prohibited within 500 feet.

Truck traffic would not be allowed under conditions where the total volume of traffic creates ruts of 3 inches or greater on roads that are not graveled or otherwise approved for all season use.

Crossings of ephemeral, intermittent, and perennial streams associated with road and utility line construction would generally be restricted until after spring runoff and normal flows are established.

### **Reclamation**

BLM would require each individual right-of-way, APD or other application to include a reclamation plan approved by the BLM

#### **Site Stabilization:**

1. All bare ground on a well pad that does not have active development (drilling, completion, and construction) and is not required for production activities would have at least 75 percent protective cover that may include but not be limited to organic mulch, herbaceous vegetation, jute matting, or other erosion-preventative fabric.
2. During the period when an existing well pad is not being fully developed, there would be no sediment discharge from the existing pad. Operators would modify all existing well pads to approach zero sediment discharge for a 25-year storm or snowmelt event within 1 year of following authorization by BLM in the SEIS ROD.
3. Access road(s) leading to the temporarily stabilized well pad would have protective cover to the same levels required on the well pad.

Disturbed channel beds would be reshaped to their approximate original configuration.

Streams, wetlands, and riparian areas disturbed during project construction would be restored to as near pre-project conditions as practical, and if impermeable soils contributed to wetland formation, soils would be compacted to reestablish impermeability.

Wetland topsoil would be selectively handled.

Areas would be recontoured and BLM-approved species would be used for reclamation. Reclamation activities would begin on disturbed wetland areas immediately after completion of project activities.

Upon completion of construction and/or production activities, Operators would restore the topography to near pre-existing contours at well sites, access roads, pipelines, and other facility sites.

All roads on federal lands not required for routine operation and maintenance of producing wells, ancillary facilities, livestock grazing administration, or necessary recreation access would be reclaimed as directed by the BLM. These roads would be permanently blocked, recontoured, reclaimed, and revegetated by the Operators, as would disturbed areas associated with permanently plugged and abandoned wells.

Disturbances should be reclaimed or managed to approach zero sediment discharge. All excavations and pits should be closed by backfilling and contouring to conform to surrounding terrain. On well pads and larger locations, the surface use plan would include objectives for successful reclamation including: soil stabilization, plant community composition, and desired vegetation density and diversity.

On producing locations, Operators would be required to reduce slopes to original contours (not to exceed 3:1 slopes). Areas not used for production purposes would be backfilled and blended into the surrounding terrain, reseeded, and erosion control measures installed. Erosion control measures would be required after slope reduction. Facilities would be required to approach zero runoff from the location to avoid contamination and water quality degradation downstream. Mulching, erosion control measures, and fertilization may be required to achieve acceptable stabilization.

Abandoned sites must be satisfactorily rehabilitated in accordance with a plan approved by the BLM. Soil samples may be analyzed to determine reclamation potential, appropriate reseeding species, and nutrient deficits. Tests may include: pH, mechanical analysis, electrical conductivity, and sodium content. Terraces or elongated water breaks would be constructed after slope reduction.

Current BLM policy recognizes that there may be more than one correct way to achieve successful reclamation, and a variety of methods may be appropriate to the varying circumstances. BLM would continue to allow applicants to use their own expertise in recommending and implementing construction and reclamation projects. These allowances still hold the applicant responsible for final reclamation standards of performance.

All reclamation is expected to 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 (3 to 5 years). Only areas needed for construction would be allowed to be disturbed.

On all areas to be reclaimed, seed mixtures would be required to be site-specific, composed of native species, and would be required to include species promoting soil stability. A pre-disturbance species composition list must be developed for each site if the project encompasses an area where there are several different plant communities present. Livestock palatability and wildlife habitat needs would be given consideration in seed mix formulation. BLM guidance for native seed use is BLM Manual 1745 (Introduction, Transplant, Augmentation, and Reestablishment of Fish, Wildlife, and Plants), and Executive Order No. 11987 (Exotic Organisms).

Interseeding, secondary seeding, or staggered seeding may be required to accomplish revegetation objectives. During rehabilitation or areas in important wildlife habitat, provision would be made for the establishment of native browse and form species, if determined to be beneficial for the habitat affected. Follow-up seeding or corrective erosion control measures may be required on areas of surface disturbance which experience reclamation failure.

Any mulch and mineral material (sand and gravel) used would be certified weed free and free from mold or fungi. Mulch may include native hay, small grain straw, wood fiber, live mulch, cotton, jute, synthetic netting, and rock. Straw mulch should contain fibers long enough to facilitate crimping and provide the greatest cover.

Operators would monitor noxious weed occurrence on the project area and implement a noxious weed control program in cooperation with the BLM and Sublette County to ensure noxious weed invasion does not become a problem. Weed-free certification by county extension agents would be required for grain or straw used for mulching revegetated areas. Gravel and other surfacing materials used for the project would be reasonably free of noxious weeds.

Herbicide applications would be kept at least 500 feet from known SSPS populations or other distance deemed safe by the BLM Authorized Officer.

### **Wetlands, Riparian Areas, and Flood Plains**

All surface disturbance, permanent facilities, etc., would remain a minimum of 500 feet away from the edge of surface waters, riparian areas, wetlands, and 100-year floodplains unless it is determined through site specific analysis, approved in writing by the BLM Authorized Officer, that there is no practicable alternative to the proposed action. If such a circumstance exists, then all practicable measures to mitigate possible harm to these areas must be employed. These mitigating measures would be determined on a case-by-case basis and may include, but are not limited to, diking, lining, screening, mulching, terracing, and diversions.

Floodplains by their very nature are unsafe locations for permanent structures. With an inundation of flood waters, soils disturbed by construction could experience a rate of erosion greater than undisturbed sites. There is an additional concern over the potential for flood waters to aid in the dispersal of hazardous materials that may be stored within such structures. Therefore, federally-managed 100-year floodplains would have no permanent structures constructed within their boundaries unless it can be demonstrated on a case-by-case basis that there is no physically practical alternative. In cases where floodplain construction is approved, additional constraints could be applied.

Floodplain Executive Order 11988 (Section 2.a.(2)) states in summary that "...if the HEAD OF THE AGENCY finds that the only practicable alternative consistent with the law and the policy set forth in the Order requires siting in a floodplain, the agency would, prior to taking action, 1) design or modify its action in order to minimize potential harm...and 2) prepare and circulate a notice containing an explanation of why the action proposed is to be located in the floodplain.

Floodplain Executive Order 11988 (Section 3), in reference to federal real property and facilities states that agencies would, if facilities are to be located in a floodplain (i.e., no

practicable alternative), apply flood protection measures to new construction or rehabilitate existing structures, elevate structures rather than fill the land, provide flood height potential markings on facilities to be used by the public, and when the property is proposed for lease, easement, right of way, or disposal, the agency has to attach restriction on uses in the conveyance, etc., or withhold from such conveyance.

Any disturbances to wetlands and/or waters of the U.S. would be coordinated with the COE, and 404 permits would be secured as necessary prior to disturbance.

Operators would evaluate all project facility sites for occurrence of waters of the U.S., special aquatic sites, and wetlands, per COE requirements. All project activities would be located outside of these sensitive areas, where practical.

Where disturbance of wetlands, riparian areas, streams, and ephemeral/intermittent stream channels cannot be avoided, COE Section 404 permits would be obtained by the Operator as necessary.

### **Air Quality**

In accordance with Wyoming Air Quality Standards and Regulations Chapter 3, Section 2(f), the emission of fugitive dust would be limited by all persons handling, transporting, or storing any material to prevent unnecessary amounts of particulate matter from becoming airborne to the extent that ambient air standards described in these regulations are exceeded.

Necessary air quality permits to construct, test, and operate facilities would be obtained from the WDEQ-Air Quality Division. All internal combustion equipment would be kept in good working order.

Operators would comply with all applicable local, state, tribal, and federal air quality laws, statutes, regulations, standards, and implementation plans, including Wyoming Ambient Air Quality Standards (WAAQS) and National Ambient Air Quality Standards (NAAQS).

To avoid the incremental risk of exposure to carcinogenic toxins from producing wells, no well would be located closer than 0.25 mile from a dwelling or residence. At 0.25 mile, the incremental risk increase for the most likely exposure scenario is below the designated threshold level of less than 1 additional person per million.

To avoid incremental risk of exposure to carcinogenic toxins from compressor facilities, any compressor facility located closer than 4 miles to a dwelling or residence would require additional NEPA analysis prior to the final selection of the site and authorization to construct.

### **Recreation**

Operators would restrict off-road vehicle (ORV) activity by employees and contract workers to the immediate area of authorized activity or existing roads and trails.

**Grazing**

All range improvements (stock water tanks, pipelines, corrals, etc.) should be avoided by 500 feet unless no other alternative is available and impacts can be mitigated as per the BLM Authorized Officer.

**Groundwater and Surface Water**

Notice of any spill or leakage, as defined in BLM NTL 3A, would be immediately reported by the Operator to the Authorized Officer and other such federal and state officials (e.g., WDEQ) as required by law. Verbal notice would be given as soon as possible, but within 24 hours, and verbal notices would be confirmed in writing within 72 hours of any such occurrence. Any accidental soil contamination by spills of petroleum products or other hazardous materials would be cleaned up and the soil disposed of or rehabilitated according to WDEQ Solid Waste Guidelines (#2) for petroleum contaminated soils.

Operators would prepare Stormwater Pollution Prevention Plans (SWPPPs) for their respective areas of field development as required by WDEQ National Pollution Discharge Elimination System (NPDES) permit requirements.

Any industrial water wells and any tanks, pumps, hoses, pipes or other associated connections would include check valves, backflow preventers or other devices that secure the well against discharge of fluids into the well.

All fresh water used for the drilling of the surface casing must comply with all requirements concerning water quality as set forth by the WOGCC Regulations.

All water used in association with this project would be permitted through the Wyoming State Engineer's Office.

All water wells put to beneficial use, including produced water associated with this project, would be under the jurisdiction of the Wyoming State Engineer's Office.

**Cultural/Paleontological Resources**

If effects to paleontological values, objects of historic or scientific interest, are observed, the Operator would be required to immediately contact the BLM and the Operator would be required to cease any operations that would result in the destruction of or adverse impact to these values.

In areas of paleontological sensitivity, a determination would be made by the BLM as to whether a survey by a qualified paleontologist is necessary prior to the disturbance. In some cases, construction monitoring, project relocation, data recovery, or other mitigation would be required to ensure that significant paleontological resources are avoided or recovered during construction.

If paleontological resources are uncovered during surface-disturbing activities, Operators would suspend operations at the site that would further disturb such materials and immediately contact the BLM Authorizer Officer, who would arrange for a determination of significance, and, if necessary, recommend a recovery or avoidance plan. Mitigation

of impacts to paleontological resources would be on a case-by-case basis, and Operators would either avoid or protect paleontological resources.

Areas underlain by either the Wasatch or Green River formations have a high potential for containing vertebrate paleontological resources (fossils) and must be surveyed by a qualified paleontologist before surface disturbing activities would be authorized if determined appropriate by the BLM AO. Based on the results of the paleontological survey, additional monitoring and/or mitigation would be necessary. All major pipelines (12" and larger) would have paleontological open trench inspections and geologic research to resolve mapping issues identified in Chapter 3. Other actions, such as on-site project monitors by professional paleontologists while surface disturbing activities are occurring, and/or spot-checks of spoil piles, pits and trenches prior to backfilling would become more common and would be considered standard stipulations within the Blue Rim-Ross Butte Management Area.

Operators would follow the Section 106 compliance process prior to any surface-disturbing activity and would either avoid or protect cultural resource properties.

Operators would halt construction activities at the site of previously undetected cultural resources discovered during construction. The BLM would be notified immediately, and consultation with the Wyoming State Historic Preservation Office (SHPO) and, if necessary, the Advisory Council, would be initiated to determine proper mitigation measures pursuant to 36 CFR 800.11 or other treatment plans, programmatic agreements, or discovery plans that may direct such efforts. Construction would not resume until a Notice to Proceed is issued by the BLM.

In culturally sensitive soils, if cultural resources are located within frozen soils or sediments precluding the ability to adequately record or evaluate the find, construction work would cease and the site would be protected for the duration of frozen soil conditions. Following natural thaw, recordation, evaluation and recommendations concerning further management would be made to the BLM Authorized Officer, who would consult with affected parties. Construction work would be suspended until management of the threatened site has been finalized.

Should future work identify any traditional Native American religious or sacred sites, consultation among the BLM, the affected Native American group, the Wyoming SHPO and the project proponent would occur to resolve conflicts. This consultation would occur on a case-by-case basis, or in conformance with an approved Native American Concerns Agreement Document.

Operators should inform their employees, contractors and subcontractors about relevant federal regulations intended to protect archaeological and cultural resources. All personnel should be informed that collecting artifacts (including arrowheads) is a violation of federal law and that employees engaged in this activity may be subject to disciplinary action, which could include dismissal.

Equipment operators should be informed that a cultural resource could be found anywhere; and if they uncover a site during construction, surface disturbing activities at the site must be immediately halted and the BLM notified.

Historic trails would be avoided. Surface disturbing activities would avoid areas within 0.25 miles of a trail unless such disturbance would not be visible from the trail or would

occur in an existing visual intrusion area. Historic trails would not be used as haul roads. Placement of facilities outside 0.25 mile that are within view of the Lander Trail would be located to blend the site and facilities in with the background.

### **Hazardous Waste Disposal**

Operators would utilize WDEQ-approved portable sanitation facilities at drill sites; place warning signs near hazardous areas and along roadways; place dumpsters at each construction site to collect and store garbage and refuse; ensure that all refuse and garbage is transported to a State-approved sanitary landfill for disposal; and institute a Hazard Communication Program for its employees and require subcontractor programs in accordance with OSHA (29 CFR 1910.1200).

In accordance with 29 CFR 1910.1200, a Material Safety Data Sheet for every chemical or hazardous material brought on-site would be kept on file at the Operator's field office.

Chemical and hazardous materials would be inventoried and reported in accordance with the SARA Title III (40 CFR 335). If quantities exceeding 10,000 pounds or the threshold planning quantity are to be produced or stored, the appropriate Section 311 and 312 forms would be submitted at the required times to the State and County Emergency Management Coordinators and the local fire departments.

Any hazardous wastes, as defined by the Resource Conservation and Recovery Act of 1976 (RCRA), as amended, would be transported and/or disposed of in accordance with all applicable federal, state, and local regulations.

Owners or operators of onshore facilities (any facility of any kind, or drilling or workover rigs) that, due to their location, could reasonably be expected to discharge oil in harmful quantities (as defined in 40 CFR part 110 & 112.3), into or upon navigable waters of the United States or adjoining shorelines, would prepare a Spill Prevention Control and Countermeasure Plan (SPCC Plan) in accordance with 40 CFR 112.7. Owners or operators of drilling or workover rigs need not prepare a new SPCC Plan each time the facility is moved to a new site. The SPCC Plan may be a general plan, using good engineering practice (40 CFR 112.3 (a), (b), and (c)). Owners or operators of a facility for which an SPCC Plan is required would maintain a complete copy of the Plan at such facility if the facility is normally attended at least 8 hours per day, or at the nearest field office if the facility is not so attended (40 CFR 112.3(e)).

SPCC Plans would be implemented and adhered to in a manner such that any spill or accidental discharge of oil would be remediated. An orientation should be conducted by the Operators to ensure that project personnel are aware of the potential impacts that can result from accidental spills and that they know the appropriate recourse if a spill occurs. Where applicable and/or required by law, streams at pipeline crossings would be protected from contamination by pipeline shutoff valves or other systems capable of minimizing accidental discharge. If reserve pit leakage is detected, operations at the site would be curtailed, as directed by the BLM, until the leakage is corrected.

All natural gas wells would be cased and cemented to protect subsurface mineral and freshwater zones. Unproductive wells and wells that have completed their intended purpose would be properly abandoned and plugged using procedures identified by the Office of State Oil and Gas Supervisor, Rules and Regulations of WOGCC and the BLM.

## **Threatened and Endangered Species, Special Status Species, and Wildlife**

### T&E and Special Status Species

If while conducting operations, substantial unanticipated environmental effects to listed, proposed or candidate species are observed (whether effects are direct or indirect), formal consultation with U.S. Fish and Wildlife Service (USFWS) would be immediately initiated in addition to cessation of all such operations.

USFWS and WGFD consultation and coordination would be conducted for all mitigation activities relating to raptors and T&E species and their habitats, and all permits required for movement, removal, and/or establishment of raptor nests would be pursued if they meet USFWS migratory bird office requirements.

Surveys for T&E and candidate wildlife species would be implemented in areas of potential habitat by a qualified biologist prior to disturbance. Findings would be reviewed by the BLM prior to or as components of ROW applications and APD review processes. If T&E and/or candidate species are found in the area, consultation with the USFWS would be initiated, and construction activities would be curtailed until there is concurrence between BLM and USFWS, on what activities can be authorized.

Proposed construction sites in the development area would be examined prior to surface-disturbing activities to confirm the presence or absence of prairie dog colonies, where appropriate. Confirmation would be made of white-tailed prairie dog colony/complex size, burrow density, and any other data to indicate whether the criteria for black-footed ferret habitat, established in the USFWS guidelines, are present. If prairie dog colony/complex meets the USFWS criteria, a qualified biologist would locate all project components to avoid direct, indirect and cumulative impacts to the colony/complex. If this is not practical or possible, black-footed ferret surveys of the prairie dog colony/complex, where required by the USFWS, would be conducted in accordance with USFWS guidelines and requirements. The results of the survey would be provided to the USFWS in accordance with Section 7 of the ESA, as amended, and Interagency Cooperation Regulations (50 CFR § 402-June 3, 1986). If a black-footed ferret or its sign is found during the survey, the BLM Authorized Officer would stop all action on the application in hand. New roads and trails should not cross colonies.

A survey for black-footed ferret may be required prior to approval of construction activities.

The USFWS has determined that any withdrawal of water from the Colorado River System (surface or ground water) would jeopardize the endangered Colorado pikeminnow, humpback chub, bonytail, and razorback sucker. The USFWS Colorado River Endangered Fish Recovery Program requires a depletion fee be paid by the proponent to help support the recovery program. The fee is required for each acre-foot of water depletion where the depletion of water is in excess of 100 acre-feet from the Colorado River system.

Operators would finance site-specific surveys for special status plant species (SSPS) prior to any surface disturbance in areas determined by the BLM to contain potential habitat for such species (Directive USDI-BLM 6840). These surveys would be

completed by a qualified botanist as authorized by the BLM and this botanist would be subject to BLM's SSPS survey policy requirements. Data from these surveys would be provided to the BLM, and if any SSPS or habitats are found, BLM recommendations for avoidance or mitigation would be implemented.

### Migratory Birds

Bald eagles roost, perch, feed, and nest along the Green and New Fork rivers. To ensure continued protection of this species, no surface disturbing or human activities would be authorized between November 1 and April 1 within 1.0 mile of known bald eagle winter use areas. All surface-disturbing or human activity, including construction of roads, pipelines, well pads, drilling, completion, or workover operations, would be seasonally restricted from February 1 through August 15 within 1.0 mile of all active eagle nests. An active eagle nest is one that has been occupied once in the past 5 years.

Permanent (life of the project) and high profile structures such as well locations, roads, buildings, storage tanks, overhead power lines, etc., and other structures requiring repeated human presence would not be constructed within 825 feet (1,000 feet for ferruginous hawks; 2,600 feet for bald eagles) of occupied raptor nests. Wells that must be located closer than 2,600 feet (but would not be allowed closer than 2,000 feet) of a bald eagle nest would be out of the direct line of sight of the nest; would have no human activity at the well site from February 1 through August 15 except in the case of an emergency; and would locate production facilities off-site or at a central production facility location at a distance of 2,600 feet or more from the nest. In these cases the USFWS would be contacted to ensure compliance under the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act.

All surface-disturbing activity (e.g., road, pipeline, well pad construction, drilling, completion, workover operations) would be seasonally restricted from February 1 through July 31 within a 0.5-mi radius of all occupied raptor nests, except ferruginous hawk nests, for which the seasonal buffer would be 1.0 mi. The seasonal buffer distance and exclusion dates applicable may vary depending on such factors as the activity status of the nest, species involved, prey availability, natural topographic barriers, line-of-site distance(s), and other conflicting issues such as cultural values, steep slopes, etc.

Except for bald eagles which are discussed above, raptor nest surveys would be conducted for active nests within a 0.5- to 1.0-mile radius of proposed surface use or activity areas if such activities are proposed to be conducted between February 1 and July 31. An active raptor nest is defined as a nest that has been occupied within the past 3 years.

The buffer distance for raptors may vary depending upon the species involved, prey availability, natural topographic barriers, line-of-sight distances, and other conflicting issues such as cultural values, steep slopes, etc. Linear disturbances such as pipelines, seismic activity, etc., could be granted exceptions as long as they would not adversely affect the raptor(s).

Surface disturbing and disruptive activity would be prohibited within 0.5 mile of occupied burrowing owl nests from April 1 through August 15. Surveys may be required to determine nesting status.

For surface disturbing activities, surveys would be conducted within suitable plover habitat by a qualified biologist in accordance with USFWS 1999 guidelines (A copy of the guidelines may be obtained from the USFWS, BLM, or WGFD). Two types of surveys may be conducted. 1) surveys to determine the presence/absence of breeding plovers (i.e., displaying males and foraging adults), or 2) surveys to determine nest density.

If surface disturbing activity is requested to take place in mountain plover habitat between April 10 and July 10, presence / absence surveys are required. Survey results would determine when activities are proposed.

Surveys to determine presence/absence of the plover would be conducted between May 1 and June 15 through out the breeding range.

Visual observation of the area should be made within 0.25 mile of the proposed action to detect the presence of plovers.

A site must be surveyed for plover three times during the survey window, with each survey separated by at least 14 days.

Initiation of the project should occur as near to completion of the plover survey as possible (within 2 days for seismic exploration; a 14-day period may be appropriate for other projects).

If active plover nest is found in the survey area, the planned activity should be delayed 37 days, or one week post-hatching. If a brood of flightless chicks is observed, activities should be delayed at least 7 days.

Plover surveys would be conducted during early courtship and territorial establishment. Throughout the breeding range, this period extends from approximately mid-April through early July. However, the specific breeding period depends on latitude, elevation, and weather.

Plover surveys would be conducted between local sunrise and 10 a.m., and from 5:30 p.m. and sunset (periods of horizontal light to facilitate spotting the white breast of the adult plovers).

Drive transects within the project area to minimize early flushing. Flushing distances for mountain plovers may be within 3 meters (9 to 10 feet) for vehicles, but plovers often flush at 50 to 100 meters (164 to 328 feet) when approached by humans on foot.

Any pits with harmful fluids in them would be maintained in a manner that would prevent migratory bird mortality.

### Sage Grouse

Surface disturbance within 0.25 mile of an occupied greater sage-grouse lek would be avoided. Linear disturbances such as pipelines, seismic activity, etc., could be granted exceptions since they do not have long-term, continuous activity associated with them that could impact breeding success.

Permanent (life of the project), high profile structures such as buildings and storage tanks would not be constructed within 0.25 mile of an occupied greater sage-grouse lek.

In selecting a site for a compressor facility, a well pad or other permanent facility, the distance from the edge of a an occupied greater sage-grouse lek would be sufficient to result in a noise level increase from operating facilities no greater than 10 decibels (dBA) above background (i.e., 39 dBA background + 10 dBA = 49 dBA). Further restrictions may be required if the species is determined by the USFWS to be eligible for listing as either threatened or endangered pursuant to the Endangered Species Act. Monitoring would be required by BLM to determine which leks in the PAPA are occupied and which have been abandoned.

If existing information is not current, field evaluations for greater sage-grouse leks and/or nests would be conducted by a qualified biologist prior to the start of activities in potential greater sage-grouse habitat. These field evaluations for leks and/or nests would be conducted if project activities are planned in potential greater sage-grouse habitat between March 15 and July 15. BLM wildlife biologists would ensure that such surveys are conducted using proper survey methods.

Operators would be required to apply noise mitigation at well locations, as determined necessary by the BLM Authorized Officer, on a case-by-case basis.

### General Wildlife

Well locations and associated road and pipeline routes would be selected and designed to avoid disturbances to areas of high wildlife value (e.g., raptor nest sites, wetland areas).

Avoid activities and facilities that create barriers to the seasonal movements of big game and livestock.

Reserve, workover, and production pits potentially hazardous to wildlife would be adequately protected (e.g., fencing, netting) to prohibit wildlife access as directed by the BLM.

Wildlife-proof fencing would be utilized on reclaimed areas, in accordance with standards specified in BLM Fencing Handbook 1741-1, if it is determined that wildlife species are impeding successful vegetation establishment.

ROW fencing associated with this project would be kept to a minimum and, if necessary, fences would consist of four-strand barbed wire meeting WGFD approval and BLM Fencing Handbook 1741-1 standards for facilitating wildlife movement.

For all breeding birds observed, additional surveys would be conducted immediately prior to construction activities to search for active nest sites.

To avoid potentially significant noise impacts, compressor engines would be located 2,500 feet or more from a dwelling or residence and from sage-grouse leks.

### **Visual Resource Management**

Approval of well pad locations, new roads, buried pipelines, or other facilities within VRM Class II and III areas and any other visually sensitive area as determined by the BLM AO, would require the Operator to demonstrate to the BLM AO's satisfaction that the location and/or facilities have reasonably incorporated visual design considerations that would mitigate unnecessary visual impacts in all areas of the PAPA.

Within Visual Resource Management (VRM) Class II and III areas, during on-site reviews, the BLM and the Operator would evaluate potential disturbances and impacts to visual resources and identify appropriate mitigation. New roads would be designed so that they conform with the landscape, incorporating curves to eliminate distant, straight line impacts; every opportunity would be taken to reclaim existing road ROWs that are not used. Revegetation would be initiated as soon as possible after disturbance; pipeline ROWs would be located within existing ROWs whenever possible; and aboveground facilities not requiring safety coloration would be painted with appropriate nonreflective standard environmental colors (Carlsbad Canyon or Desert Brown, or other specified standard environmental color) specified by the BLM. Topographic screening, vegetation manipulation, project scheduling, and traffic control procedures would all be employed as deemed appropriate by the BLM to further reduce visual impacts.

Low profile tanks would be required wherever visual sensitivity is an issue and/or wherever deemed appropriate mitigation to help maintain the basic characteristics of the landscape. Unless excepted, BLM would allow only low profile tanks north of the New Fork River and within the Lander Trail viewshed.

Within Visual Resource Management (VRM) Class IV areas, the BLM and Operators would utilize existing topography to screen roads, pipeline corridors, drill rigs, wells, and production facilities from view, where practical. Operators would paint all aboveground production facilities with appropriate colors (e.g., Carlsbad Canyon or Desert Brown) specified by the BLM to blend with adjacent terrain, except for structures that require safety coloration in accordance with OSHA requirements.

One way to avoid visual impacts associated with construction of well pads, roads, and pipelines in visually sensitive areas is to avoid any surface disturbing activities, where practical, on the sensitive soils shown on Map 3.17-1 in the Final SEIS. Locating well pads on sensitive soils or slopes greater than 10 to 15 percent increases the total amount of disturbance because larger areas would be needed to accommodate the well pad, road or pipeline. Furthermore, disturbed sensitive soils could be difficult to reclaim because topsoil is limiting, effective moisture is low and erosion is high. The badland soils in the Blue Rim Area of the PAPA are unique landform features that provide character to the landscape and, if disturbed, could not be reclaimed to their original form. Well pads, roads and buried pipelines would avoid the sensitive soils shown on Map 3.17-1 in the Final SEIS.

Avoid the introduction of new, linear visual intrusions on the landscape. New roads and pipeline corridors, to the extent practicable, would follow contours and use topography as screening. New pipelines would be combined with existing or proposed roads and, wherever possible, new cross-county pipeline corridors would be avoided.

Any well pad developed in any area managed for visual resources, roads and well pads may need to be surfaced with materials that reduce visual contrast. For example, in the VRM Class II area near Pinedale, the subsoil material (Wasatch Formation) can be very light in color and thus contrasts with surrounding undisturbed areas. Mixing topsoil with gravel (1 inch deep) in highly visible areas would help to reduce contrast. Operators would be required to investigate the feasibility of applying this opportunity of surfacing roads and well pads with materials closer in color and texture to the surrounding landscape.

## **APPENDIX 5**

### **Transportation Plans**

## **Appendix 5A**

### **Alternative A – Transportation Plan**

## **Alternative A – Transportation Plan**

The Transportation Plan for Alternative A is the same as the Transportation Plan in the PAPA ROD (BLM, 2000b).

## **Appendix 5B**

### **Alternative B – Transportation Plan**

## Alternative B – Transportation Plan

Prepared by  
Ultra Resources, Inc.  
Shell Exploration & Production Company  
Questar Market Resources

### Purpose

Questar Market Resources (Questar), Shell Exploration & Production Company (Shell), and Ultra Resources, Inc. (Ultra), hereinafter collectively referred to as “Proponents”, propose this Transportation Plan to supplement the 2000 PAPA ROD Transportation Plan (TP 2000) as provided below.

The purpose of this plan is to incorporate measures that: 1) reduce surface use to maintain habitat function and minimize habitat fragmentation; 2) reduce human activity to lessen disturbance to wildlife and reduce impacts to community, county and state infrastructure; and, 3) reduce air emissions through consolidation of locations and associated development and production activities.

Proponents propose to accomplish these goals through reduction of the number of pads through multi-well pad development, directional drilling, and simultaneous operations; concentration of pad locations into three operation areas; reduction of rig moves on and off pads; use of liquids gathering systems and centralized facilities where feasible to reduce truck traffic and the number of production tanks and associated VOC's; management of traffic through busing and scheduling during seasonal stipulation periods; and the increased use of computer assisted operations (CAO) reducing trips and traffic during production. Proponents' proposal will also result in a decrease of the expected period for development in concentrated areas under seasonal restrictions by up to 50 percent.

### Scope

This plan applies to roads and the transportation of gas, condensate, or water via pipelines and as outlined in the TP 2000. The plan includes assumptions, mitigation measures, and guidelines. Relevant requirements for road construction or reconstruction and the development of agreements for surface use, rights-of-ways (ROW), and maintenance will be addressed and quantified in the Technical Support Document (TSD) submitted to BLM within 1 year of the release of the SEIS ROD and will be updated annually.

Pipelines / flowlines will be installed either within the road easement and / or within existing pipeline corridors to the extent feasible. Pipelines generally will be located adjacent to roads to reduce new surface disturbance. In instances where paralleling roads and lines lead to increased environmental and / or safety impacts, pipelines may be located along alternative routes. These alternative routes will be evaluated and sited to minimize environmental impacts.

Multi-well pads utilizing directional drilling may accommodate use of multiple drilling rigs operating year round as well as simultaneous drilling, completion, construction, and production operations. Concentrating operational activity into specific multi-section areas will lessen road development PAPA-wide during a given time period leaving large blocks of undeveloped acreage available to wildlife and livestock.

### Proponent Committed Measures

1. Proponents will use public and existing roads as much as possible to lessen new surface disturbance and habitat fragmentation. New road construction under the concentrated development, multi-well pad proposal would be reduced by at least 70% PAPA-wide as compared to non-concentrated, single-well pad development. Per section, this equates to up to 1.16 miles or about 12 acres (roadway, flowline easement).
2. When siting new roads, Proponents will work with the Bureau of Land Management (BLM) to ensure this is done in the most efficient and environmental effective way. Proponents will continue use and development of ROW Surface Use Plans.
3. Annual road planning, development, maintenance, and other issues and concerns will be incorporated into a Technical Support Document (TSD), as will detailed information (including maps) on existing roads/routes and natural obstacles. The TSD and associated maps, as well as proposed project activities; operator construction and maintenance responsibilities; and road-specific dust abatement, construction, and surfacing requirements, will be updated annually or as necessary and submitted to the BLM.
4. Proponents will not move drill rigs to and from well pads in crucial big game winter range after November 15 and before May 1 outside of the agreed upon concentrated activity areas. Rigs within the concentrated areas will normally move onto a pad and stay until all scheduled wells for that rig are drilled as feasible. Delineation wells as discussed in Chapter 2 will be determined in the annual plans in consultation with BLM and WG&FD.
5. Proponents will deliver and store equipment and bulk supplies on or near the well pads prior to seasonal stipulation periods to the maximum extent feasible to reduce traffic and human disturbance on wildlife.
6. Proponents are committed to utilizing liquids gathering systems and centralized facilities where feasible. After the construction phase and where appropriate, liquids gathering systems and centralized facilities will significantly reduce tanker truck traffic by up to 475 truck trips per day during peak production.
7. Between November 15 and April 30 in a given year in crucial big game winter range and sage grouse winter concentration areas, Proponents will make reasonable effort to bus rig crews from appropriate vehicle staging areas to minimize commuting traffic. Proponents will not tolerate workers who miss the bus and drive personal vehicles to the pads during this time period.
8. Proponents will each coordinate the transportation routes and scheduling of service contractors to minimize the amount of traffic associated with year round development.
9. Proponents will fund hosted workers to the BLM Pinedale Office to operate an access station from November 15 through April 30 each year to monitor essential traffic to the pads. Proponents will determine in consultation with BLM how long the access station will be in place. Hosted workers would report to the BLM Pinedale Field Office. Traffic

- data would be compiled to differentiate between essential activity and non-essential traffic. Proponents would use this information to adjust their practices, if needed, to reduce traffic. The access station would be open 24 hours a day, seven days a week. Proponents would fund signage appropriate to inform the public and industry of the access station and travel restrictions.
10. Where feasible, Proponents will utilize computer assisted remote monitoring of producing wells to reduce the need for daily site visits during the production phase.
  11. Proponents will reclaim any road not required for routine operation and maintenance of producing wells or ancillary facilities as directed by the BLM, State Land Board, or private landowner. These roads would be blocked, recontoured, reclaimed, and revegetated by Proponents, as would disturbed areas associated with permanently abandoned pads.
  12. As part of normal operational winter maintenance, Proponents will plow roads the minimum amount necessary to allow safe navigation. Plows would provide breaks in snow piled berms along the road margins (knockouts) in order to allow free movement of wildlife across roads.
  13. Proponents will advise personally and/or by mail to all project-related personnel and vendors traffic activity restrictions and rules of conduct while on the PAPA. These will include, but are not limited to:
    - a. No stopping to observe wildlife
    - b. No harassment of wildlife
    - c. No firearms
    - d. No pets outside a vehicle
  14. Proponents will provide a laminated sheet entitled "Code of Conduct during Seasonal Stipulation Periods" that will be required to be carried in each company vehicle. The sheets will also provide instruction on the types of human activity that create stress in wildlife.
  15. Proponents would observe speed limits within the PAPA and will encourage service contractors and vendors to do the same. This will be included in the "Code of Conduct during Seasonal Stipulation Periods".
  16. Proponents will implement voluntary fugitive dust control measures on primary access roads and heavily used resource roads.
  17. Proponents will instruct personnel on behaviors appropriate for minimizing disturbance to wildlife consistent with current documents on such conduct and developed in consultation with BLM, WG&FD or other wildlife experts.
  18. In consultation with BLM and WG&FD, Proponents will install gates as appropriate and supply other needed material in crucial winter range and sage grouse concentration areas to encourage compliance with traffic restrictions. After construction, the BLM would maintain the gates. Gate keys would be managed by the BLM. Gate closures would be consistent with traffic restrictions. Proponents would assist BLM with signage on or near the gate explaining the traffic restrictions.

### Estimated Traffic Volumes – Drilling

Following are the anticipated traffic and activity associated with drilling in a concentrated area on a consolidated multi-well pad:

1. Each rig will have the following personnel on location 24 hours per day. Each person will have a vehicle, but would typically not leave location on most days.
  - a. Drilling Foreman
  - b. Toolpusher
  - c. Mud Engineer
  - d. Directional Driller, when needed
  - e. MWD Technician, when needed
  - f. Mud Logger
  - g. Top Drive Operator
2. Each rig will typically have two six-man crews, each working a 12-hour shift. Shift changes are generally at 6:00 a.m. and 6:00 p.m.
3. Rig traffic. The estimated traffic required for each well for the 45 to 55 days it takes to drill the well has been estimated as follows:
  - a. Fuel Tankers – 17
  - b. General Hauling – 88
  - c. Mud and Waste Haulers – 44
  - d. Water Trucks – 49, unless on-site water wells are permitted
  - e. Down hole tool delivery and Misc. Supplies – 70
  - f. Construction, management, roustabouts and services – 284
  - g. Cement, barite, and mud chemicals – 48
  - h. Rig moves on / off pad – 70
  - i. Skids – 6

This traffic estimate includes approximately 299 roundtrips by heavy trucks and 301 roundtrips by pickup truck or autos per well excluding the rig moves on / off pad and skids. The trip total reflects a decrease in supply traffic on multi-well pads at approximately 33 percent less than normal traffic to single wells on separate pads.

### Estimated Traffic Volumes – Completions

Following are the anticipated traffic and activity associated with completions in a concentrated area on a consolidated multi-well pad. Estimates are per well and will be reduced with concurrent multiple well completions.

a. Proppant Hauling	53
b. Frac Fleet	40
Semi Transport	
Light Trucks	53
c. Water Delivery	35
Hauling	130
d. Wireline- Perforating and Logging	10
e. Coiled Tubing Drillout	28
f. Other semis/transport	19
g. Other light truck/pickup	120
TOTAL	488

**Estimated Traffic Volumes – Production**

Where feasible, upon gathering systems being fully operational and in combination with computer assisted operations being utilized, Proponents anticipate 1 roundtrip per day associated with pad production.

**Estimated Traffic Volumes – Pad and Road Construction**

Proponents expect to construct / expand pads and roads primarily outside of winter conditions.

Anticipated traffic to construct / expand one pad is 708 roundtrips which include heavy and light trucks, dump trucks, and water trucks.

Anticipated traffic to construct one access road is 146 roundtrips which include heavy and light trucks, dump trucks, and water trucks.

**Emergency Vehicle Traffic Volumes**

Emergency vehicle traffic for emergencies cannot be predicted or quantified, but are noted they will occur even as Proponents continue to enhance the safety of their contractors, service providers, and themselves in their operations.

## **Appendix 5C**

### **Alternative C – Transportation Plan**

## **Alternative C – Transportation Plan**

If Alternative C is selected in the ROD, the Alternative B Transportation Plan would be modified as appropriate.

## **Appendix 5D**

### **Alternative D – Transportation Plan**

Note: The Proponents' original Transportation Plan's committed mitigation for their Proposed Action (Alternative B) is as submitted. To accommodate Alternative D, the Transportation Plan is revised to delete references to concentrated pad locations in consolidated areas and replace them with references appropriate to development area terminology.

Please see p. D-2, third paragraph, first sentence; p. D-3, number 1, second sentence and number 4, first and second sentences; and, p. D-5, under "Estimated Traffic Volumes – Drilling", first sentence and under "Estimated Traffic Volumes – Completions", first sentence.

## Alternative D – Transportation Plan

### Purpose

Ultra Resources, Inc. (Ultra), Shell Exploration & Production Company (Shell) and Questar Market Resources (Questar), hereinafter collectively referred to as “Proponents”, propose this Transportation Plan to supplement the 2000 PAPA ROD Transportation Plan (TP 2000) as provided below.

The purpose of this plan is to incorporate measures that: 1) reduce surface use to maintain habitat function and minimize habitat fragmentation; 2) reduce human activity to lessen disturbance to wildlife and reduce impacts to community, county and state infrastructure; and, 3) reduce air emissions through consolidation of locations and associated development and production activities.

Proponents propose to accomplish these goals by reducing the number of well pads through multi-well pad development, directional drilling, and simultaneous operations; pad locations in five development areas; reducing rig moves on and off pads; installing liquids gathering systems and centralized facilities where feasible to reduce truck traffic and the number of production tanks and associated VOC’s; managing traffic through busing and scheduling during seasonal stipulation periods; and increasing the use of computer assisted operations (CAO) to reduce trips and traffic during production. Proponents’ proposal will also result in a decrease in the expected development period over development under seasonal restrictions by up to 50 percent.

### Scope

This plan applies to roads and the transportation of gas, condensate, and water via pipelines and as outlined in the TP 2000. The plan includes assumptions, mitigation measures, and guidelines. Relevant requirements for road construction or reconstruction and the development of agreements for surface use, rights-of-ways (ROW), and maintenance will be addressed and quantified in the Technical Support Document (TSD) to be submitted to BLM within one year of the release of the SEIS ROD and which will be updated annually.

Pipelines / flowlines will be installed either within the road easement and / or within existing pipeline corridors to the extent feasible. Pipelines generally will be located adjacent to roads to reduce new surface disturbance. In instances where paralleling roads and existing pipelines would lead to increased environmental and / or safety impacts, pipelines may be located along alternative routes. These alternative routes will be evaluated and sited to minimize environmental impacts.

Multi-well pads may accommodate use of multiple drilling rigs utilizing direction drilling and operating year round as well as simultaneous drilling, completion, construction, and production operations. Concentrating operational activity within specific multi-section areas will lessen road development PAPA-wide during a given time period leaving large blocks of undeveloped acreage available to wildlife and livestock.

### Proponent Committed Measures

1. Proponents will use public and existing roads as much as possible to lessen new surface disturbance and habitat fragmentation. New road construction under the multi-well pad proposal would be reduced by at least 70% PAPA-wide as compared to single-well pad development. Per section, this equates to up to 1.16 miles or about 12 acres (roadway, flowline easement).
2. When siting new roads, Proponents will work with the Bureau of Land Management (BLM) to ensure placement and construction is done in the most efficient and environmentally effective way. Proponents will continue use and development of ROW Surface Use Plans.
3. Annual road planning, development, maintenance, and other issues and concerns will be incorporated into the TSD, as will detailed information (including maps) on existing roads/routes and natural obstacles. The TSD and associated maps, as well as proposed project activities, operator construction and maintenance responsibilities, and road-specific dust abatement, construction, and surfacing requirements, will be updated annually or as necessary and submitted to the BLM.
4. Proponents will not move drill rigs to and from well pads outside of the agreed upon activity areas in crucial big game winter range after November 15 and before May 1. Rigs will normally move onto a pad and stay until all scheduled wells for that rig are drilled, as feasible. Delineation wells as discussed in Chapter 2 will be determined in the annual plans in consultation with BLM and Wyoming Game and Fish Department (WG&FD).
5. Proponents will deliver and store equipment and bulk supplies on well pads prior to seasonal stipulation periods to the extent feasible to reduce traffic and human disturbance on wildlife.
6. Proponents are committed to utilizing liquids gathering systems and centralized facilities where feasible. The liquids gathering systems and centralized facilities will significantly reduce tanker truck traffic by up to 475 truck trips per day during peak production.
7. In crucial big game winter range and sage grouse winter concentration areas, Proponents will make reasonable effort to bus drilling rig crews between November 15 and April 30 from appropriate vehicle staging areas to minimize commuting traffic. Proponents will not tolerate workers who miss the bus and drive personal vehicles to the pads during this time period.
8. Proponents will coordinate the transportation routes and scheduling of service contractors to minimize the amount of traffic associated with year-round development.
9. Proponents will fund hosted workers within the BLM Pinedale Field Office to operate an access station annually from November 15 through April 30 to monitor traffic within crucial winter range areas. Proponents will determine in consultation with BLM how long the access station will be in place. Hosted workers would report to the BLM Pinedale Field Office. Traffic data would be compiled to differentiate between essential activity and non-essential traffic. Proponents would use this information to adjust their practices, and, if needed, to reduce traffic. The access station would operate 24 hours a

- day, seven days a week. Proponents would fund appropriate signage to inform the public and industry of the access station and travel restrictions.
10. Where feasible, Proponents will utilize computer assisted remote monitoring of producing wells to reduce the number of site visits during the production phase.
  11. Proponents will reclaim any road not required for routine operation and maintenance of producing wells or ancillary facilities as directed by the BLM, State Land Board, or private landowner. These roads would be blocked, recontoured, reclaimed, and revegetated by Proponents, as would disturbed areas associated with permanently abandoned pads.
  12. As part of normal operational winter maintenance, Proponents will plow roads the minimum amount necessary to allow safe navigation. Plows would provide breaks in snow piled berms along the road margins (knockouts) in order to allow free movement of wildlife across roads.
  13. Proponents will advise all project-related personnel and vendors either personally, by mail or by e-mail of all seasonal stipulation-related traffic activity restrictions and rules of conduct while on the PAPA. These will include, but are not limited to:
    - a. No stopping to observe wildlife
    - b. No harassment of wildlife
    - c. No firearms
    - d. No pets outside a vehicle
    - e. Obey posted speed limits
  14. Proponents will provide a laminated sheet entitled "Code of Conduct during Seasonal Stipulation Periods" that will be required to be carried in each company vehicle during seasonal stipulation periods. The sheets will provide instruction on the types of human activity that create stress in wildlife.
  15. Proponents would observe speed limits within the PAPA and will encourage service contractors and vendors to do the same. This will be included in the "Code of Conduct during Seasonal Stipulation Periods."
  16. Proponents will implement voluntary fugitive dust control measures on primary access roads and heavily used resource roads.
  17. Proponents will instruct personnel on behaviors appropriate for minimizing disturbance to wildlife consistent with current documents developed by BLM, WG&FD or other wildlife experts and which are provided to Proponents by BLM.
  18. In consultation with BLM and WG&FD, Proponents will install gates as appropriate and supply other needed material in crucial winter range and sage grouse concentration areas to encourage compliance with traffic restrictions. After construction, the BLM would maintain the gates. Gate keys would be managed by the BLM. Gate closures would be consistent with traffic restrictions. Proponents would assist BLM with signage on or near the gate explaining the traffic restrictions.

### Estimated Traffic Volumes – Drilling

Following are the anticipated traffic and activity associated with drilling on a consolidated multi-well pad:

1. Each rig will have the following personnel on location 24 hours per day. Each person will have a vehicle, but would typically not leave location on most days.
  - a. Drilling Foreman
  - b. Toolpusher
  - c. Mud Engineer
  - d. Directional Driller, when needed
  - e. MWD Technician, when needed
  - f. Mud Logger
  - g. Top Drive Operator
  
2. Each rig will typically have two six-man crews, each working a 12-hour shift. Shift changes are generally at 6:00 a.m. and 6:00 p.m.
  
3. Rig traffic. The estimated traffic required for each well for the 45 to 55 days it takes to drill the well has been estimated as follows:
  - a. Fuel Tankers – 17
  - b. General Hauling – 88
  - c. Mud and Waste Haulers – 44
  - d. Water Trucks – 49, unless on-site water wells are permitted
  - e. Down hole tool delivery and Misc. Supplies – 70
  - f. Construction, management, roustabouts and services – 273
  - g. Cement, barite, and mud chemicals – 48
  - h. Rig moves on / off pad – 70
  - i. Skids – 6
  - j. Logging Truck – 3
  - k. Casing Running – 4 x 2

This traffic estimate includes approximately 299 roundtrips by heavy trucks and 301 roundtrips by pickup truck or autos per well excluding the rig moves and skids. The trip total reflects a decrease in supply traffic on multi-well pads of approximately 33 percent less than normal traffic to single wells on separate pads.

### Estimated Traffic Volumes – Completions

Following are the anticipated traffic and activities associated with completions on a multi-well pad. Estimates are per well and will be reduced with concurrent multiple well completions:

a. Light	120
b. Heavy	180
TOTAL	300

### Estimated Traffic Volumes – Production

Where feasible, upon gathering systems being fully operational and in combination with utilization of computer assisted operations, Proponents anticipate one roundtrip per day associated with normal pad production operations.

**Estimated Traffic Volumes – Pad and Road Construction**

Proponents expect to construct / expand pads and roads primarily outside of winter conditions.

Anticipated traffic to construct / expand one pad is 708 roundtrips which includes heavy and light trucks, dump trucks, and water trucks.

Anticipated traffic to construct one access road is 146 roundtrips which includes heavy and light trucks, dump trucks, and water trucks.

**Emergency Vehicle Traffic Volumes**

Emergency vehicle traffic cannot be predicted or quantified, but it is noted emergencies may occur even as Proponents continue to enhance the safety of their employees, contractors, and service providers.

## **Appendix 5E**

### **Alternative E – Transportation Plan**

## **Alternative E – Transportation Plan**

If Alternative E is selected in the ROD, the Transportation Plan from the PAPA ROD would be modified as appropriate.

## **APPENDIX 6**

### **Pipeline Design and Construction Procedures**

## Pipeline Design and Construction Procedures

### 1.0 INTRODUCTION

Rendezvous Gas Services, L.L.C. (RGS) proposes to construct a 103.6-mile long, 30-inch diameter, natural gas pipeline (Rendezvous Phase VII (RVII) Pipeline) within the proposed Bird Canyon Corridor (BCC) and Blacks Fork Granger Corridor (BFGC) to transport natural gas produced in the PAPA to gas processing plants: Segment 1 of the proposed RVII Pipeline (41.5 miles) would be located in the BCC and Segment 2 (62.1 miles) would be located in the BFGC. Segment 1 of the proposed RVII Pipeline would begin at the Pinedale/Gobblers Knob Compressor Station and end at the Bird Canyon Compressor Station. Segment 2 of the proposed RVII Pipeline would begin at the Bird Canyon Compressor Station and end at the Blacks Fork Processing Plant. It is anticipated that the RVII Pipeline would be constructed during the summer and fall of 2008.

Jonah Gas Gathering Company (JGGC) proposes to construct a 41.5-mile long, 36-inch natural gas pipeline (Paradise to Bird Canyon (PBC) Pipeline) and a connecting 45.5-mile long, 30-inch pipeline (Opal Loop III Pipeline) to transport natural gas from the PAPA to gas processing plants. The PBC Pipeline is proposed to be located in the BCC and will parallel the RVII Pipeline. The Opal Loop III Pipeline is proposed to be located in the OPC and will parallel the Bridger Pipeline that was constructed in 2006.

The design and engineering of the proposed pipelines would be completed by RGS/JGGC personnel or their contractors in accordance with safe and proven engineering practices. All pipeline plans and specifications, alignment sheets, road profiles, cross sections, site-specific details, and design drawings associated with the project would be available for review at RGS's office in Green River, Wyoming, JGGC's office in Rock Springs, Wyoming, and the BLM Field Offices in Pinedale, Rock Springs, and Kemmerer, Wyoming prior to issuance of the right-of-way (ROW) grant.

RGS/JGGC would secure all rights of way on adjacent nonfederal lands prior to pipeline construction. RGS/JGGC would notify authorized ROW users of RGS/JGGC's proposed pipeline crossings or overlaps on the surface occupied by the affected ROW users. Any associated road and utility permits would be secured from the appropriate regulatory agency prior to construction. RGS and JGGC are requesting federal ROW grants for a period of 30 years with options to renew for as long as there are marketable quantities of natural gas available. All equipment and vehicular access would be confined to existing roads and the established ROW corridors. No major reconstruction or rerouting of roads is proposed.

### 2.0 PIPELINE DESCRIPTIONS

Surface disturbance associated with the proposed pipelines is provided in Table 1.

**Table 1**  
**Estimated Total and Life of Project (LOP)**  
**Disturbance for Gas Sales Pipelines and the Granger Gas Plant**

Component	Number or miles	Total Disturbance (acres)	LOP Disturbance (acres)
30-inch Rendezvous (RVII) Pipeline <sup>1</sup>	103.6 miles	1,506.9	1.0
RVII temporary extra work areas <sup>2</sup>	168	23.3	0.0
RVII temporary extra work areas – HDDs <sup>3</sup>	4 sites	8.3	0.0
<b>Subtotal</b>		<b>1,538.5</b>	<b>1.0</b>
36-inch Paradise to Bird Canyon (PBC) Pipeline <sup>1</sup>	41.5 miles	603.6	1.0
PBC temporary extra work areas <sup>2</sup>	48	9.4	0.0
PBC temporary extra work areas – HDDs <sup>3</sup>	2 sites	4.2	0.0
<b>Subtotal</b>		<b>617.2</b>	<b>1.0</b>
30-inch Opal Loop III Pipeline <sup>1</sup>	45.5 miles	661.8	10
Opal Loop III temporary extra work areas <sup>2</sup>	68	10.5	0.0
<b>Subtotal</b>		<b>672.3</b>	<b>1.0</b>
Granger Gas Plant	1 site	86.4	86.4
<b>Total Sales Pipelines/Gas Plant</b>	<b>1 site</b>	<b>2,914.4</b>	<b>89.40</b>
<sup>1</sup> Disturbance based on 120 feet construction ROW width. <sup>2</sup> Temporary extra work areas are required for road, foreign line, historic trail and waterbody crossings. <sup>3</sup> horizontal directional drill.			

### Rendezvous Phase VII Pipeline

The proposed RVII natural gas pipeline (both RVII Segments 1 and 2) would be constructed of 30-inch x 0.438- or 0.625-inch w.t., Grade X-70, steel pipe. Maximum operating pressure would be approximately 1,440 psig. The proposed RVII Pipeline would be buried to a minimum depth of 48 inches.

RGS proposes a 120-foot wide construction ROW which includes a 50-foot wide permanent ROW and a 70-foot temporary construction ROW. Additional temporary extra work areas would be required on both sides of road, historic trail, railroad, and waterbody crossings. At these locations, the total ROW width would increase to 150 feet. For all waterbody and railroad crossings, a temporary extra work area of 150 feet in width x 300 feet in length would be required. New disturbance for staging areas including pipe and equipment storage yards is not anticipated. Existing storage facilities located off-ROW would be used.

The proposed BCC and BFGC corridors and the specific route for RVII Pipeline within the proposed 500-foot and 300-foot corridors would be located parallel and adjacent to existing pipelines for approximately 81.0 miles (78 percent) of the pipeline's total length. The remaining 24.4 miles (22 percent) of the proposed route would parallel other linear features such as roads or traverse the landscape cross-country. The proposed 103.6-mile long RVII Pipeline would cross approximately 85.5 miles (83 percent) of federal lands, 0.8 mile (0.8 percent) of state lands, and 16.5 miles (16 percent) of private lands.

Estimated surface disturbance required for construction of the proposed RVII Pipeline is presented in Table 1. Disturbance associated with construction and operation of main line valve assemblies, pig launchers/receivers, side taps, and meter stations would be confined within the

50-foot wide permanent ROW. Off-ROW staging areas are not required due to the availability of existing storage yards for pipe and other equipment. Access by vehicles and equipment to the ROW for construction and operations would be via existing roads and would require no upgrades or improvements. Repairs to existing roads would be made should pipeline construction activities result in road damage.

In conjunction with the proposed pipeline project, RGS is requesting approximately 87 acres of BLM-administered federal land to expand the existing Granger Plant. The expansion would provide space for additional processing facilities to handle an additional 600 (MMSCF/D) of natural gas and associated natural gas liquids.

### **Paradise to Bird Canyon and Opal Loop III Pipelines**

The Paradise to Bird Canyon Pipeline would be constructed of 36-inch x 0.515-inch w.t., Grade X-70, steep pipe. The Opal Loop III Pipeline would be constructed of 30-inch x 0.438-inch w.t., Grade X-70, steel pipe. Maximum operating pressure would be approximately 1,440 psig for both segments. The proposed JGGC pipelines would be buried to a minimum depth of 48 inches.

JGGC proposes a 120-foot wide corridor for construction of both the 36-inch and 30-inch pipelines with a 50-foot wide permanent ROW for operational and maintenance purposes and 70-foot wide temporary construction ROW within the 500-foot wide BCC and 300-foot wide OPC (PBC Pipeline and Opal Loop III Pipeline, respectively) of the proposed pipeline corridor. Additional temporary extra work areas, 30 feet wide by 100 feet long, would be required on both sides of road, historic trail, railroad, and creek crossings. At these locations, the total ROW width would increase to 150 feet. At river crossings, temporary extra work areas of 150 feet in width x 300 feet on both sides of horizontal directional drill (HDD) locations beyond the 120-foot construction ROW width would be required. Total construction ROW width at HDD crossings of rivers and other features would be 260 feet wide and 300 feet long on both sides.

The proposed BCC and OPC corridors and the specific route for the PBC Pipeline within the proposed 500-foot wide corridor, and the Opal Loop III Pipeline within the proposed 300-foot wide corridor, would be located parallel and adjacent to existing pipelines for approximately 66.8 miles (76.8 percent) of the pipeline's total length. The remaining 20.2 miles (23.2 percent) of the proposed route parallel other linear features such as roads or traverse the landscape cross-country.

The PBC and Opal Loop III pipelines would be placed 35 feet from adjacent existing pipelines. The permanent ROW for these pipelines would require 25 feet of the 35 foot separation. Although the spoil side of the JGGC pipeline's construction ROWs would likely overlap with areas previously disturbed by the construction of the adjacent, existing pipeline, the amount of overlap with previous disturbed areas is unknown; therefore, the assessment of anticipated disturbance from construction of the JGGC pipelines is based on the convention that all disturbance would be considered new disturbance. The combined BCC and OPC corridors and the proposed 87.0 miles of JGGC pipelines would cross approximately 81.9 miles (94 percent) of federal lands, 0.9 mile (1 percent) of state lands, and 4.2 miles (5 percent) of private lands.

Estimated surface disturbance required for construction of the proposed PBC and Opal Loop III pipelines is presented in Table 1. Disturbance associated with construction and operation of main line valve assemblies, pig launchers/receivers, side taps, and meter stations would be confined within the 50-foot wide permanent ROW. The need for off-ROW staging areas where new disturbance would be necessary is not anticipated due to the availability of existing storage yards for pipe and other equipment. Access by vehicles and equipment to the proposed ROW for construction and operations would use existing roads and would require no upgrades or

improvements. Repairs to existing roads would be made, should pipeline construction activities result in road damage.

### **3.0 WORKFORCE REQUIREMENTS AND CONSTRUCTION SCHEDULE**

Pipeline firms/proponents would notify the authorized officers of the appropriate agencies five days prior to commencing construction activities. Proponents would also comply with all timing stipulations for wildlife. Easements would be obtained from private landowners. The construction force for each pipeline is expected to number approximately 200 to 300 persons at the peak of construction and it is expected to take 3 to 5 months. No temporary work camps are anticipated.

The following is a list of construction equipment that would likely be required for a large diameter pipeline project:

- 15 welding trucks
- 12 tractor trailers
- 6 two ton trucks
- 25 pickup trucks
- 2 dump trucks
- 2 seed drillers and tractors (if applicable)
- rubber tired backhoes
- 12 trackhoes
- 20 side boom caterpillar
- wheel trenchers
- 8 D7 dozers
- 1 fuel truck
- 1 low head pump
- 1 pressure pump
- 1 air compressor -1750 cfm
- 1 air compressor-1200 cfm
- 2 motor graders

### **4.0 CONSTRUCTION SEQUENCE**

Pipeline construction within the proposed corridors would commence when all permits and ROW documents have been secured, and BLM authorization is received. Proponents would notify the AO 5 days in advance of starting construction activities. All private surface landowners would be contacted prior to construction for access and surface usage. All materials, construction, operation, maintenance, and termination practices for the proposed pipeline would be completed by proponent personnel or their contractors in accordance with safe and proven engineering practices.

Construction sites would be maintained in a sanitary condition at all times; waste materials at those sites would be disposed of promptly at an appropriate waste disposal site. The term "waste" refers to all discarded matter including human waste, trash, garbage, refuse, oil drums, petroleum products, ashes, and equipment. A litter policing program which would cover all roads and sites associated with the ROW would be implemented by the proponent and approved in writing by the BLM AO.

Construction of the pipeline would not inhibit public use of existing roads and trails, or inhibit wildlife or livestock movement. No additional trench would be opened than that which could be

successfully backfilled and compacted in a 10 day period. Areas within 0.25 mile of livestock would be fenced, if required.

**Clearing and Grading.** The staked ROW would be cleared and graded to provide a smooth and even work area to facilitate the safe movement of equipment and personnel. A motor grader with a blade would be used to knock down vegetation, such as sagebrush within as much of the construction ROW as is needed to provide a safe working area. Grading usually requires cutting and/or filling to achieve a more uniform grade for the pipeline, and may include ripping rock close to the surface. Blading may be required to provide a safe and suitable working area in areas of excessively steep hillsides or at approaches to waterbody crossings and at established temporary extra work areas. The top six inches of soil would be salvaged, stockpiled on the side of the ROW, and spread back over the area after final grading.

For more typical but less steep terrain, a minimum of the top six inches of soil, more if the BLM deems necessary, would be stockpiled on the side of the ROW and spread back over the area after the final grading. Spoil and topsoil would be windrowed and separated along the nonworking side of the trench.

**Hauling and Stringing.** All construction materials would be hauled to the job by truck (80-foot pole trailers), as needed, and strung as it arrives. Pipe would be strung in such a manner as to cause the least interference with the normal use of the land.

**Trenching.** A wheel trencher would be used to dig an adequate trench, stacking the dirt beside the ditch. In rocky areas or in areas where the pipeline changes direction, an excavator would be used. The ditch would be excavated to an adequate depth of cover of the pipeline. Spoil and topsoil would be windrowed and stockpiled separately along the nonworking side of the trench.

To allow for both livestock and wildlife movement, no more trench than can be successfully backfilled and compacted in a 10-day period will be open at any one time. Variance to the 10-day limit may be granted upon justification. Soft plugs will be placed approximately every 0.25 mile or at logical breaks in pipe installation (e.g., roads, other pipelines, etc.) at approximate 0.25 mile intervals, and when stringing pipe one joint of pipe will be set back approximately every 0.25 mile or at logical breaks in pipe installation at approximate 0.25 mile intervals.

**Road Crossings.** Construction at road and railroad crossings would use heavier-walled pipe to withstand greater external loads. Roads that are not heavily used would be open cut. The open cut roads would be backfilled and compacted in a way that would maintain the integrity of the road. Roads that are more heavily traveled and railroads would be bored to avoid disruption of traffic. Two-track roads or trails which are rarely traveled and do not usually accommodate heavy loads would be crossed by conventional construction techniques.

**Bending, Welding, and Coating.** A bending machine would be used to bend the pipe to fit the trench and contour of the land. Induction bends (prefabricated bends) would be used as required.

The pipeline welding crews would align the pipe for welding, and complete the welding of the pipeline above the trench. The welds would be nondestructively tested (x-rayed) to insure the quality of the weld. The pipe string would be temporarily stored on skids until lowered into the trench.

Although the pipe would arrive at the ROW with a corrosion resistant coating, crews would apply additional coating to the weld areas and repair any damage to the factory-applied coating to prevent corrosion.

**Lowering In, Padding, and Backfilling.** Side booms would be used to lower the pipe into the trench. In rocky areas, the trench would be padded with sand or soil using a padding machine, which separates rocks from satisfactory padding materials.

After the pipe is placed in the trench, a motor grader or caterpillar would be used to push the dirt back into the trench. The fill in the trench would then be tamped into place with the grader wheels. Any excavated material that cannot be placed in the trench would be disposed of in accordance with landowner and agency requirements.

**Horizontal Directional Drills.** In areas where it is impractical to use conventional construction techniques, or where environmentally sensitive areas exist, a HDD may be used. This construction technique uses equipment to drill a pilot hole beneath the waterbody crossing or other sensitive area at a depth that maintains minimum coverage requirements. Once the pilot hole has been successfully completed, the hole is enlarged by reaming out the pilot hole in multiple passes with a reamer. After the hole has been enlarged to a diameter large enough to receive the pipeline, a pre-welded and pre-tested section of pipe (coated with abrasion resistant coating), located on the opposite side of the drilling equipment, is pulled back into the bore hole. The annulus around the pipeline would be sealed with bentonite.

RGS is proposing to cross the New Fork River, the Green River and the Blacks Fork River by HDD construction methods. JGGC is proposing to cross the New Fork River and the Green River using HDD. All other waterbodies for both pipelines would be crossed by open-cut methods using conventional trenching techniques, however, they would only be crossed when the streambed is dry.

**Fabrication/Tie Ins.** The mainline valve assemblies, pig receivers, pig launchers, side taps, and meter stations would be prefabricated off site. In order to keep the construction assembly line moving as efficiently as possible, tie-in crews would be used to complete the final installation of fabricated assemblies.

## 5.0 HYDROSTATIC TESTING

Pipelines would be pressure tested as per ASME Standard B318. A pipeline would be filled with water and pressurized to a minimum of 1.1 times the designated operating pressure for 8 hours to verify integrity. Test water would most likely be obtained from the New Fork, Green, and/or Blacks Fork rivers and hauled to the pipeline for testing. Permits or license agreements for the withdrawal would be obtained from the Wyoming State Engineer's Office and the Bureau of Reclamation. Prior to release, the test water would be analyzed and processed, if necessary, to ensure it meets local, state, and federal water quality standards. The test water would be discharged to an upland area. In order to prevent scouring and erosion, test water would be discharged into energy dissipation devices, filter bags, or straw bale dewatering structures, which would be removed upon completion of testing. Hydrostatic test water discharge would be approved in writing by the Wyoming Department of Environmental Quality/Water Quality Division (WDEQ-WQD).

A total of 65.1 acre-feet of water would be necessary for hydrostatic testing of the RVII Pipeline, 45.1 acre-feet for the length of the pipeline and 20 acre-feet for testing of the HDDs and railroad crossing. Approximately 13.4 acre-feet would be withdrawn from the New Fork River; approximately 12.4 acre-feet from the Green River; and approximately 19.3 acre-feet from the Blacks Fork River. An additional 5 acre-feet of water would be used at each HDD crossing (three rivers and one railroad crossing) for a total of 20 acre-feet of water for the HDDs (Table 2).

**Table 2**  
**Rendezvous Phase 6 Pipeline Hydrostatic Testing**

Source Waterbody	Volume (acre-feet)	Withdrawal Location	Discharge Location
<b>Pipeline Testing</b>			
New Fork River	13.4	SWSE Sec. 11, T. 31 N., R. 109 W.	SWSE Sec. 11, T. 31 N., R. 109 W. NWNW Sec. 4, T. 30 N., R. 108 W. NE Sec. 34, T. 27 N., R. 111 W.
Green River	12.4	NESE Sec. 17, T. 23 N., R. 111 W.	NESE Sec. 17, T. 23 N., R. 111 W. SESE Sec. 21, T. 26 N., R. 111 W.
Blacks Fork River	19.3	SW Sec. 28, T. 19 N., R. 111 W.	SW Sec. 28, T. ;19 N., R. 111 W.
<b>HDD Testing</b>			
New Fork River	5	SWSE Sec. 11, T. 31 N., R. 109 W.	SWSE Sec. 11, T. 31 N., R. 109 W.
Green River	5	NESE Sec. 17, T. 23 N., R. 111 W.	NESE Sec. 17, T. 23 N., R. 111 W.
Blacks Fork River	5	SW Sec. 28, T. 19 N., R. 111 W.	SW Sec. 28, T. 19 N., R. 111 W.
<b>Railroad Testing</b>			
Blacks Fork River	5	SW Sec. 28, T. 19 N., R. 111 W.	SW Sec. 28, T. 19 N., R. 111 W.
<b>Total</b>	<b>65.1</b>		

A total of 40.6 acre-feet of water would be required for hydrostatic testing of the PBC and Opal Loop III pipelines. Hydrostatic testing would likely be performed in 7 to 10 mile sections repeated for the length of the pipelines using water from two sources and multiple discharge point locations. Approximately 10.0 acre-feet would be withdrawn from the New Fork River, and approximately 20.6 acre-feet would be withdrawn from the Green River. An additional 5.0 acre-feet of water would be used at each HDD crossing (two rivers) for a total of 10 acre-feet of water (Table 3).

**Table 3**  
**Paradise to Bird Canyon and Opal Loop III Pipelines Hydrostatic Testing**

Source Waterbody	Volume (acre-feet)	Withdrawal Location	Discharge Location
<b>Pipeline Testing</b>			
New Fork River	10.0	SWSE Sec. 11, T. 31 N., R. 109 W.	SWSE Sec. 11, T. 31 N., R. 109 W. NWNW Sec. 4, T. 30 N., R. 108 W. NE Sec. 34, T. 27 N., R. 111 W.
Green River	20.6	NESE Sec. 17, T. 23 N., R. 111 W.	NESE Sec. 17, T. 23 N., R. 111 W. SESE Sec. 21, T. 26 N., R. 111 W.
<b>HDD Testing</b>			
New Fork River	5	SWSE Sec. 11, T. 31 N., R. 109 W.	SWSE Sec. 11, T. 31 N., R. 109 W.
Green River	5	NESE Sec. 17, T. 23 N., R. 111 W.	NESE Sec. 17, T. 23 N., R. 111 W.
<b>Total</b>	<b>40.6</b>		

## 6.0 SPECIAL CONSTRUCTION TECHNIQUES

**General.** Pipeline warning signs would be installed at line-of-sight intervals at road crossings to identify the location of the pipeline within the ROW.

Cathodic test stations would be installed as required to maintain pipeline integrity. These stations would be used to test and monitor the corrosion resistance of the pipeline.

**Wet Construction.** RGS and JGGC would not allow any construction or routine maintenance activities during periods when soil is too wet to adequately support construction equipment. If such equipment creates surface ruts in excess of 4 inches deep, proponents would deem that soil conditions are too wet to adequately support construction equipment. Construction activities would not be allowed until soil conditions improve.

**Dust Control.** In addition to water withdrawn from rivers for hydrostatic testing, water would be withdrawn from the New Fork, Green, and Blacks Fork rivers for use in dust control during pipeline construction. Construction of the 103.6 mile long RVII Pipeline would require approximately 67.0 acre-feet of water from a combination of New Fork, Green, and Blacks Fork river sources. Construction of the 41.5-mile long PBC Pipeline would require approximately 26.9 acre feet of water from the New Fork and Green rivers. Construction of the 45.5 mile long Opal Loop III Pipeline would require approximately 29.3 acre feet of water from the Green River. Water would be pumped into 80- and 100-barrel tanker trucks/trailers and hauled to the construction sites where the water would be sprayed from the tanks to the ground.

**Winter Construction 6 Step Frozen Ground Procedure.** Should winter construction be necessary, proponents would:

- remove snow and slightly scalp vegetation with a grader blade and windrow it to one side of the ROW;
- use a wheeled trencher equipped with rock teeth to remove approximately 6 to 8 inches of topsoil by appropriately setting trencher depth (frosted top soil would be broken to smallest density possible; a kick board would be installed on the trencher to distribute topsoil directly down on the ROW near the trench and deter top soil from being thrown too far off ROW; the kick board would enable operator to vary speed for better cultivation of top soil);
- allow trencher to provide for 4 feet of burial and stockpile the soil or spoil to one side;
- install pipe and backfill trench with spoil;
- place stockpiled topsoil in the trench; and
- place the scalped vegetation back on the ROW using a grader.

The BLM would be contacted prior to construction in frozen ground.

## 7.0 RECLAMATION

Following the completion of hydrostatic testing, the ROW would be restored in accordance with the regulatory agency or landowner requirements. All disturbed areas would be re-contoured so that the disturbed area blends into the surrounding terrain. Topsoil would be evenly spread across the ROW. Appropriate measures would be taken to prevent erosion through the use of construction diversion terraces, rip-rap, matting/erosion control fabric, mulch, and/or water bars.

All disturbed areas would be reseeded. Seed would be planted using a drill and in areas not suitable for drilling, the seed would be broadcasted. The seed would be raked or chained to cover the seed. The application rate and seed mixture would comply with landowner or agency

specifications. The proposed upland seed mix is provided in Table 4.

**Table 4**  
**Upland Seed Mix and Application Rates**

Species/Variety	Drill Seeding Rate lbs/acre PLS <sup>1</sup>
Western Wheatgrass/Rosanna	4
Thickspike Wheatgrass/Critana	4
Indian Ricegrass	4
Bitterbrush	1
Scarlet Globe mallow	1
Winterfat	2
Fourwing Saltbush	1
<b>Total</b>	<b>17</b>
<sup>1</sup> PLS=pure live seed. Formula: % of purity of seed mixture times % germination of seed mixture=portion of seed mixture that is PLS.	

If herbicides are required following construction, proponents would comply with all applicable federal and state laws. Herbicides would be used in accordance with registered uses and within limitations imposed by the Secretary of Interior. Before using herbicides (including emergency situations), proponents would obtain, from the AO, written approval of a plan showing the type and quantity of material used, weed(s) to be controlled, method of application, location of storage, disposal of containers, and any other information deemed necessary.

Proponents would be responsible for weed control on the disturbed areas within the established limits of the ROW. Proponents would coordinate with the AO, or local authorities, to obtain acceptable weed control methods for the disturbed areas within the ROW.

## 8.0 OPERATION AND MAINTENANCE

Proponents would conduct all activities associated with the operation and maintenance of the pipeline within the authorized limits of the ROW. The pipeline would be routinely patrolled and inspected by foot and/or vehicle to check for problems such as erosion, ROW condition, unauthorized encroachment, and any other situation that could cause a safety hazard or require preventive maintenance. If damage should occur to the pipe from external sources, repair or replacement of the portion of the pipeline could be necessary. Detailed line break and emergency procedures would be used by proponents as routine operational procedures. All permanent aboveground facilities, including piping and valves, would be painted a flat, non-contrasting color harmonious with the surrounding landscape as identified by the AO.

Proponents would remain responsible for weed control within the established limits of the ROW. Proponents would coordinate with the AO to develop acceptable weed control methods for implementation, as needed. Prior to use of herbicides, including use in emergency situations, proponents would obtain written approval of a plan, detailing the type and quantity of herbicide to be used, weed to be controlled, method of application, location of storage, disposal of containers, and any other information deemed necessary by the AO. Proponents would comply with all applicable federal and state laws regarding the use of herbicides. Herbicides would be used in accordance with registered uses and within limitations imposed by the appropriate regulatory authority.

## 9.0 ABANDONMENT

Prior to cessation of pipeline operations, proponents would obtain necessary authorization to abandon the facilities. All aboveground pipeline facilities would be removed and all

unsalvageable materials would be disposed of at authorized sites. Regrading, reclamation, and revegetation of disturbed areas (if applicable) would be completed as necessary.

## 10.0 ENVIRONMENTAL PROTECTION MEASURES

**Hazardous Materials.** No toxic substances are proposed for use in connection with the construction project; however if toxic substances are required, usage shall conform with provisions of the Toxic Substances Control Act of 1976, as amended (40 CFR Part 702-799). Any release of toxic substances (leaks, spills, etc.) in excess of the reportable quantity as established by 40 CFR Part 117.3 shall be reported as required by the Comprehensive Environmental Response, Compensation, and Liability Act, Section 102 B. A copy of any requested report required by any Federal or State agency of a reportable release or spill of any hazardous material shall be furnished to the AO within 5 working days of the occurrence of the spill or release.

The holder(s) shall comply with all applicable Federal laws and regulations existing or hereafter enacted or promulgated. In any event, the holder(s) shall comply with the Toxic Substances Control Act of 1976, as amended (15 U.S.C. 2601, *et seq.*) with regard to any toxic substances that are used, generated by or stored on the ROW or on facilities authorized under this ROW grant. (See 40 CFR, Part 702-799 and especially, provisions on polychlorinated biphenyls, 40 CFR 761.1-761.193.) Additionally, any release of toxic substances (leaks, spills, etc.) in excess of the reportable quantity established by 40 CFR, Part 117 shall be reported as required by the Comprehensive Environmental Response, Compensation and Liability Act of 1980, Section 102b. A copy of any report required or requested by any Federal agency or State government as a result of a reportable release or spill of any toxic substances shall be furnished to the AO concurrent with the filing of the reports to the involved federal agency or state government.

A proponent, the applicant for the proposed ROW grant, 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 ROW (unless the release or threatened release is wholly unrelated to the ROW holder's activity on the ROW. This agreement applied without regard to whether a release is caused by a proponent, its agent, or unrelated third parties.

**Survey Monuments.** Proponents would protect all survey monuments, witness corners, reference monuments, and bearing trees within the ROW against disturbance during construction, operation, maintenance, and rehabilitation. If any monument, corner, or accessory is destroyed, obliterated, or damaged, proponents would arrange for a registered land surveyor to restore the disturbed monument, corner, or accessory using surveying procedures specified in the *Manual of Surveying Instruction for the Survey of Public Lands of the United States*, 1973 edition. Proponents would record the survey in the appropriate BLM office.

**Fire Control.** Proponents would notify the AO of any fires during construction and would comply with all rules and regulations administered by the AO concerning the use, prevention, and suppression of fires on federal lands.

In the event of a fire, proponents or their contractors would initiate fire suppression actions in the work area. Suppression would continue until the fire is out or until the crew is relieved by an authorized representative of the agency on whose land the fire occurred. Heavy equipment would not be used for fire suppression outside the ROW without prior approval of the AO unless there is imminent danger to life or property. Proponents or their contractors would be responsible for all costs associated with the suppression of fires and the rehabilitation of fire

damage resulting from their operations, employees, or contractors.

Proponents would designate a representative to be in charge of fire control during pipeline construction. The fire representative would ensure that each construction crew has fire fighting tools and equipment, such as extinguishers, shovels, and axes available at all times. The number of tools needed would depend on the number of persons working in the area. Proponents would, at all times during construction, maintenance, and operations, require that satisfactory spark arresters be maintained on internal combustion engines.

**Cultural Resources.** Proponents and contractors would inform their employees about relevant federal regulations protecting cultural resources. If any cultural remains, monument sites, objects, or antiquities subject to the Antiquities Act of June 8, 1906 or the Archaeological Resources Protection Act of 1979 are discovered during construction, activities shall immediately cease and the responsible AO would be notified.

An open trench inspection would be conducted on the pipeline if required by an agency with regulatory jurisdiction. Previously unknown or unanticipated resources found during this activity would be recorded, tested, and evaluated in consultation with the Wyoming State Preservation Office.

Proponents would comply with all BLM and State Historic Preservation Office (SHPO) recommendations for crossings of Historic Trails. Trails would be crossed in areas of existing disturbance and no new disturbance would occur in undisturbed portions of trails. Historic Trail segments would not be used by proponents or their contractors to access the pipeline ROW.

Direct impacts to the Sublette Cutoff, the East Bank Kinney Cutoff, and the Baker Davis Road/Slate Creek Cutoff would be prohibited. The areas where these trails are crossed by the proposed pipelines would be fenced so as to prohibit construction damage to existing trail ruts. All fences would extend a minimum of 50 feet from each side of a trail center point for a total of 100 feet. The position of the fence would be determined by a permitted archaeologist. The trails would be bored from outside of the fenced areas. This approach to trail crossing would eliminate new impacts to historic trail ruts.

All surface disturbing activity within 200 feet of the Sublette Cutoff, the East Bank Kinney Cutoff, and the Baker Davis Road/Slate Creek Cutoff would be monitored by an archaeologist who meets or exceeds the qualification standards recommended by the Secretary of the Interior.

The proposed crossing of the Oregon Trail and the second crossing of the Oregon Trail/Pony Express Route by the BFGC and RVII pipelines is contained within previous disturbance. These historic trails are crossed by existing pipelines and the proposed corridor in an area previously determined non-contributing to the overall eligibility of the sites. Construction would be contained within the existing disturbance.

**Paleontological Resources.** Proponents of pipelines would support a BLM-approved paleontologist's review, evaluation, and possible monitoring of potential paleontological resources for a proposed pipeline ROW. The paleontologist would conduct a literature search for information pertinent to the proposed pipeline ROW, complete a pre-construction survey of the proposed ROW where previous surveys have not been completed, collect surface fossil specimens if deemed necessary, and make recommendations for mitigation, including monitoring if necessary, of potential impacts from construction.

If paleontological resources are uncovered during construction activities, proponents or their contractors would suspend all operations to prevent further disturbance of such materials and would immediately contact the BLM's AO, who would arrange for a determination of significance and, if necessary, recommend a recovery or avoidance plan. Mitigation of paleontological

resources would occur on a case-by-case basis, and proponents would be responsible for the costs. Proponents would abide by the mitigation plan approved by the BLM.

**Wildlife.** Construction of the pipelines would be in accordance with BLM's Practices and Restrictions for the Pinedale Anticline Project Area (Appendix 4) and all other guidelines as they relate to wildlife.

**Raptors.** Where feasible, pipeline ROWs and temporary extra work areas would be selected and designed to avoid disturbance to raptor nests. Construction of the pipelines would be in accordance with the BLM's Practices and Restrictions for the Pinedale Anticline Project Area (Appendix 4) and all other guidelines as they relate to raptors.

**Greater Sage- Grouse.** Surface disturbance within 0.25 mile of greater sage-grouse leks would be avoided. Construction of the pipelines would be in accordance with the BLM's Practices and Restrictions for the Pinedale Anticline Project Area (Appendix 4) and all other guidelines as they relate to greater sage-grouse.

**Special Status Animals and Plants.** The BLM would conduct U.S. Fish and Wildlife Service (USFWS) consultation and coordination, as necessary, for all mitigation activities relating to threatened or endangered (T&E), candidate species, proposed species, and their habitats. In areas that have not been previously surveyed or cleared for these species, a qualified biologist/botanist would conduct surveys for these species in areas of potential habitat prior to disturbance. If T&E, candidate, or proposed species are found, consultation with the USFWS would be initiated, as necessary, and construction activities would be curtailed until the BLM, USFWS, and proponents concur on which activities can be authorized.

Proponents would conduct site-specific surveys for sensitive plants on uncleared areas as directed by the BLM.

## **APPENDIX 7**

### **Development Procedures for Wellfield Activities**

## Development Procedures for Wellfield Activities

### 1.0 INTRODUCTION

These development procedures include plans prepared by Ultra Resources, Inc., Shell Exploration & Production Company, and Questar Market Resources including Operator committed mitigation. The plans include a Transportation Plan (Appendix 5), Reclamation Plan (Appendix 8), Hazardous Materials Summary (Appendix 12), and Wildlife and Habitat Mitigation Plan (Appendix 9).

### 2.0 DEVELOPMENT PROCEDURES

Drilling and development operations would continue year-round and may utilize as many as 48 drilling rigs operating in the PAPA. However, depending on the Alternative selected, some areas would be restricted for winter drilling. Approximately 300 wells per year would be drilled in the PAPA during peak drilling.

#### Traffic and Workforce

The traffic volume in and out of the PAPA varies seasonally. During the development period (through 2023), traffic would be much greater in summer than in winter due to construction traffic required for construction of roads, pads and pipelines. Workers, material and equipment would be transported to the project area over U.S. Highways 191 and 189, State Highway 351, and county and BLM roads located within the PAPA. A comparison of traffic requirements for each of the Alternatives for 2009 with and without the Shell and Ultra's liquids gathering system is provided in Table 1 below. A Transportation Plan is provided as Appendix 4.

**Table 1**  
**Comparison of Traffic (vehicles per day)**  
**During Development for all Alternatives in 2009**

	Alternatives A and E <sup>1</sup>			Alternatives B, C and D		
	Light	Heavy	Total	Light	Heavy	Total
Summer	1,917	1,061	2,978	622	600	1,222
Winter	1,547	692	2,239	521	448	969

<sup>1</sup> Shell/Ultra liquids gathering system is not included in Alternatives A and E.

**Workforce Requirements.** Estimated workforce requirements to develop a single well in the PAPA are provided in Table 2 and workforce requirements necessary to operate and maintain a single well are provided in Table 3.

**Table 2**  
**Workforce Requirements Necessary to Develop A Single Well in the PAPA**

Category	Average Number of Workers	Average Number of Days
Well Pad and Access Road Construction	15	5
Rig U/Down	15	5
Drilling	25	50
Testing and Completion	20	12

**Table 3**  
**Workforce Requirements Necessary to**  
**Operate and Maintain a Single Well<sup>1,2</sup>**

Development Scenario	Average Number of Workers
With liquids gathering system	0.076
Without liquids gathering system	0.120
<sup>1</sup> Estimates include field and office employees and contractors.	
<sup>2</sup> Assumes 4,800 producing wells (existing and projected).	

### Preconstruction Planning and Site Layout

Pursuant to *Onshore Oil and Gas Order No. 1* and BLM regulation 42 CFR § 3162.3-1, each proposed well would require an Application for Permit to Drill (APD) approved by BLM prior to any surface disturbance. Each APD includes site-specific information regarding all facets of well development, including environmental concerns. Operators and/or their contractors and subcontractors would be required to conduct all phases of project implementation (e.g., well pad construction, road and pipeline construction, drilling and completion operations, maintenance, reclamation, and abandonment) in full compliance with all applicable federal, state, and county plans, laws, and regulations and according to approved APD specifications, right-of-way (ROW) permits, and potentially site-specific environmental assessments (EAs) and decision records (DRs). Pursuant to section 390 of the Energy Policy Act of 2005, Pub. L. No. 109-58, § 390(b)(3), 119 Stat. 747-48 (2005), the BLM may exclude from NEPA documentation the approval of individual APDs within a developed field when a NEPA document has been prepared. Operators would be fully accountable for their contractors' and subcontractors' compliance with the requirements in the approved permits and/or plans.

When development of federal minerals would take place on private surface, Operators would follow *Onshore Oil and Gas Order No. 1* and regulations with regard to access for natural gas resource development and remuneration to the landowner for potential damage.

### Construction and Drilling Operations

All activities at each well in the PAPA would follow procedures approved by the BLM in the APD and attached Conditions of Approval (COAs). Well pad, access road, and other construction activities would follow guidelines set forth in the most recent edition of the "Gold Book," *Surface Operating Standards for Oil and Gas Exploration and Development*, and/or *Manual 9113 Roads* concerning road construction standards on projects subject to federal jurisdiction. Sufficient topsoil to facilitate revegetation would be segregated from subsoils during all construction and would be replaced on the surface upon completion of operations as part of the reclamation and revegetation program. Operators would employ appropriate topsoil storage technology and procedures to ensure soil viability and plant rooting potential are maintained. When topsoil piles exceed 3 feet in height or will be stored for 2 years or longer, Operators would develop a plan for BLM approval that details methods and/or procedures to maintain or replace soil microbial and nutrient viability for reclamation.

### Well Pads

Major components of each individual well pad include the following:

- a level drilling area for placement and support of the drilling rig and related equipment, production facilities, and storage tanks;

- if approved, an earthen reserve pit to contain drilling fluids, drilled cuttings, and fluids produced during the drilling operation; and
- an earthen flare pit for the safe ignition of flammable gases produced during drilling and permitted completion and testing operations.

The entire well pad area would be cleared of all vegetation, and up to 12 inches of topsoil would be removed from all cut, fill, and/or subsoil storage areas. Topsoil would be stockpiled for future use in reclamation. After the topsoil has been removed, the pad would be graded to prepare a level working surface. Each well location would be designed so that the amount of cut and fill material would “balance,” where feasible, thereby minimizing the need to stockpile excess subsoil adjacent to the well location until site reclamation. Materials excavated from the reserve pit (if such pit is approved) would be stockpiled adjacent to the reserve pit and used to backfill the pit during reclamation.

The area required for drilling and completion of each well would vary depending upon the total number of wells to be developed from the pad, and whether new development would occur from an existing pad. In general, single well pads would require 5 to 10 acres, and directional well pads with multiple wells would require from 6 to 28 acres.

Erosion control would be maintained through prompt revegetation and by constructing surface water drainage controls such as berms, diversion ditches, and sediment ponds as necessary at each well location. All diversion ditches and other surface water and erosion control structures at each location would be shown on topographic relief maps provided with each APD. Storm Water Pollution Prevention Plans (SWPPPs) would be prepared by each Operator for all wells, access roads, and other disturbances of more than 1 acre, in compliance with the Wyoming Department of Environmental Quality (WDEQ) Water Quality Division requirements.

### Roads

Roads would be designed by a licensed professional engineer if deemed necessary by the BLM (i.e., in problem areas such as steep slopes, unsuitable soils), and all roads would be built in accordance with guidelines established for oil and gas exploration and development activities in *BLM Manual* Section 9113. On completion of construction activities, the engineer would certify that the road was constructed in accordance with the approved road construction design, if deemed necessary by the BLM. Any deficiencies would be corrected to ensure compliance with both the approved Road Construction Plan and the APD. Once resource road construction is complete, all but 35 feet of the ROW (road surface area and portions of borrow ditch) would be reclaimed and revegetated.

Aggregates used for road and well location construction would be acquired from commercial sources in and adjacent to the PAPA. Prior to aggregate extraction, appropriate permits would be obtained from the BLM and/or WDEQ/Land Quality Division (LQD) and WDEQ/Air Quality Division (AQD), as appropriate. Aggregates would be free of noxious weeds.

### Drilling Operations

Up to 48 drilling rigs rated for drilling to depths of 14,000 feet or more may be operating simultaneously during project development to accommodate development of approximately 300 wells per year. All drilling operations and other well site activities would be conducted in compliance with applicable BLM, Wyoming Oil and Gas Conservation Commission (WOGCC), WDEQ, and other federal, state, and county rules and regulations. Including rig-up and rig-

down activities, drilling each well would take an average of approximately 50 days.

Directional drilling provides for the construction of a single well pad that may accommodate as many as 32 wells (consolidated well pad). The initial and LOP disturbance required for each consolidated well pad is increased over that for a pad with a single well, however, there are fewer total pads for a given number of wells. Consolidated well pads may be serviced by one access road and gathering system pipeline, as well as a single separation, dehydration, and storage facility. Where new directional wells are developed at an existing well site, separate separation, dehydration, and storage facilities may be used.

Drilling operations would utilize either water-based or oil based mud system or both, with additives to minimize downhole problems. The quantity of water used in drilling and completion varies between Operator because of mud type, and the re-use of partially treated produced water in drill-out and fracturing. If water based mud is used throughout the hole and there is no re-use of produced water, as much as 40,000 bbl Wasatch well water may be required per gas well. Use of oil-based mud in drillout below casing and re-use of produced water in completions can reduce that requirement to less than 5,000 bbl per gas well. There are currently approximately 100 water supply wells in the PAPA, but it is proposed that each new consolidated well pad would have its own water supply well to avoid haulage and piping. Because they are located on drilling pads, new water supply wells would require no additional disturbance. The All water well would be permitted with the Wyoming State Engineer's Office (SEO).

Water might still be trucked or piped to some well pads from water wells and/or treatment facilities depending on site-specific conditions, disturbance requirements, and time of year. Water pipelines would be temporary and would consist of either standard 3-to 6-inch diameter aluminum sections or polypipe. These water pipelines would be laid on the ground surface within road ROWs or directly overland and would be removed after completion/testing operations are done.

Operators would utilize closed drilling systems (no reserve pits) for well locations where certain environmental conditions exist (e.g. high water table). If reserve pits are approved, Operators would remove/vacuum fluids from reserve pits within 1 year of all wells on the pad being put into production. If this timeframe is infeasible on a particular site, the Operators would notify the WOGCC or BLM and fluids would be removed as soon as practical. If oil-based fluids are used, they would be recovered in tanks. If any oil enters reserve pits, it would be removed pursuant to WOGCC rules and regulations and the pit would be flagged overhead or covered with netting to prevent waterfowl use in compliance with BLM Informational Bulletin Number WY-93-054.

Surface casing is set to isolate shallow water zones (alluvium and Wasatch). After drilling out each well and logging it, production casing is run and cemented effectively isolating all geologic formations and eliminating fluid migration between hydrocarbon-bearing zones and freshwater aquifers.

### Completion Operations

Once the well has been drilled and cased, completion operations would begin to clean the wellbore, to conduct pressure testing, and to perforate potentially productive zones. A bond log would be run (a bond log tests the integrity of the cement bond between the casing and the borehole is verified), casing would be perforated in potentially productive zones downhole (e.g., Lance Pool sand lenses), fracture stimulated, and ultimately production tubing run. Multiple

sand lenses would be fracture-stimulated. Fracture-stimulation (fracturing) is the process by which fluids and proppants (typically water or nitrogen foam with sand) are pumped downhole under pressure through the casing perforations and into the formation. As the formation is fractured by applied pressure, the fractures are filled with sand to prop them open, so that they facilitate the flow of gas into the well.

Upon completion of fracturing, the well is flowed back to the surface to recover as much of the fracture fluid as possible and to clean excess sand out of the perforations. Production tubing might be permanently set, if warranted.

All fracture fluid additives would meet BLM and/or EPA requirements for disposal of oil field wastes. All fluids utilized in the completion procedure would be contained on the well pad in pits or tanks and disposed of in compliance with state and federal rules and regulations. Completion operations proposed for this project would continue to comply with the Wyoming DEQ-AQD flaring permits for the Pinedale Anticline operations.

If reserve pits are approved, Operators would remove/vacuum fluids from reserve pits within 1 year of all wells on the pad being put into production. If this timeframe is infeasible on a particular site, the Operators would notify the WOGCC or BLM and fluids would be removed as soon as practical. Off-lease disposal of fluids would be in strict accordance with all appropriate rules and regulations regarding the discharge, transport, and/or disposal of such fluids.

Interim reclamation of disturbed areas not needed for production would occur as specified in APDs. Up to 60 percent of the disturbed acres would be reclaimed during interim reclamation. After well completion, production equipment would be set, gathering pipelines installed, and the well placed on line, with production continuing as long as the well is capable of commercial production and a demand for the gas exists. Production equipment typically would include a "Christmas tree" at the wellhead (a series of valves designed to control pressures and regulate flows from the well); separators to segregate natural gas, condensate, and water; aboveground tanks for condensate and produced water storage with emission control devices to lower volatile organic compounds (VOCs) where required by WDEQ; a methanol tank and pump; a glycol dehydrator, with emission control devices to lower VOCs and hazardous air pollutants (HAPs) and pump; and a meter run for measurement of gas volumes produced into the pipeline. More or larger tanks would be required at multiple well pads. As gas production declines from wells, so does condensate and water production, and, over time, condensate and water tanks may be removed from well pads or smaller tanks may be substituted to accommodate reduced storage requirements for condensate and produced water.

All aboveground production facilities would be painted a standard environmental color that blends with the surrounding landscape, except for structures that require safety coloration to comply with Occupational Safety and Health Administration (OSHA) regulations.

#### Shell and Ultra Liquids Gathering System

Under Alternatives B, C, and D, Shell and Ultra plan to install a liquids gathering system to collect condensate and water from existing and future well pads. The piping right-of-way disturbance would be a short-term impact during piping construction and burial. Following installation of the piping, reclamation and seeding of right-of-ways would take place to restore the disturbed areas to a native state.

The liquids gathering systems would also require facilities for transporting, treating, and storing the collected liquids. These facilities will consist of central gathering facilities, which will include components such as: pumps, compressors, pressure vessels, tanks, liquids treating equipment, sales metering, and associated utilities systems necessary to provide power, heat, and other process needs.

Secondary pipelines would be necessary to transport the processed liquids from the central gathering facilities. These pipelines will be for condensate, water recycling and disposal, and for gas recovered from the facilities. Again, the sharing of right-of-ways has been considered in an effort to minimize surface disturbance associated with these secondary lines.

## **APPENDIX 8**

### **Reclamation Plans**

## **Appendix 8A**

### **Alternative A – Reclamation Plan**

## **Alternative A – Reclamation Plan**

The Reclamation Plan for Alternative A is the same as the Reclamation Plan in the PAPA ROD (BLM, 2000b).

## **Appendix 8B**

### **Alternative B – Reclamation Plan**

## **Alternative B – Reclamation Plan**

Prepared by  
Ultra Resources, Inc.  
Shell Exploration & Production Company  
Questar Market Resources

### **Purpose**

Questar Market Resources (Questar), Shell Exploration & Production Company (Shell), and Ultra Resources, Inc. (Ultra), hereinafter collectively referred to as “Proponents”, propose this reclamation plan to supplement the 2000 PAPA ROD reclamation components as provided below.

A high priority of the Proponents is to limit surface disturbance through multiple-well pads, interim reclamation, directional drilling and consolidated development. Use of these multiple-well pads will correspondingly reduce associated development impacts such as roads and pipelines. By concentrating pad locations and operational activities, Proponents will leave large blocks of acreage undisturbed and available for wildlife and livestock use.

The purpose of this plan is to incorporate measures which will support the return of as much of the disturbed acreage to its pre-disturbed state as quickly as feasible upon conclusion of drilling and completion operations from a given surface pad.

### **Scope**

This plan applies to practices within the PAPA to protect vegetation and to ensure proper and timely restoration of disturbed areas to approximate pre-disturbance levels. Monitoring of reclaimed areas and pilot / demonstration reclamation plots will be done to assure successful reclamation occurs.

The Standard Practices as to soils and vegetation which are specified in the 2000 PAPA ROD page 20 – 21 and in Appendix A, pages A-2, A-12 - 15, and A-27 - 30 should be incorporated into the SEIS. In addition, as stated in Appendix A, page A-14, “BLM will continue to allow applicants to use their own expertise in recommending and implementing construction and reclamation projects,” thus permitting new methods and application practices to be implemented to accelerate and improve revegetation.

### **Proponent Committed Measures to Lessen Disturbance and the Need for Reclamation**

1. The proposed concentrated development, multiple-well pad plan will reduce overall vegetation disturbance by 48 percent over development envisioned under the 2000 PAPA ROD, a significant benefit to wildlife and livestock.
2. Proponents will use public and existing roads as much as possible to lessen new surface disturbance and habitat fragmentation. By using multiple-well pads, proponents will be able to eliminate up to 1.16 miles or about 12 acres of roadway and flowline easement per section.

3. Proponents will use existing pads to the extent feasible for infill development to reduce the need for new pads and lessen new surface disturbance.

### **Proponent Committed Measures for Reclamation**

1. Proponents will return as much of the disturbed acreage as possible to its pre-disturbed state as quickly as possible. Final revegetation will begin when the last of the wells on the pad is completed. Drilling and completing all wells on a pad sequentially results in earlier final revegetation and a smaller disturbed area. Proponents propose to use a variety of options and methods, such as the new habitat seed mixture of grasses, shrubs, and forbs and new application method which is in its second year of demonstration. This expedited reclamation will increase habitat patch sizes and reduce habitat fragmentation for sagebrush-obligate species. Proponents estimate that on the larger consolidated pads, approximately 70% of the pad will be reclaimed if pits were on the pad. If there are no reserve pits, the surface disturbance area is smaller and about 50% of that smaller pad would be reclaimed.
2. Proponents will utilize interim reclamation, where reasonable, to return as much of the landscape as possible to a condition usable by wildlife and livestock as quickly as possible. Interim reclamation will increase habitat patch sizes and reduce habitat fragmentation for sagebrush-obligate species.
3. Proponents will continue to monitor reclaimed areas and will encourage review of the monitoring data by BLM, Wyoming Game and Fish Department, and Wyoming Department of Agriculture habitat experts.
4. Proponents will adapt reclamation practices as appropriate based upon monitoring information. Successful reclamation to maintain soil stability and provide habitat function will be measured in stages, as follows:
  - a. The establishment of a viable seedling cover within 1 year of initiation of reclamation. Viable seedling cover shall consist of indigenous species and/or ecologically-comparable species as approved by BLM habitat experts;
  - b. Within 5 years of initiation of reclamation, the operator will establish at least 50% of indigenous vegetative cover and species composition; and,
  - c. Within 8 years of initiation of reclamation establish at least 80% of indigenous vegetative cover and species composition.
5. The initiation of reclamation will commence immediately after the last well scheduled on a pad is put into production, as weather permits. In the event that more than two years will lapse between the drilling and / or completion of wells on a pad, the BLM may require interim reclamation and / or temporary site stabilization measures.
6. Proponents will test and implement, as appropriate, new methods of reclamation, seed mixtures, and application practices to accelerate and improve the revegetation in consultation with BLM and WGFD.

## **Appendix 8C**

### **Alternative C – Reclamation Plan**

## Alternative C – Reclamation Plan

Achieving these objectives would, in part, mitigate impact to Land Use/Land Cover, Recreation Resources, Visual Resources, Surface Water, Soil Resources, Vegetation Resources, Grazing Resources, Riparian Resources, Threatened and Endangered Species and Special Status Species, and Wildlife and Aquatic Resources.

### Temporary Site Stabilization

1. On existing well pads that would not be fully developed within the upcoming annual cycle, all bare ground would have at least a 75 percent protective cover that may include but not be limited to organic mulch, herbaceous vegetation, jute matting, or other erosion-preventative fabric. Protective cover may be excluded on active work sites (up to the wellhead with production equipment) if justified by the Operator and with concurrence of BLM.
2. During the period when an existing well pad is not being fully developed, there would be no sediment discharge from the existing pad. Operators would modify all existing well pads to achieve zero sediment discharge for a 25-year storm or snowmelt event within 1 year of following authorization by BLM in the SEIS ROD.
3. During the period when an existing well pad is not being fully developed, the well pad would be vegetated prior to the first winter after the ROD to achieve at least 50 percent vegetative cover of desirable herbaceous species by the following spring.
4. If an existing well pad would not be fully developed in 2 or more years after the ROD, desirable vegetation growth on the well pad would be at least 80 percent cover within three growing seasons.
5. Reserve pits on existing pads that would not be fully developed in 2 or more years after the ROD would be reclaimed prior to the first winter after the ROD.
6. Access road(s) leading to the temporarily stabilized well pad would be revegetated to the same levels required on the well pad.
7. Vehicular access on the revegetated road(s) would be on two-tracks established during road revegetation. Two-track access would be sufficient for use by only one vehicle at a time.
8. Pipeline corridor(s) leading to the temporarily stabilized well pad would be revegetated immediately after construction.
9. Vehicular access on the reclaimed, revegetated pipeline corridors would be on two-tracks only if there is no adjacent road. No vehicular access would be allowed on reclaimed, revegetated pipeline corridors. Two-track access, if allowed, would be sufficient for use by only one vehicle at a time.

## Full Site Reclamation

1. Once a well pad has been fully developed, full site restoration and reclamation would begin as soon as the ground is not frozen and would be completed before the onset of winter.
2. Full site restoration would require re-grading the pad to conform to the original contours.
3. Full site restoration would require redistributing the original topsoil or transfer and distribution of topsoil from a newly cleared well pad in the same geographic area with similar slope and soil characteristics.
4. Full site restoration would require protection of vegetation until herbivory by wildlife and livestock can be sustained.
5. Access road(s) leading to the fully restored well pad would be reclaimed to conform to the original corridor contours.
6. Access road(s) leading to the fully restored well pad would be revegetated to the same levels required on fully reclaimed well pads.
7. Pipeline corridor(s) leading from the fully restored well pad would be reclaimed to conform to the original corridor contours.
8. Pipeline corridor(s) leading from the fully restored well pad would be revegetated to the same levels required on fully reclaimed well pads.
9. Vehicular access on the reclaimed, revegetated pipeline corridors would be on two-tracks only if there is no adjacent road. No vehicular access would be allowed on reclaimed, revegetated pipeline corridors. Two-track access, if allowed, would be sufficient for use by only one vehicle at a time.

## Reclamation Monitoring

### Monitoring Responsibilities

1. It is the responsibility of the Operator to monitor reclaimed areas, determine if reclamation criteria are being met, develop and implement remedial actions if success standards are not being met, provide resulting data to the BLM annually, and request concurrence from BLM that success standards have been met and monitoring is no longer required.
2. It is the responsibility of the BLM to evaluate the annual monitoring reports, provide concurrence (or not) with the reclamation assessments as to whether or not success standards are being met and the rationale for the determination.
3. It is the responsibility of the BLM to provide Operators with remedial actions when reclamation success criteria are not being met. The remedial actions may include such things as soil testing, soil amendments, irrigation, and seeding.

## Monitoring Methods

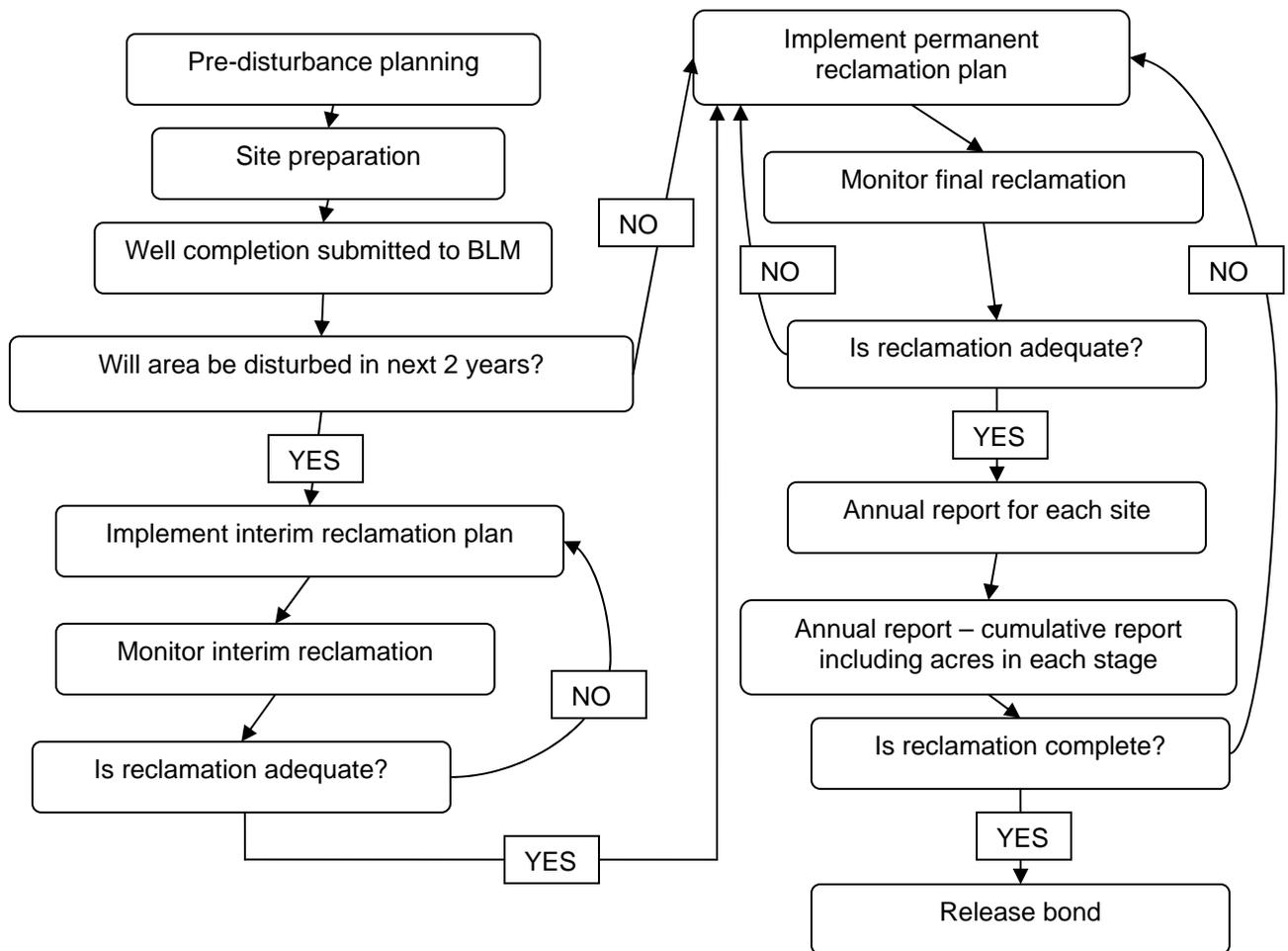
1. Monitoring methods provide the basis for consistent, uniform, and standard vegetation attribute sampling that is economical, repeatable, statistically reliable, and technically adequate. Vegetative monitoring would be conducted using BLM approved monitoring methods. The following guidelines would be used to determine if the site has met final reclamation criteria. Specific guidelines can be found at the BLM Library [Sampling Vegetation Attributes, Interagency Technical Reference 1734-4, 1996](http://www.blm.gov/nstc/library/techref.htm) <http://www.blm.gov/nstc/library/techref.htm>
  - a. Location of data collection:
    - i. A sample representation of the vegetative population would be used to collect the vegetative data on the reclamation and reference sites.
    - ii. The reference site location would represent the ecological characteristics described in the reclamation criteria.
    - iii. The sites would be permanently marked with a GPS unit for accuracy of future analysis. Precise locations of the site would be noted on a detailed map or aerial photo. The exact location of the study site and the directions for relocating it would also be noted.
    - iv. See Sampling Vegetation Attributes, Chapter III- Study Design and Analysis, part B, for statistical considerations to be used.
  - b. Timing of data collection.
    - i. If at all possible, baseline data should be collected prior to disturbance.
    - ii. Monitoring will occur during the growing season post seeding to determine if seeds have germinated. It is crucial to understand if a viable seed source exists on the reclamation site. If seeds germinate but seedlings do not survive due to weather conditions, the site must be reseeded.
    - iii. Monitoring may require multiple visits to a site within a given year to capture presence of species (especially forbs) that grow at various times during the growing season. In general, most plants are at their peak in June.
2. Data Collection Methods: For accuracy and time effectiveness, systematic sampling would be used to decrease personal bias. A standard procedure would be identified and used in all data collection methods.
  - a. Ground cover and species composition would be evaluated using line-point intercept by plant species method. At a minimum, 200 data points should be collected on each site.
  - b. Line-point intercept techniques result in smaller non-sampling errors than the use of quadrants.
  - c. Nested Frequency Quadrants would be used to measure frequency. At a minimum, 200 frame plots on each site should be used to calculate data.
  - d. The density method as described in Sampling Vegetation Attributes Interagency Technical Reference would be used to measure density. At a minimum, 200 frame plots on each site should be used to calculate data.
  - e. Production measurements would be made using the double sampling method. Data should be collected from a minimum of 20 plots on each site.
  - f. To measure erosion control, a soil surface factor of 1 to 20 percent must be achieved.
3. Photo Points. Permanent photo points would be established on both the pre-disturbed site and the reference site. Photo points should be permanently marked with a GPS.

Photos should be taken yearly (preferably in June) as close to the same time of year previous photos were taken to reduce difference in plant growth characteristics.

- a. Close-up pictures show the soil surface characteristics and the amount of ground surface covered by vegetation and litter. Close-ups would be taken at permanently located photo plots. A 1-meter x 1-meter photo plot is recommended.
- b. General view pictures present a broad view of a site. Pictures depicting north, south, east, and west would also be established and monitored.

4. Stages of reclamation. After evaluating the monitoring data, each site would be categorized into one of four stages to determine landscape trends and reclamation status of the PAPA.

- a. Contouring, soil preparation, seeding (may be different between grasses and forbs/shrubs)
- b. Preliminary evaluation in 1 to 3 years – some criteria could be developed to aid in determining whether or not the seeding is successful so a determination can be made as to whether or not to reseed.
- c. Criteria met or not met – identification of potential plant community in early successional stage that is specific to range site (number of shrubs and forbs important here).
- d. Final Reclamation and bond release – similar composition as above but with greater structure and shrub abundance.



## **Appendix 8D**

### **Alternatives D and E – Reclamation Plan**

## Alternatives D and E – Reclamation Plan

The Operators are responsible for the satisfactory and timely reclamation of the land surface disturbed by their operations in accordance with federal regulations and the standards, guidelines, and criteria set forth below. Operators are encouraged to reduce net disturbance utilizing aggressive reclamation techniques that restore wildlife habitat and livestock grazing function. These standards would apply to all surface disturbing activities including but not limited to pads, roads, right-of-way, and all industry associated pipelines.

All surface disturbances will be reclaimed to meet Bureau of Land Management (BLM) standards as described in Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development – The Gold Book, and specific criteria identified in this document. Habitat and livestock grazing reclamation shall be initiated to meet criteria standards on all portions of the well pads, access roads, etc not needed for production operations when the last well on the pad is drilled and completed or when no forecasted drilling (based in existing Wyoming Oil and Gas Conservation Commission permitted spacing or depth limitations) or completion activity is expected within two years, but additional well development activity is planned on the pad. Sites stabilization including seeding will occur during the first appropriate growing season. BLM will coordinate such requests for expansion and reoccupation with Wyoming Game and Fish Department and/or other appropriate agencies through the Application for Permit to Drill (APD) process. Where practical this coordination would occur through the annual meeting, but could occur on a case-by-case basis throughout the year. Proposals to expand or reoccupy a pad after habitat and forage reclamation has been initiated would be approved by Bureau of Land Management.

### **Reclamation Objectives**

The objective of **interim reclamation** is to achieve healthy, biologically active topsoil; control erosion; and restore habitat, visual, and forage function on those portions of the disturbed area not need for production operations for the life of the well or facilities or until final reclamation is initiated.

Interim reclamation may be considered successful when:

- Disturbed areas not needed for long-term production operations or vehicle travel are recontoured, protected from erosion, and revegetated with a self-sustaining, vigorous, diverse, native (or otherwise approved) plant community sufficient to minimize visual impacts, provide habitat and forage, stabilize soils, and impede the invasion of noxious weeds.

The objective of **final reclamation** is to achieve habitat, forage, and hydrologic function the functions that existed prior to disturbance. Including restoration of the original landform or creating a landform that approximates and blends in with the surrounding landform. Final reclamation involves restoring natural vegetative community, hydrologic systems, visual resources, agricultural values and wildlife habitats.

Final reclamation may be considered successful when:

- The original landform is restored for individual disturbed areas including well pads, production facility areas, roads, pipelines, and utility corridors.
- A self-sustaining, vigorous, diverse, native (or otherwise approved) plant community is established on the site, with a density or frequency sufficient to control erosion and

non-native plant invasion and reestablish wildlife habitat and forage production. Sites demonstrate productivity approximately equal to or better than pre-disturbance levels.

- Plants are resilient as evidenced by well-developed root systems, flowers, and seed heads. Sites must exhibit sustainability of desired attributes after the removal of external influences for a period of not less than one year.
- Shrubs are well established and in a “young” age class at a minimum (therefore, not comprised of seedlings that may not survive until the following year).
- In agricultural areas, irrigation systems and soil conditions are reestablished in such a way as to ensure successful cultivation and harvesting of crops.
- Erosion control is sufficient so that water naturally infiltrates into the soil and gullying, headcutting, slumping, and deep or excessive rilling (greater than 3 inches) or excessive sheet erosion is not observed.
- The site is free of federal, state and county-listed noxious weeds, oil field debris, contaminated soil, and equipment.

### **Reclamation Plan and Annual Reports**

The Operators will prepare a detailed Reclamation and Monitoring Plan for the SEIS area within 1 year of the signing of the ROD. The Plan will include appropriate quantitative and qualitative reclamation and monitoring standards, as detailed below.

Site-specific reclamation plans will continue to be included with the section 10 of the 13 point Surface Use Plan of Operations for APD-related surface disturbing activity and in the Plan of Development (POD) for right-of-way related actions. The reclamation plan for surface disturbance should reference and be consistent with the overall Reclamation Plan for the SEIS area and should reference the ecological site type when the site type is available, or will reference general vegetation composition if ecological site type data is not available. The plan will address erosion control measures including wind erosion.

Reclamation standards, objectives, and results will be reviewed during the Annual Planning Meetings. Reclaimed sites should be inspected annually (until release of bond) and evaluated the first and third growing seasons post seeding to determine if desirable plants are establishing. Operators will provide annual ERRP reports indicating reclamation status of all locations (to include extent of reclamation, vegetative composition, density or frequency, cover, resilience, sustainability, diversity and noxious weed presence, and surface stability. Surface disturbance reports will include “as built” GIS data in acceptable form for inclusion into BLM database.

### **Monitoring and Evaluation**

The Operators shall monitor and evaluate reclamation success and shall prepare an annual monitoring and evaluation report to be submitted to BLM and the cooperating agencies a minimum of 3 weeks prior the annual meeting. Sites will be monitored and evaluated by individuals skilled in rangeland or reclamation monitoring (including knowledge of local ecology and plant identification). An interagency-review team will annually review and analyze the annual monitoring results and methods.

Should the success criteria stated below not be met, the operators will be responsible for implementing additional measures as directed by BLM. Wyoming Game and Fish Department (WGFD), Department of Environmental Quality (DEQ) and/or other appropriate agencies may

provide guidance and suggestions to BLM what the additional measures could include, such as: soil amendments, reseeding, inter-seeding, providing precipitation, fencing to isolate plantings from ungulates, and creating snow fences to increase snowfall depth.

### **Interim or Final Reclamation Criteria**

A sample representation of the vegetative population will be used to collect the vegetative data on the reclamation and reference site. The reference site location will represent the ecological characteristics of the well pad prior to disturbance.

Successful reclamation to facilitate restoration of habitat function will be measured in stages as follows:

Within 1 year of initiation of interim or final reclamation sites will demonstrate the establishment of a viable desirable seedling density or frequency. Desirable seedling density or frequency, compared to reference site, shall consist of a vigorous, diverse, native (or otherwise approved) plant community or ecologically comparable species as approved by BLM Authorizing Officer.

### **Vegetative Criteria for Interim Reclamation**

**a. Native Forbs:** The average density or frequency of desirable forbs must be a minimum of 75% of the reference site within 5 years. Diversity of forbs on a reclaimed site must be equal to or greater than the reference site within 5 years.

**b. Native Shrubs:** The average density or frequency of the shrub component must be at least 50 % of the reference site within 5 years. This includes both shrubs and half shrubs (e.g. winterfat, fringed sage, etc.). At least 15 % density or frequency of the shrub component must be by the dominant species from reference site. The diversity of shrubs must be equal to or greater than the reference site.

**c. Native Grasses:** Reclaimed sites must have a minimum of 3 native perennial grass species present, 2 of which must be bunch grass species. These are to be planted at rates appropriate to achieve abundance and diversity characteristics similar to those found on the reference site.

**d. Non-Native Weeds:** Sites must be free from all species listed on the Wyoming and federal noxious weed lists. All state and federal laws regarding noxious weeds must be followed. Other highly competitive invasive species such as cheatgrass and other weedy brome grasses are also prohibited in seed mixtures and will be actively treated if are found in the reclaimed areas,

**e. Plant Vigor:** Plants must be resilient as evidenced by well-developed root systems, flowers, and seed heads. All sites must exhibit the sustainability of the above desired attributes after the removal of external influences. A minimum of 1 growing season without external influences (irrigation, mat pads, fences, etc.) may satisfy this requirement.

## **Full Site Final Reclamation Criteria**

### **1. Ground Cover & Ecological Function**

To ensure soil stability and nutrient cycling, ground cover must be equal to or greater than the reference site and vegetative litter must be decomposing into the soil.

### **2. Vegetative Criteria**

**a. Native Forbs:** The average density or frequency and total diversity of forbs must be equal to or greater than the reference site within 8 years

**b. Native Shrubs:** The average density or frequency of the shrub component must be at least 80% of the reference site within 8 years. This includes both shrubs and half shrubs (e.g. winterfat, fringed sage, etc.). At least 25% density or frequency of the shrub component must be the dominant species from the reference site. The diversity of shrubs must be equal to or greater than the reference site.

**c. Native Grasses:** Reclaimed sites must exhibit grass production equal to the reference site. A minimum of 3 native perennial species must be included with at least 2 bunch grass species.

**d. Non-Native Weeds:** Sites must be free from all species listed on the Wyoming and Federal noxious weed list. All state and federal laws regarding noxious weeds must be followed. Other highly competitive invasive species such as cheatgrass and other weedy brome grasses are also prohibited.

**e. Plant Vigor:** Plants must be resilient as evidenced by well-developed root systems and flowers. Shrubs will be well established and in a “young” age class at a minimum (e.g. not comprised of seedlings that may not survive until the following year).

### **Other Requirements**

All seed must be native (or otherwise approved) ecologically suitable species and site-specific. Should available seed mixtures, techniques or other applications be available to enhance the productivity and diversity of the reclaimed area used by wildlife or livestock, these methods should be pursued as approved by the BLM Authorizing Officer.

All topsoil from disturbed sites should be salvaged and stockpiled for later use in reclamation. Stockpiled topsoil will be seeded with native perennial grasses or an appropriate cover crop and soil should be reapplied to a reclaimed area while the topsoil is still viable – usually within 2-5 years.

Any mulch used would be free from mold, fungi, or noxious weed seeds. Mulch may include native hay, small grain straw, wood fiber, live mulch, cotton, jute, biodegradable netting, and rock or otherwise approved media. Straw mulch should contain fibers long enough to facilitate crimping and provide the greatest cover. The grantee or lessee would be responsible for the control of all noxious weed infestations on surface disturbances.

**Release Criteria for Suspended and Term NSO Leases (Alternative D only)**

A primary goal of reclamation is to restore functioning habitat. Federal suspended and term NSO leases would be considered for release when habitat function is demonstrably restored in the Alternative D Core Area. Successfully reclaimed areas are defined in detail above under Full Site Final Reclamation Criteria. Habitat may qualify as restored when ecological processes are functioning and the land is providing sustainable forage for wildlife and/or livestock as documented by animal use and stable populations based on the Wildlife Monitoring and Mitigation Matrix (Appendix 11 to the Final SEIS). BLM will confer with WGFD prior to releasing the federal suspended and term NSO leases in the flanks. Consistent with their commitment to the BLM, development could proceed on leases held by Anschutz after the primary 5-year term but would be subject to existing seasonal restrictions.

## **APPENDIX 9**

### **Wildlife and Habitat Mitigation Plans**

## **Appendix 9A**

### **Alternative B – Wildlife and Habitat Mitigation Plan**

## Alternative B – Wildlife and Habitat Mitigation Plan

Prepared by  
Ultra Resources, Inc.  
Shell Exploration & Production Company  
Questar Market Resources

### Purpose

Ultra Resources, Inc. (Ultra), Shell Exploration & Production Company (Shell), and Questar Market Resources (Questar), collectively referred to as the “Proponents”, propose this wildlife and habitat mitigation plan to supplement wildlife and habitat provisions identified in the 2000 Pinedale Anticline Exploration and Development Project Record of Decision (ROD) (Bureau of Land Management [BLM] 2000).

On December 6, 2004, the Wyoming Game and Fish Department (WGFD) issued the guidance document Recommendations for Development of Oil and Gas Resources within Crucial and Important Wildlife Habitats (WY Game & Fish Department, 2004 Cheyenne, WY). This document recommends various mitigation and management practices to address impacts to wildlife which could be employed by oil and gas industry in the development of oil and gas resources in Wyoming. In addition to its recommended standard management practices to reduce wildlife impacts associated with oil and gas development, the WGFD also recommended additional mitigation/management prescriptions including: directional drilling, clustered development, condensate removal, remote monitoring, travel plans, environmental monitoring, and as appropriate, gate and close all newly constructed roads to public travel. The following Proponent commitments have incorporated not only most of the recommended standard management practices, but all of the recommended additional mitigation/management prescriptions.

The Proponents’ development proposal limits surface fragmentation through directional drilling, multiple-well pads, interim reclamation and consolidated development areas. Use of these multiple-well pads within consolidated development areas will correspondingly reduce associated development impacts such as roads and pipelines. In addition, the Proponents will substantially reduce the amount of human activity and on-site facilities through the use of liquids gathering systems and consolidated production facilities which will result in decreased surface disturbance. By concentrating pad locations and operational activities, Proponents will leave large blocks of acreage undisturbed and available for wildlife use.

### Scope

This plan applies to practices within the Pinedale Anticline Project Area (PAPA) to ensure avoidance and minimization of impacts to wildlife and wildlife habitat and to ensure in the event that avoidance and minimization are unachievable, the proper and timely mitigation of wildlife and habitat impacts both on-site and off-site, if needed.

This Plan amends the 2000 PAPA ROD and Mitigation Guidelines and Standard Practices, Appendix A, as they apply to big game and sage grouse except for surface occupancy within 0.25 mile of an active lek. Proponents are requesting exceptions to existing stipulations for big game and sage grouse during wintering, nesting, and brood rearing periods within the concentrated development areas (CDA) for construction and development activities. This will allow for year round construction and development activities within these CDA’s during the multi-year period required to complete these actions thereby substantially reducing the time

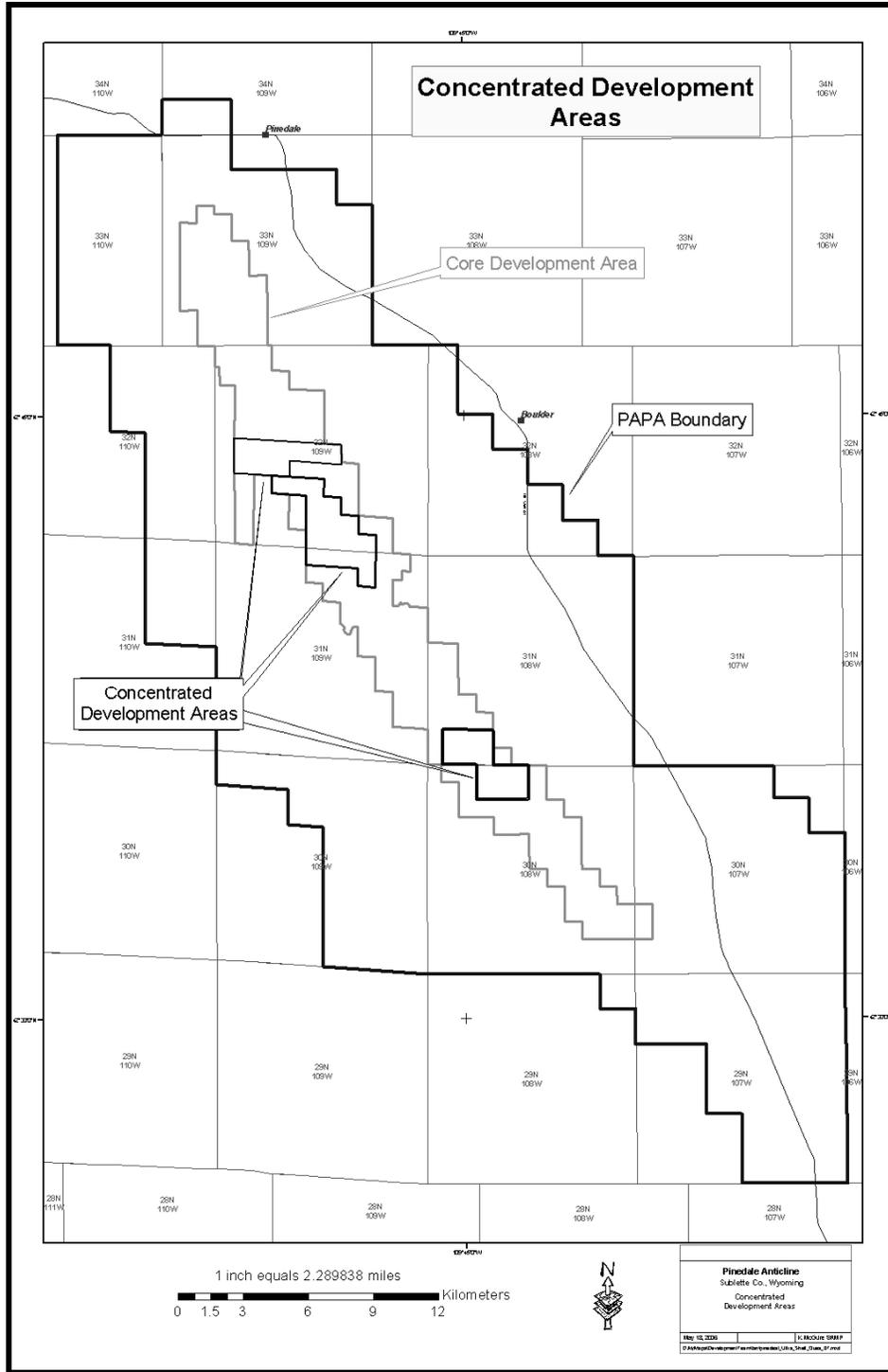
required for the project development phase. A 0.25-mile restriction of no surface occupancy of permanent facilities near active sage grouse leks will remain in effect. Exceptions for raptor and/or Bald Eagle stipulations will be sought on an individual basis by the Proponent wishing to conduct operations and will be addressed through Voluntary Best Management Practices (BMP's) and in coordination with the U.S. Fish and Wildlife Service (USFWS). Permitting mitigation alternatives outlined below will be implemented.

### **Proponent Committed Measures**

The Proponents' commitments for wildlife and habitat mitigation are designed to offset impacts resulting from their development activities within the PAPA, and center on: avoiding impacts; minimizing impacts; rectifying, repairing, rehabilitating, or restoring environmental conditions; reducing or eliminating impacts over time; and compensating for impacts on-site or off-site. As outlined under the National Environmental Policy Act (NEPA), 40 CFR 1508.20:

Avoidance of Impact: "Avoiding the impact altogether by not taking a certain action or parts of an action."

- The Proponents will make efforts to avoid the impacts that could otherwise occur if development was implemented pursuant to the 2000 PAPA ROD. Proponents propose to use directional drilling on larger multi-well pads in consolidated development areas year round. Under a No Action alternative, operators could require up to 839 new pads (with additional NEPA analysis) to develop 4,399 new wells. The Proposed Action will require 253 new pads to develop the 4,399 new wells. The year round access development proposal utilizes a total of 601 pads for natural gas development including some possible downspacing to 20, 10 and 5 acre down-hole well density. The No Action total is 1,187 pads. The Proposed Action provides about a 50% percent reduction in total pads. Thirty or more wells may be developed from a single pad in some areas. The 2000 PAPA ROD analyzed wells at 40-acre spacing and limited active pads to 700 pads.
- The arrangement of the consolidated areas will leave large, contiguous blocks of land without active development activities. The estimated total disturbed acreage (without reclaimed acreage calculated into the number) will leave 92% of the PAPA undisturbed by natural gas development. An example of CDA development:



- The Proponents will utilize the following voluntary eagle and raptor BMP's from which they may choose any or all as voluntary measures, and will seek technical assistance from the BLM and the USFWS as necessary.
  1. Conduct appropriate raptor surveys before commencement of ground disturbing activities within 1 mile of proposed disturbance to determine status of known nests and roosts and to identify new nests and roosts.
  2. Monitor any activities that may adversely impact bald eagles and other raptor species.
  3. Restrict activities within 0.5 mile of active raptor nests (1 mile of active bald eagle and ferruginous hawk nests) from the period of early courtship through the fledging of chicks (generally from February 1 to August 15). With assistance from the USFWS, modifications to protective buffers may be considered when topography, vegetation and other variables serve as natural protective buffers.
  4. Restrict activities within 1 mile of known bald eagle winter roosts from November 1 to April 1, when activity has been verified. With assistance from the USFWS, modifications to the 1-mile protective buffer may be considered when topography, vegetation and other variables serve as natural protective buffers.
  5. In coordination with the USFWS noise reduction barriers may be used to minimize disturbance when activities are proposed within an established protective buffer.
  6. Prohibit activities that produce extremely loud noises within 1 mile of active bald eagle nests during nesting periods unless greater tolerance to the activity (or similar activity) has been demonstrated by the particular pair of bald eagles through monitoring.
  7. Build all power lines to standards identified in Avian Power Line Interaction Committee and utilize industry-accepted standards to prevent raptors from being electrocuted on towers and poles.
  8. To preclude bald eagles or other raptors from nesting on human-made structures such as cell phone towers and condensate tanks and to avoid impeding operation or maintenance activities, install anti-perching devices on structures to discourage use by raptors. Additionally, in coordination with the USFWS and based on appropriate ecosystem management, construct artificial nesting platforms to encourage nesting away from human activity.
  9. As necessary, notify the appropriate authorities (Wyoming Department of Transportation on Highways and WGFD or BLM on rural and county roads) of the presence of roadside carrion and ask that they remove the carrion as soon as possible. Carcasses may be covered in the interim to discourage scavenging by bald eagles and other raptors, but only authorized personnel may touch or remove the carcasses.

10. When possible, include the USFWS in on-site reviews for future project sites.
11. The Proponents will work to identify voluntary opportunities to conserve and/or improve natural resources in the area to promote a positive land ethic. Maintain adequate buffer from riparian habitats where possible (outside edge of trees as area of effect). Buffers would be site specific depending on vegetation and topography. They will be developed in coordination with qualified biologists, the USFWS and/or the BLM as necessary. Proponents will strive to conserve potential nesting, roosting and foraging habitat whenever possible by retaining mature trees and old growth stands wherever possible, particularly within 0.5 mile of water.

Minimize Impacts: “Minimizing impacts by limiting the degree or magnitude of the action and its implementation.”

- All activities will be conducted in such a manner that minimizes impacts on wildlife, habitat and the local communities.
- The Proponents will minimize the total area of surface disturbance and associated areas of indirect habitat loss by reducing to the extent possible human presence and activity.
  1. The Proponents will utilize liquids gathering systems and centralized processing and storage facilities where feasible thereby reducing traffic.
  2. The Proponents will utilize computer assisted remote monitoring of producing wells, and anticipate an average of only 1 roundtrip per day to each well pad during production.
  3. In addition to minimizing surface disturbance by restricting activities to existing roads, traffic on those roads will also be minimized to the extent practical by coordinating and scheduling the transportation routes and use of the roads by project personnel and service contractors.
  4. Commuting traffic will be minimized in crucial big game winter range and sage grouse winter concentration areas by bussing rig crews from staging areas to work areas.
  5. Total acreage disturbance by 2024, without reclamation considered, is estimated at 14,961 leaving 92% of the PAPA undisturbed.
- The Proponents will make efforts to reduce the total duration of project activities in the PAPA.
  1. The areas of concentrated simultaneous drilling, completion, construction, and production activities will be completed in as short a time as possible by completely drilling and completing all wells on a pad as feasible prior to moving development activities to another pad.

- Development (drilling, and completion activities) within the core area (48.36 square miles) will be concentrated to a maximum of 19 square miles in the three development areas which is 39.29% of the core acreage, leaving 60.71% of the core available for wildlife. This will result in leaving the greatest amount of undisturbed habitat as possible at any point in time in the best combination of the following:
  - largest area
  - largest contiguous blocks
  - best functional connectivity
  - highest quality
- The Proponents' implementation of a road management plan, which voluntarily restricts their activities to existing roads where possible, will reduce surface disturbance and expansion of human disturbance into new areas and will lessen road mileage by 70% as compared to traditional non-concentrated, single-well pad development.
- The Proponents will plan their activities to avoid to the extent practical moving drill rigs in crucial big game winter range after November 15 and before May 1, thereby reducing the number of trucks, equipment and associated traffic during big game stipulations.
- Each year, the specific areas of concentrated activities will be determined through joint review of Proponent development plans. The Proponents (combined or separate as appropriate), BLM, and WGFD will work to reach agreement on the final plans as early in the calendar year as possible to allow sufficient time to plan, permit, and execute new construction as required in the summer months for the next activity year.
- The Proponents will also provide a 10-year rolling forecast of PAPA activity at the same time each year to fully describe the future development plans on an ongoing basis.
- Each year, the Proponents will collaborate as appropriate seeking opportunities to adjust the size of the areas required for concentrated activities and reduce impacts. The Proponents, BLM, and WGFD will jointly seek improvements to the annual and 10-year development plans designed to further reduce potential project impacts.
- The Proponents may choose any or all of the following BMP's as voluntary measures which can be used to minimize disturbance to bald eagles and other raptors when oil and gas development activities occur within recommended protective buffers.
  1. During night operations, direct lighting toward the pad to avoid light disturbance to surrounding areas if no negative pad safety impact is foreseen.
  2. Reduce unnecessary traffic and encourage travel times to be during daylight hours between 9-3.
  3. In areas within 1 mile of active nests where there is line of sight from active nests to the activity, pipeline installation equipment shall be shielded from the affected area with camouflage netting.

4. Avoid potentially disruptive activities or permanent above ground structures in the bald eagles' direct flight path between their nest and roost sites and important foraging areas.

Restoration of Impacts: "Rectifying the impact by repairing, rehabilitating, or restoring the affected environment."

- Mitigation measures will begin immediately or as soon as practical, to avoid any lag time between impacts that decrease habitat function and the on-the-ground mitigation actions that increase habitat function. Mitigation in the form of interim reclamation (utilizing native cool-season grasses, forbs, and shrubs in the seed mix) will proceed as soon as practical after development drilling, completion and construction activities are completed on individual pads, which will reduce the net surface disturbance as development proceeds. Once all drilling and completion work has been finished and all wells on the pad are on production, the Proponents forecast that 70% of the disturbed pad area will be reclaimed on individual pads containing pits, and 50% of the disturbed pad area will be reclaimed on pads developed without reserve pits. The Proponents will also temporarily reclaim pads when no forecasted drilling or completion activity is expected on the pad for the following two years.
- Impacts will be mitigated by developing coordinated mitigation approaches with the BLM, WGFD, and other federal and state agencies to seek opportunities to further benefit wildlife.
- Key habitats and habitat components, such as crucial winter ranges, migration routes, sage grouse seasonal habitats, and identified sensitive species habitats, will receive first consideration for mitigation. Specific mitigation actions will as much as possible:
  - occur on-site, or immediately adjacent to impacts
  - address the same animals or species that are being impacted
  - address the same habitat components that are being impacted

Reduction and Elimination of Impacts: "Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the project."

- The Proponents have committed to utilizing liquids gathering systems and centralized processing and storage facilities where feasible. Liquids gathering systems and centralized facilities will significantly reduce tanker truck traffic, most notably after the project construction phase.
- The Proponents will utilize computer assisted remote monitoring of producing wells. Proponents anticipate 1 field operator visit per day per pad.
- Proponents will use existing roads where possible which will reduce surface disturbance and expansion of human disturbance into new areas and will lessen road mileage by 70% compared to traditional non-concentrated, single-well pad development.

Compensation for Impacts: “Compensating for the impact by replacing or providing substitute resources or environments.”

- The Proponents have agreed to a 3:1 acre off-site mitigation ratio in the event that off-site mitigation is required to compensate for loss of on-site habitat (i.e., for every acre of long-term on-site habitat disturbed by the project, Proponents will improve three acres off-site habitat). This would supersede existing Questar commitments for off-site mitigation as identified in Decision Records for Questar’s existing over-winter development proposals (BLM 2004 [*Finding of No Significant Impact, Decision Record and Environmental Assessment for the Questar Year-Round Drilling Proposal, Sublette County, Wyoming*], and BLM 2005 [*Finding of No Significant Impact, Decision Record and Environmental Assessment for the Questar Year-Round Drilling Addendum, Sublette County, Wyoming*]).
- The Proponents commit to developing a comprehensive off-site mitigation plan within one year of SEIS ROD release. Options that may be included in the plan are enhancing habitat on land contiguous to the PAPA and acquisition of property rights (leasehold interest, short-term or long-term conservation easements, etc.) designed to set aside habitats, protect key migration routes and preserve open space.
- Off-site mitigation will generally be implemented if on-site actions are not considered adequate, or if off-site measures are considered to be of significantly greater value. Off-site mitigation would occur as close to the impacted area as possible, and provide habitat for the specific animals being displaced or experiencing habitat declines as a result of development. Off-site mitigation that occurs farther away would provide a key year-round life requirement for the animals that occupy the development area during part of the year.
- To assure implementation and use of effective monitoring efforts and mitigation options, annual mitigation planning for wildlife and habitats will be coordinated among BLM, WGFD, and the Proponents. The Proponents, BLM and WGFD will jointly seek improvements to the proposed development plans to further reduce project impacts.
- The Proponents would support formation of a dedicated multi-agency management team to plan and implement permitting, monitoring, mitigation, and reclamation activities. This will benefit both the Proponents and agencies by streamlining the development process, providing continual focus on plan implementation, and providing coordination and cost-efficiencies with other adjacent developments that could impact some of the same animals and habitats impacted by this project.
- The Proponents will monitor mitigation measures to determine mitigation effectiveness and provide ongoing information and direction for future mitigation efforts during the life of the field.
- The Proponents will commission and fund a habitat inventory of the PAPA. Habitat inventory data will be used for development, reclamation, and potential habitat improvement planning for key habitats and habitat components. Habitat improvements may be applied in important habitats to restore degraded or lost habitat functions.

- Concurrent with and complementing these on-site efforts to avoid, minimize and mitigate impacts, the Proponents have commissioned and funded wildlife research, wildlife monitoring and other special studies. The first year of a five year study on pronghorn antelope is now complete as is the first year of a five year research project on sage grouse. The mule deer study is in its sixth year of a seven year research and monitoring project.
- The Proponents will promote communication with other stakeholders as mitigation objectives and approaches are being developed. Specific wildlife and habitat mitigation objectives and actions should, as much as possible, be designed to minimize impacts to other important area resources (e.g., livestock, recreation, visual resources).

## **Appendix 9B**

### **Alternative C – Wildlife and Habitat Mitigation Plan**

## **Alternative C – Wildlife and Habitat Mitigation Plan**

If Alternative C is selected in the ROD, the Alternative B Wildlife and Habitat Mitigation Plan would be modified as appropriate. The only change that would be required would be changing references to Concentrated Development Areas (CDAs) to Development Areas (DAs).

## **Appendix 9C**

### **Alternative D – Wildlife and Habitat Mitigation Plan**

## Alternative D – Wildlife and Habitat Mitigation Plan

Prepared by  
Ultra Resources, Inc.  
Shell Exploration & Production Company  
Questar Market Resources

### **Purpose**

Ultra Resources, Inc. (Ultra), Shell Exploration & Production Company (Shell), and Questar Market Resources (Questar), collectively referred to as the “Proponents”, propose this wildlife and habitat mitigation plan to supplement wildlife and habitat provisions identified in the 2000 Pinedale Anticline Exploration and Development Project Record of Decision (ROD) (Bureau of Land Management [BLM] 2000).

On December 6, 2004, the Wyoming Game and Fish Department (WGFD) issued the guidance document Recommendations for Development of Oil and Gas Resources within Crucial and Important Wildlife Habitats (WY Game & Fish Department. 2004 Cheyenne, WY). This document recommends various mitigation and management practices to address impacts to wildlife which could be employed by oil and gas industry in the development of oil and gas resources in Wyoming. In addition to its recommended standard management practices to reduce wildlife impacts associated with oil and gas development, the WGFD also recommended additional mitigation/management prescriptions including: directional drilling, clustered development, condensate removal, remote monitoring, travel plans, environmental monitoring, and as appropriate, gate and close all newly constructed roads to public travel. The following Proponent commitments have incorporated not only most of the recommended standard management practices, but all of the recommended additional mitigation/management prescriptions as recommended by WGFD. These are measures that were not contemplated in the 2000 Pinedale Anticline Exploration and Development Project Record of Decision (ROD) (Bureau of Land Management [BLM] 2000).

The Proponents’ development proposal limits surface fragmentation through directional drilling, multiple-well pads, interim reclamation, development areas in the core and voluntary time-limited lease suspensions or no surface occupancy (NSOs) in the flanks. Use of these multiple-well pads within development areas will correspondingly reduce associated development impacts such as roads and pipelines. In addition, the Proponents will substantially reduce the amount of human activity and on-site facilities through the use of liquids gathering systems and consolidated production facilities which will result in decreased surface disturbance. Through development areas, voluntary time-limited lease suspensions or NSOs in the flanks, and operational activities, Proponents will leave large blocks of acreage undisturbed and available for wildlife use.

### **Scope**

This plan applies to practices within the Pinedale Anticline Project Area (PAPA) to ensure avoidance and minimization of impacts to wildlife and wildlife habitat and to ensure in the event that avoidance and minimization are unachievable, the proper and timely mitigation of wildlife and habitat impacts both on-site and off-site, if needed.

This Plan amends the 2000 PAPA ROD and Mitigation Guidelines and Standard Practices, Appendix A, as they apply to big game and sage grouse except for surface occupancy within

0.25 mile of an active lek. Proponents are requesting exceptions to existing stipulations for big game and sage grouse during wintering, nesting, and brood rearing periods within certain development areas as outlined in Alternative D in Chapter 2 for construction and development activities. This will allow for year round construction and development activities within these specific areas during the multi-year period required to complete these actions thereby substantially reducing the time required for the project development phase. A 0.25-mile restriction of no surface occupancy of permanent facilities near active sage grouse leks will remain in effect. Exceptions for raptor and/or Bald Eagle stipulations will be sought on an individual basis by the Proponent wishing to conduct operations and will be addressed through Voluntary Best Management Practices (BMP's) and in coordination with the U.S. Fish and Wildlife Service (USFWS). Permitting mitigation alternatives outlined below will be implemented.

### **Proponent Committed Measures**

The Proponents' commitments for wildlife and habitat mitigation are designed to offset impacts resulting from their development activities within the PAPA, and center on: avoiding impacts; minimizing impacts; rectifying, repairing, rehabilitating, or restoring environmental conditions; reducing or eliminating impacts over time; and compensating for impacts on-site or off-site. As outlined under the National Environmental Policy Act (NEPA), 40 CFR 1508.20:

Avoidance of Impact: "Avoiding the impact altogether by not taking a certain action or parts of an action."

- The Proponents will make efforts to avoid the impacts that could otherwise occur if development was implemented pursuant to the 2000 PAPA ROD. Proponents propose to use directional drilling on larger multi-well pads in development areas year round. Under Alternative D, operators commit to no more than 600 pads to develop 4,399 new wells. The year round access development proposal utilizes pads for natural gas development including some possible downspacing to 20, 10 and 5 acre down-hole well density. Thirty or more wells may be developed from a single pad in some areas. The 2000 PAPA ROD analyzed wells at 40-acre spacing and limited active pads to 700 pads.
- The arrangement of the development areas will leave large, contiguous blocks of land without active development activities. The estimated total disturbed acreage (without reclaimed acreage calculated into the number) will leave 92% of the PAPA undisturbed by natural gas development.
- Proponents offer to voluntarily suspend for a time-limited period or commit to time-limited NSOs on certain leases or acreage in the flank areas of the PAPA. This voluntary commitment ensures a significant portion of the flanks of the PAPA will be available as undisturbed habitat for wildlife.
- The Proponents will utilize the following voluntary eagle and raptor BMP's from which they may choose any or all as voluntary measures, and will seek technical assistance from the BLM and the USFWS as necessary.
  1. Conduct appropriate raptor surveys before commencement of ground disturbing activities within 1 mile of proposed disturbance to determine status of known nests and roosts and to identify new nests and roosts.

2. Monitor any activities that may adversely impact bald eagles and other raptor species.
3. Restrict activities within 0.5 mile of active raptor nests (1 mile of active bald eagle and ferruginous hawk nests) from the period of early courtship through the fledging of chicks (generally from February 1 to August 15). With assistance from the USFWS, modifications to protective buffers may be considered when topography, vegetation and other variables serve as natural protective buffers.
4. Restrict activities within 1 mile of known bald eagle winter roosts from November 1 to April 1, when activity has been verified. With assistance from the USFWS, modifications to the 1-mile protective buffer may be considered when topography, vegetation and other variables serve as natural protective buffers.
5. In coordination with the USFWS noise reduction barriers may be used to minimize disturbance when activities are proposed within an established protective buffer.
6. Prohibit activities that produce extremely loud noises within 1 mile of active bald eagle nests during nesting periods unless greater tolerance to the activity (or similar activity) has been demonstrated by the particular pair of bald eagles through monitoring.
7. Build all power lines to standards identified in Avian Power Line Interaction Committee and utilize industry-accepted standards to prevent raptors from being electrocuted on towers and poles.
8. To preclude bald eagles or other raptors from nesting on human-made structures such as cell phone towers and condensate tanks and to avoid impeding operation or maintenance activities, install anti-perching devices on structures to discourage use by raptors. Additionally, in coordination with the USFWS and based on appropriate ecosystem management, construct artificial nesting platforms to encourage nesting away from human activity.
9. As necessary, notify the appropriate authorities (Wyoming Department of Transportation on Highways and WGFD or BLM on rural and county roads) of the presence of roadside carrion and ask that they remove the carrion as soon as possible. Carcasses may be covered in the interim to discourage scavenging by bald eagles and other raptors, but only authorized personnel may touch or remove the carcasses.
10. When possible, include the USFWS in on-site reviews for future project sites.
11. The Proponents will work to identify voluntary opportunities to conserve and/or improve natural resources in the area to promote a positive land ethic. Maintain adequate buffer from riparian habitats where possible (outside edge of trees as area of effect). Buffers would be site specific depending on vegetation and topography. They will be developed in coordination with

qualified biologists, the USFWS and/or the BLM as necessary. Proponents will strive to conserve potential nesting, roosting and foraging habitat whenever possible by retaining mature trees and old growth stands wherever possible, particularly within 0.5 mile of water.

Minimize Impacts: “Minimizing impacts by limiting the degree or magnitude of the action and its implementation.”

- All activities will be conducted in such a manner that minimizes impacts on wildlife, habitat and the local communities.
- The Proponents will minimize the total area of surface disturbance and associated areas of indirect habitat loss by reducing to the extent possible human presence and activity.
  1. The Proponents will utilize liquids gathering systems and centralized processing and storage facilities where feasible thereby reducing traffic.
  2. The Proponents will utilize computer assisted remote monitoring of producing wells, and anticipate an average of only 1 roundtrip per day to each well pad during production.
  3. In addition to minimizing surface disturbance by restricting activities to existing roads, traffic on those roads will also be minimized to the extent practical by coordinating and scheduling the transportation routes and use of the roads by project personnel and service contractors.
  4. Commuting traffic will be minimized in crucial big game winter range and sage grouse winter concentration areas by bussing rig crews from staging areas to work areas.
  5. Total acreage disturbance by 2024, without reclamation considered, is estimated at 14,961 leaving 92% of the PAPA undisturbed.
- The Proponents will make efforts to reduce the total duration of project activities in the PAPA.
  1. The areas of simultaneous drilling, completion, construction, and production activities will be completed in as short a time as possible by completely drilling and completing all wells on a pad as feasible prior to moving development activities to another pad.
- Development (construction, drilling, and completion activities) will be as specified in Alternative D in Chapter 2. This will result in leaving the greatest amount of undisturbed habitat as possible at any point in time in the best combination of the following:
  - largest area
  - largest contiguous blocks
  - best functional connectivity
  - highest quality

- The Proponents' implementation of a road management plan, which voluntarily restricts their activities to existing roads where possible, will reduce surface disturbance and expansion of human disturbance into new areas and will lessen road mileage by 70% as compared to traditional single-well pad development.
- The Proponents will plan their activities to avoid to the extent practical moving drill rigs in crucial big game winter range after November 15 and before May 1, thereby reducing the number of trucks, equipment and associated traffic during big game stipulations.
- Each year, the specific areas of activities will be determined through joint review of Proponent development plans. The Proponents (combined or separate as appropriate), BLM, and WGFD will work to reach agreement on the final plans as early in the calendar year as possible to allow sufficient time to plan, permit, and execute new construction as required in the summer months for the next activity year.
- The Proponents will also provide a 10-year rolling forecast of PAPA activity at the same time each year to fully describe the future development plans on an ongoing basis.
- Each year, the Proponents, BLM, and WGFD will jointly seek improvements to the annual and 10-year development plans designed to further reduce potential project impacts.
- The Proponents may choose any or all of the following BMP's as voluntary measures which can be used to minimize disturbance to bald eagles and other raptors when oil and gas development activities occur within recommended protective buffers.
  1. During night operations, direct lighting toward the pad to avoid light disturbance to surrounding areas if no negative pad safety impact is foreseen.
  2. Reduce unnecessary traffic and encourage travel times to be during daylight hours between 9-3.
  3. In areas within 1 mile of active nests where there is line of sight from active nests to the activity, pipeline installation equipment shall be shielded from the affected area with camouflage netting.
  4. Avoid potentially disruptive activities or permanent above ground structures in the bald eagles' direct flight path between their nest and roost sites and important foraging areas.

Restoration of Impacts: "Rectifying the impact by repairing, rehabilitating, or restoring the affected environment."

- Mitigation measures will begin immediately or as soon as practical, to avoid any lag time between impacts that decrease habitat function and the on-the-ground mitigation actions that increase habitat function. Mitigation in the form of interim reclamation (utilizing native cool-season grasses, forbs, and shrubs in the seed

mix) will proceed as soon as practical after development drilling, completion and construction activities are completed on individual pads, which will reduce the net surface disturbance as development proceeds. Once all drilling and completion work has been finished and all wells on the pad are on production, the Proponents forecast that 70% of the disturbed pad area will be reclaimed on individual pads containing pits, and 50% of the disturbed pad area will be reclaimed on pads developed without reserve pits. The Proponents will also temporarily reclaim pads when no forecasted drilling or completion activity is expected on the pad for the following two years.

- Impacts will be mitigated by developing coordinated mitigation approaches with the BLM, WGFD, and other federal and state agencies to seek opportunities to further benefit wildlife.
- Key habitats and habitat components, such as crucial winter ranges, migration routes, sage grouse seasonal habitats, and identified sensitive species habitats, will receive first consideration for mitigation. Specific mitigation actions will as much as possible:
  - occur on-site, or immediately adjacent to impacts
  - address the same animals or species that are being impacted
  - address the same habitat components that are being impacted

Reduction and Elimination of Impacts: “Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the project.”

- The Proponents have committed to utilizing liquids gathering systems and centralized processing and storage facilities where feasible. Liquids gathering systems and centralized facilities will significantly reduce tanker truck traffic, most notably after the project construction phase.
- The Proponents will utilize computer assisted remote monitoring of producing wells. Proponents anticipate 1 field operator visit per day per pad.
- Proponents will use existing roads where possible which will reduce surface disturbance and expansion of human disturbance into new areas and will lessen road mileage by 70% compared to traditional single-well pad development.

Compensation for Impacts: “Compensating for the impact by replacing or providing substitute resources or environments.”

- Proponents commit to the agreed upon wildlife monitoring and mitigation matrix with performance based objectives and sequential outcomes. The matrix was agreed to among the Proponents, the Governor of Wyoming, and the WGFD. Please see Appendix 10 to the Final SEIS.
- The Proponents commit to developing a comprehensive off-site mitigation plan within one year of SEIS ROD release. Options that may be included in the plan are enhancing habitat on land contiguous to the PAPA and acquisition of property rights

(leasehold interest, short-term or long-term conservation easements, etc.) designed to set aside habitats, protect key migration routes and preserve open space.

- The Proponents commit to establishing the Pinedale Anticline Operators' Mitigation and Monitoring Fund (Fund). This Fund will provide assurance that financial support is available for mitigation and monitoring for the life of the project. The sole purpose of the Fund is to provide funding for monitoring and mitigation impacts directly related to Proponents' activities in the PAPA SEIS project. Proceeds from the Fund can be used both on-site and off-site in the general PAPA area for air quality monitoring, wildlife, livestock, vegetation and reclamation research, analysis, monitoring, mitigation and agencies' PAPA-project essential full time equivalent (FTE) positions as a result of PAPA activities. Proponents envision that the Fund will support as components of wildlife mitigation:
  - basic habitat enhancements for improvement of habitat function both on-site and off-site and
  - protection of key migration routes and / or acreage that directly benefit wildlife.

The funds referenced in this correspondence are aimed at mitigation and monitoring activities and specifically targeted to funding mitigation as required from the wildlife monitoring and mitigation matrix. It is impossible to accurately predict what types of actions would warrant the use of these monies, but compliance activities do not fit the intended purpose of the fund.

Proponents will provide \$4.2 million as the initial contribution after BLM issues the SEIS Record of Decision (ROD) to begin mitigation and monitoring efforts immediately. Proponents would make future annual contributions to the Fund based on the pace of development. Estimated annual average contribution based on the Proposed Action is \$1.8 million per year with an expected total contribution based on the Proposed Action of approximately \$36 million. This offer is the only commitment for Proponents' contributions to the Fund.

- Off-site mitigation will generally be implemented if on-site actions are not considered adequate, or if off-site measures are considered to be of significantly greater value. Off-site mitigation would occur as close to the impacted area as possible, and provide habitat for the specific animals being displaced or experiencing habitat declines as a result of development. Off-site mitigation that occurs farther away would provide a key year-round life requirement for the animals that occupy the development area during part of the year.
- To assure implementation and use of effective monitoring efforts and mitigation options, annual mitigation planning for wildlife and habitats will be coordinated among BLM, WGFD, and the Proponents. The Proponents, BLM and WGFD will jointly seek improvements to the proposed development plans to further reduce project impacts.
- The Proponents would support formation of a dedicated multi-agency management team to plan and implement permitting, monitoring, mitigation, and reclamation activities funded out of the Mitigation and Monitoring Fund. This will benefit both the Proponents and agencies by streamlining the development process, providing

continual focus on plan implementation, and providing coordination and cost-efficiencies with other adjacent developments that could impact some of the same animals and habitats impacted by this project.

- The Proponents will monitor mitigation measures to determine mitigation effectiveness and provide ongoing information and direction for future mitigation efforts during the life of the field.
- The Proponents will commission and fund a habitat inventory of the PAPA. Habitat inventory data will be used for development, reclamation, and potential habitat improvement planning for key habitats and habitat components. Habitat improvements may be applied in important habitats to restore degraded or lost habitat functions.
- Concurrent with and complementing these on-site efforts to avoid, minimize and mitigate impacts, the Proponents have commissioned and funded wildlife research, wildlife monitoring and other special studies. The first year of a five year study on pronghorn antelope is now complete as is the first year of a five year research project on sage grouse. The mule deer study is in its sixth year of a seven year research and monitoring project.
- The Proponents will promote communication with other stakeholders as mitigation objectives and approaches are being developed. Specific wildlife and habitat mitigation objectives and actions should, as much as possible, be designed to minimize impacts to other important area resources (e.g., livestock, recreation, visual resources).

## **APPENDIX 10**

### **Wildlife Monitoring and Mitigation Matrix**

### Wildlife Monitoring and Mitigation Matrix

SPECIES	CRITERIA	METHOD	CHANGES THAT WILL BE MONITORED	SPECIFIC CHANGE REQUIRING MITIGATION	MITIGATION RESPONSES
Mule Deer	Change in Mesa deer numbers	Current mule deer study, and use of WGFD data	Change in deer numbers in any year, or a cumulative change over all years, initially compared to average of 05/06 numbers (2856 deer)	15% change in any year, or cumulatively over all years, compared to reference area (Sublette mule deer herd unit [average 05/06 herd unit population is 27,254], or other mutually agreeable area).	Select mitigation response sequentially as listed below, implement most useful and feasible and monitor results over sufficiently adequate time for the level of impact described by current monitoring.
	Avoidance distances		Average of any 2-year avoidance distance from well pads and roads, and a concurrent change in deer numbers compared to average of 05/06 numbers (2856 deer)	Average of 0.5 km change per year over 2 years, and a concurrent 15% change in deer numbers in any year, compared to reference area (Sublette mule deer herd unit [average 05/06 herd unit population is 27,254], or other mutually agreeable area).	Select mitigation response sequentially as listed below, implement most useful and feasible and monitor results over sufficiently adequate time for the level of impact described by current monitoring.
Antelope	Change in Anticline antelope numbers	WMI antelope study; TRC project; and use of WGFD data	Change in antelope numbers in any year, or a cumulative change over all years, initially compared to first year of available antelope data	15% change in any year, or cumulatively over all years, compared to reference area (Sublette antelope herd unit or other, mutually agreeable area)	Select mitigation response sequentially as listed below, implement most useful and feasible and monitor results over sufficiently adequate time for the level of impact described by current monitoring.
	Size of habitat fragments used		Use by antelope in any year, initially compared to first year of available antelope habitat use data, and a concurrent change in antelope numbers compared to first year of available antelope data	10% change in habitat availability for one year, and a concurrent 15% change in antelope numbers for that year, compared to reference area (Sublette antelope herd unit or other mutually agreeable area).	Select mitigation response sequentially as listed below, implement most useful and feasible and monitor results over sufficiently adequate time for the level of impact described by current monitoring.

<b>SPECIES</b>	<b>CRITERIA</b>	<b>METHOD</b>	<b>CHANGES THAT WILL BE MONITORED</b>	<b>SPECIFIC CHANGE REQUIRING MITIGATION</b>	<b>MITIGATION RESPONSES</b>
Sage Grouse	Number of active leks in identified lek complexes	Lek counts according to protocol	Active use on 70% of total current leks; Active use on 70% of leks in each complex (the development area complexes include the Mesa, Duke's Triangle, and Yellow Point complexes) compared to 2007 data	30% change in total number of active leks, or 30% change in the number of leks in a single complex <sup>1</sup>	Select mitigation response sequentially as listed below, implement most useful and feasible and monitor results over sufficiently adequate time for the level of impact described by current monitoring.
	Peak numbers of males attending lek complexes <sup>1</sup>		Total average 2-year change in numbers of males attending development area lek complexes (the Mesa, Duke's Triangle, or Yellow Point lek complex), compared to the East Fork, Speedway, or Ryegrass reference lek complexes	Average of 30% change in numbers over 2 years compared to reference area <sup>1</sup>	Select mitigation response sequentially as listed below, implement most useful and feasible and monitor results over sufficiently adequate time for the level of impact described by current monitoring.
	Nesting success and habitat selection	Current sage grouse study; WGFD data	Change in nesting success compared to reference areas, or change in nesting success and a concurrent change in habitat selection by nesting hens in relation to development disturbance	Average of 15% per year change over 2 years in nesting success compared to reference area, or a 0.5 km increase in avoidance distance per year over 2 consecutive years and a concurrent change of an average of 15% per year change over 2 years in nesting success compared to reference area	Select mitigation response sequentially as listed below, implement most useful and feasible and monitor results over sufficiently adequate time for the level of impact described by current monitoring.

SPECIES	CRITERIA	METHOD	CHANGES THAT WILL BE MONITORED	SPECIFIC CHANGE REQUIRING MITIGATION	MITIGATION RESPONSES
Sage Grouse (cont.)	Winter concentration area use	Monitoring according to protocol	Change in winter concentration area use compared to reference area (once initial data is available), and a concurrent change in the total average 2 year numbers of males attending development area lek complexes (the Mesa, Duke's Triangle or Yellow Point lek complex), compared to the East Fork, Speedway, or Ryegrass reference lek complexes	Average of 15% per year change in amount of winter habitat used over 2 years compared to reference areas, and a concurrent average of 30% change in numbers over 2 years compared to reference area	Select mitigation response sequentially as listed below, implement most useful and feasible and monitor results over sufficiently adequate time for the level of impact described by current monitoring.
	Noise levels	Decibel monitoring from March 1-May 15 at lek sites	Noise levels demonstrated to impact peak lek use by male sage grouse and a concurrent change in the total average 2-year numbers of males attending development area lek complexes (the Mesa, Duke's Triangle, or Yellow Point lek complex), compared to the East Fork, Speedway, or Ryegrass reference lek complexes	Decibel levels at the lek more than 10 dBA above background measured from the edge of the lek (2000 ROD, p.27), and a concurrent average of 30% change in peak numbers of male birds over 2 years vs. reference area.	Select mitigation response sequentially as listed below, implement most useful and feasible and monitor results over sufficiently adequate time for the level of impact described by current monitoring.
Sensitive Species <sup>2</sup>	Occurrence of species and change in numbers of each species	TRC data, existing and continued	3-year change in presence/absence of species, and in numbers of individuals of each species, compared to reference areas.	3 consecutive years of change in presence or absence of a species, or an average of 15% change in numbers of individuals each year over 3 years.	Select mitigation response sequentially as listed below, implement most useful and feasible and monitor results over sufficiently adequate time for the level of impact described by current monitoring.
<p><sup>1</sup> If the number of leks decline but the bird numbers on lek complexes do not, the mitigation threshold would not be surpassed. If the number of leks does not decline but the bird numbers on lek complexes does decline, the mitigation threshold would be surpassed. If both numbers of leks and birds decline, the mitigation threshold would obviously be surpassed.</p> <p><sup>2</sup> Pygmy rabbit and white-tailed prairie dog</p>					

## MITIGATION RESPONSES

It should be noted that these mitigation responses all follow operational mitigation measures already in place for development of the field, and deal with the remaining unavoidable impacts from field development.

The mitigation process utilizes performance-based measures to proactively react to emerging impact changes early enough to assure both effective mitigation responses and a fluid pace of development over the life of the project. In that regard, this process is designed to provide certainty to the affected agencies and the public that impacts to wildlife will be addressed before consequences become severe or irreversible by monitoring changes and responding early. Initial mitigation will utilize Mitigation Responses 1, 2, and 3. Certainty of adequate results will be through implementation of a mitigation response followed by monitoring of mitigation results and, if the results are not satisfactory, repeating the process with another response from Mitigation Responses 1, 2, or 3 until the desired results are achieved or all feasible responses from this group are exhausted. It is fully anticipated that with multiple mitigation attempts with subsequent monitoring, it will be several years before modification of operations as noted in Mitigation Response 4 will be considered.

Sufficient time will be allowed for mitigation measures to demonstrate the desired result before the next mitigation response for each specific impact is required, and this expected time will be estimated when the measure is planned and implemented. If continued monitoring indicates that additional levels of impacts occur, beyond those already being mitigated, additional mitigation for those impacts will also occur, and will also initially utilize Mitigation Responses 1, 2, and 3. Priority for mitigation will be given to those habitats designated as most crucial or important (big game crucial winter ranges; sage grouse breeding, nesting, and winter habitats; raptor nesting areas; specific sensitive species habitats).

The process provides certainty for the Operators in that modification of operations through Mitigation Response 4 would not be considered until the previous sequential options were fully utilized. This certainty is further supported by utilization of a diverse review panel, if deemed necessary by the Operators, Wyoming Game and Fish Department, or the BLM, and selected by these entities, that would provide any needed information or advice regarding modification of operations.

Monitoring of unavoidable impacts that could result in a mitigation response is designed to identify those impacts directly attributable to oil and gas activities by isolating natural fluctuations in wildlife numbers and habitat use (e.g., severe winters, drought, wildfires, disease) as well as other unrelated cumulative man-made impacts (e.g., prescribed fires, hunting seasons) from those caused by the development of the Pinedale Anticline.

The first annual BLM/State Cooperator/Operator and 10-year development plan meeting will be held within 30 days of the signing of the ROD. A monitoring/mitigation plan will be initiated at that meeting to describe more specifically the details and process of monitoring and selection of actual mitigation responses. This plan will be updated each year, based on the monitoring and mitigation results and future needs that are apparent at that time. Monitoring methods, changes requiring mitigation, and responses are also subject to discussion and change as part of these meetings, and are subject to change in response to new research and other updated information as it becomes available.

Specific monitoring requirements for wildlife will be developed by the Wyoming Game and Fish Department, in cooperation with the operators and their contractors. When monitoring indicates a change requiring mitigation, serious mitigation efforts would be made to avoid the change becoming greater, as this may result in more costly and long-term responses to mitigate the impacts. Specific mitigation efforts will be discussed during the annual meetings. Once a change requiring mitigation happens, mitigation will need to be continued for the life of the impact and any reclamation associated with it. Mitigation measures dealing with habitat impacts will nearly always need to be long-term in nature (habitat enhancements, Conservation Easements, etc.) in order to achieve appropriate results and assure their usefulness.

Discussions on mitigation responses will first evaluate on-site measures, followed by off-site measures, in the order of sequence noted below.

#### On-site

1. Protection of flank areas from disturbance (e.g., voluntary lease suspensions, lease buyouts, voluntary limits on area of delineation/development drilling) to assure continued habitat function of flank areas, and to provide areas for enhancement of habitat function.
2. Habitat enhancements of SEIS area (both core/crest and flanks) at an appropriate (initially 3:1) enhancement-to-disturbance acreage ratio.

#### On-site/Off-site

3. Conservation Easements or property rights acquisitions to assure their continued habitat function, or provide an area for enhanced habitat function (e.g., maintenance of corridor and bottleneck passages, protection from development, establishment of forage reserves, habitat enhancements at an appropriate (initially 3:1) enhancement-to-disturbance acreage ratio).

#### Modification of operations

4. Recommend, for consideration by Operators and BLM, adjustments of spatial arrangement and/or pace of ongoing development.

## **APPENDIX 11**

### **Alternative D Mitigation**

## Proponents' Committed Mitigation Measures

Note: The following is the Proponents' committed mitigation measures which is excerpted from their public comments on the Draft SEIS (letter to the PFO Field Manager dated April 4, 2007).

Ultra Resources, Inc. (Ultra), Shell Exploration & Production Company (Shell), and Questar Market Resources (Questar), collectively referred to as the "Proponents", propose the following on-site and off-site mitigation components, as commitments to avoid, minimize and mitigate impacts from natural gas development and production activities in the Pinedale Anticline Project Area (PAPA) in accordance with the National Environmental Policy Act (NEPA), 40 CFR 1508.20. This proposal includes and summarizes both the Proponents' original mitigation commitments and additional mitigation including a \$36 million mitigation and monitoring fund. Some commitments have been revised and are noted in this appendix. The net costs to operators for implementing these combined measures will exceed \$1 billion. Proponents' ability to fulfill these commitments is directly tied to surface access and pace of development as described in the Proponents' Proposed Action.

Proponents' primary emphasis is on avoidance of impacts and on-site mitigation of any unavoidable impact and Proponents also commit to off-site mitigation. This proposal is unlike any other onshore natural gas development proposal in its effort to minimize on-site disturbances to wildlife, livestock, habitat and air while providing benefits to local and state communities.

### Proponents' Original Mitigation Commitments:

- Directional drilling - 600 pads to drill over 5,000 total wells (100 fewer pads than the No Action)
- Year-round concentrated drilling and completion activity
- Interim reclamation of well pads
- Liquids Gathering Systems to reduce traffic
- Computer Assisted Operations
- Tier 2 equivalent rig engine emissions by 2009
- 10-year plan and annual meetings with BLM and appropriate state agencies

### Proponents' Additional Mitigation Commitments:

- Mitigation and monitoring fund
- Mitigation, monitoring, continued research, and Performance-Based Objectives with threshold
- Voluntary suspension of certain leases on the flanks of the Pinedale Anticline
- 80% rig engine NO<sub>x</sub> reduction from 2005 levels by year end 2010 with a Q3 2007 ROD or 42 months following signing of the ROD

### Benefits:

- Minimizes surface disturbance and habitat fragmentation
- Preserves large, contiguous undisturbed blocks of habitat and migration corridors
- Provides interim, and earlier, well pad reclamation
- Substantially reduces air emissions
- Substantially reduces traffic and human activity for the Life of Project

- Stabilizes development activity and year-round workforce
- Facilitates community forecasting for planning purposes
- Develops fully the natural gas resource

The benefits to wildlife, livestock, habitat, air quality and local communities of this proposal are substantial. The Proponents' comprehensive long-term development plan will result in the most beneficial long-term protection of the wildlife and habitat while enabling the efficient, full development of the PAPA natural gas resource.

In order to mitigate potential impacts identified during the NEPA process, and in addition to the net cost Proponents will incur by implementing the Proponents' committed mitigation, Proponents have committed to establishing the Pinedale Anticline Operators' Mitigation and Monitoring Fund (Fund). This Fund will provide assurance that financial support is available for mitigation and monitoring for the life of the project. The sole purpose of the Fund is to provide funding for monitoring and mitigation impacts directly related to Proponents' activities in the PAPA SEIS project. Proceeds from the Fund can be used both on-site and off-site in the general PAPA area for air quality monitoring, wildlife, livestock, vegetation and reclamation research, analysis, monitoring, mitigation and agencies' PAPA-project essential full time equivalent (FTE) positions as a result of PAPA activities. Proponents envision that the Fund will support as components of wildlife mitigation:

- basic habitat enhancements for improvement of habitat function both onsite and off-site and
- protection of key migration routes and / or acreage that directly benefit wildlife.

The funds referenced in this correspondence are aimed at mitigation and monitoring activities. It is impossible to accurately predict what types of actions would warrant the use of these monies, but compliance activities do not fit the intended purpose of the fund.

Proponents will provide \$4.2 million as the initial contribution after BLM issues the SEIS Record of Decision (ROD) to begin mitigation and monitoring efforts immediately. Proponents would make future annual contributions to the Fund based on the pace of development. Estimated annual average contribution based on the Proposed Action is \$1.8 million per year with an expected total contribution based on the Proposed Action of approximately \$36 million. This offer is the only commitment for Proponents' contributions to the Fund.

### **Detailed Explanation of Committed Measures**

#### **Background**

According to the Energy Information Administration, the PAPA is the second largest natural gas field in the nation with an estimated 20 to 25 trillion cubic feet (TCF) of recoverable natural gas. Unlike Jonah, or any other natural gas project at this stage of development in Wyoming or onshore in the western continental United States, the Proponents have intentionally designed the PAPA comprehensive development and production proposal to avoid, or in the alternative lessen and minimize, any on-site

impacts to wildlife, livestock, habitat and air while improving the socio-economic health of the local and state communities.

The Proponents have developed this plan based on recommendations from federal and state agency wildlife biologists. Year-round access lessens both the development period by up to 50% in areas with seasonal restrictions and impacts of human presence on wildlife populations over the life of the project. Temporary year-round access is necessary for this Proposal to be economically feasible.

## **Mitigation**

### Concentrated, Directional Drilling and Completion

The Proponents' plan minimizes surface fragmentation during the development phase by utilizing directional drilling from multi-well pads. By operating large multiple-well pads year-round, the Proponents are able to complete operations on individual pads much sooner, which in turn will allow pads to be reclaimed up to a decade earlier compared to multi-well pads developed under seasonally restricted stipulations. Multi-well pads also decrease the amount of disturbed acreage per well compared to what is needed for single well pads.

As the resource is currently understood, Proponents estimate it would take 4,400 additional wells for full development. Regardless of the number of wells needed to fully develop the field, the Proposed Action commits to no more than 600 pads. According to the No Action Alternative, The 1,800 producing wells on 700 pads would only extract 36% of the recoverable natural gas resource ensuring a request for additional NEPA analysis would occur within the next few years to allow for recovery of the remaining reserves. The impacts associated with the additional NEPA analysis would be in addition to impacts associated with the first 700 pads and the result would be far less beneficial than this Proposal.

### Reclamation

The Proponents' plan allows individual pads to be reclaimed up to a decade earlier compared to multi-well pads developed under seasonal restriction stipulations. Proponents commit to the reclamation goal of restoring habitat function as soon as reasonably possible to pre-disturbance levels by restoring wildlife habitat through vigorous site-stabilizing plant growth with a native plant community that is endemic to the area. This community will be diverse in species composition, as well as age classifications, and productivity. Should available seed mixtures, techniques and other applications be available to enhance the productivity and diversity of the reclaimed area used by wildlife or livestock, these methods will be pursued. The Proponents will also commit to working with livestock producers on water placement and other methods to balance livestock needs with the need to isolate reclaimed areas for the revegetation. The Proponents commit that successful reclamation to maintain soil stability and provide habitat function will be measured in stages, as follows:

- a. The establishment of a viable seedling cover within 1 year of initiation of reclamation. Viable seedling cover shall consist of indigenous species and/or ecologically comparable species as approved by BLM habitat experts;

- b. Within 5 years of initiation of reclamation establish at least 50% of indigenous vegetative cover and species composition; and
- c. Within 8 years of initiation of reclamation establish at least 80% of indigenous vegetative cover and species composition.

By concentrating pad locations and operational activities, as well as engaging in earlier reclamation, the Proponents will leave large blocks of acreage undisturbed and migration corridors available for use by wildlife. On July 26, 2007, Proponents submitted revised language for the Reclamation Plan to BLM which supplants a, b, and c above.

#### Liquids Gathering System / Computer Assisted Operations

During the production phase, the Proponents commit to substantially reducing the amount of human activity, disturbance and on-site facilities through the use of liquids gathering systems (LGS) and consolidated production facilities, which will result in up to 165,000 fewer truck trips per year when compared to a full development scenario with no LGS. In addition, LGS significantly reduces tank requirements and associated emissions. Questar installed a LGS as mitigation for its 2004 Environmental Analysis. Ultra and Shell are committing to a LGS in the Proposed Action as their mitigation for year-round access. In addition, the Proponents commit to expanding the use of computer assisted operations (CAO) which will substantially reduce the number of trips to pads required for normal operations.

#### Air Emissions Reduction

As a part of the on-site mitigation commitment, the Proponents are committed to an 80% reduction in rig engine NO<sub>x</sub> emissions from 2005 levels at the end of the three year and a half year period following issuance of the SEIS ROD (42 months). With year-round access, Proponents can identify and retain 'fit for purpose' drilling rigs and economically justify investments on these drilling rigs to reduce NO<sub>x</sub> emissions.

Additional emission from traffic, tanks (VOC), and compressor engines will be reduced through implementation of LGS, CAO and other technologies.

After the Proponents achieve the rig engine NO<sub>x</sub> emission goals, compression emissions become the dominant source of NO<sub>x</sub>. Proponents are studying alternative solutions to reduce these emissions.

#### Lease Suspension

BLM wildlife biologists and the Wyoming Game and Fish Department have encouraged Proponents to mitigate impacts for wildlife by keeping large, contiguous blocks of habitat undisturbed and available for wildlife. Proponents offer to voluntarily suspend or commit to time-limited No Surface Occupancy (NSO) certain leases or acreage in the flank areas of the PAPA. This voluntary commitment ensures a significant portion of the flanks of the PAPA will be available as undisturbed habitat for wildlife. The certainty of undisturbed habitat allows for enhanced access for delineation and development activities in certain areas.

### Mitigation, Monitoring, Continued Research, Performance-Based Objectives

Within one year of the PAPA SEIS Record of Decision (ROD), Proponents commit to developing a comprehensive mitigation and monitoring plan and by working with the BLM and Game and Fish to develop an appropriate wildlife threshold / emerging trends matrix. Proponents commit to continued research and monitoring of mule deer, pronghorn antelope, sage grouse and vegetation on the PAPA and of control groups. Results of this monitoring and other wildlife tracking efforts will be used to identify emerging trends and be used to cooperatively determine what mitigation actions (on-site and / or off-site) should be taken next based on the plan.

### Planning

The Proponents commit to provide an annual development plan which will tier from a 10-year rolling forecast of PAPA activity fully describing the future development plans on an ongoing basis. Each year the specific areas of concentrated activities will be determined through joint review of the development plan. The Proponents, the BLM, Game and Fish and DEQ will reach agreement on the final plans early in the calendar year for the following year and tentative plans or the year after to allow sufficient time to plan, permit and execute new construction as required in the summer months. For example, the first quarter 2009 meeting determines 2010 activity and outlines 2011 plans. Each year, the Proponents will collaborate as appropriate to seek opportunities to further tighten the areas required for concentrated activities and reduce the associated impacts. The Proponents, BLM, Game and Fish and DEQ will jointly seek improvements to the development plan to further reduce impacts. During the annual meetings, impacts and mitigation will be evaluated for effectiveness.

### Mitigation and Monitoring Fund

In order to mitigate potential impacts identified during the NEPA process, and in addition to the net cost Proponents will incur by implementing the Proponents' committed mitigation, Proponents have committed to establishing the Pinedale Anticline Operators' Mitigation and Monitoring Fund (Fund). This Fund will provide assurance that financial support is available for mitigation and monitoring for the life of the project. The sole purpose of the Fund is to provide funding for monitoring and mitigation impacts directly related to Proponents' activities in the PAPA SEIS project. Proceeds from the Fund can be used both on-site and off-site in the general PAPA area for air quality monitoring, wildlife, livestock, vegetation and reclamation research, analysis, monitoring, mitigation and agencies' PAPA-project essential full time equivalent (FTE) positions as a result of PAPA activities. Proponents envision that the Fund will support as components of wildlife mitigation:

- basic habitat enhancements for improvement of habitat function both onsite and off-site and
- protection of key migration routes and / or acreage that directly benefit wildlife.

The funds referenced in this correspondence are aimed at mitigation and monitoring activities. It is impossible to accurately predict what types of actions would warrant the use of these monies, but compliance activities do not fit the intended purpose of the fund.

Proponents will provide \$4.2 million as the initial contribution after BLM issues the SEIS Record of Decision (ROD) to begin mitigation and monitoring efforts immediately. Proponents would make future annual contributions to the Fund based on the pace of development. Estimated annual average contribution based on the Proposed Action is \$1.8 million per year with an expected total contribution based on the Proposed Action of approximately \$36 million. This offer is the only commitment for Proponents' contributions to the Fund.

### **Summary**

Mitigation, both on-site and off-site, is a substantial cost that the Proponents are committed to bear as part of a comprehensive development plan that includes the temporary relaxation of all seasonal restrictions including, but not limited to, big game and sage grouse within specific concentrated areas as defined by the annual development plan. Raptor seasonal stipulations would be managed under the 2006 voluntary best management practices from the United States Fish and Wildlife Service.

Proponents' mitigation commitment for the PAPA SEIS would supersede all existing commitments for mitigation as well as those identified in the following and any other Decision Records: BLM 2004 [Finding of No Significant Impact, Decision Record and Environmental Assessment for the Questar Year-Round Drilling Proposal, Sublette County, Wyoming, WY-100- EA05-034]; BLM 2005 [Finding of No Significant Impact, Decision Record and Environmental Assessment for the Questar Year-Round Drilling Proposal – Condensate Pipeline Modifications, Sublette and Lincoln Counties, Wyoming, WY-100-EA05-283]; and BLM 2005a [Questar Year- Round Drilling Proposal, Addendum Environmental Assessment, WY-100-EA06-04]. Acreage included in existing habitat enhancement projects that have been initiated pursuant to these and other Decision Records will apply towards the mitigation commitment under a PAPA SEIS ROD.

## **APPENDIX 12**

### **Hazardous Materials Summary**

## Hazardous Materials Summary

Prepared by  
Ultra Resources, Inc.  
Shell Exploration & Production Company  
Questar Market Resources

### PURPOSE

Ultra Resources, Inc. (Ultra), Shell Exploration & Production Company (Shell) and Questar Market Resources (Questar), hereinafter collectively referred to as "Proponents," propose this Hazardous Materials Plan to supplement the 2000 Record of Decision on the Environmental Impact Statement for the Pinedale Anticline Oil and Gas Exploration and Development Project, Sublette County, Wyoming (2000 PAPA ROD) as provided below.

The purpose of the Hazardous Materials Plan is to protect public and worker health and safety and support the Bureau of Land Management's (BLM's) inspection and enforcement capability.

### SCOPE

This plan applies to construction, development and production practices within the Pinedale Anticline Project Area (PAPA) applicable to handling, storage and disposal of hazardous materials.

### PROONENTS' COMMITTED MEASURES

1. Each individual Proponent would be responsible for ensuring that all production, use, storage, transport and disposal of hazardous and extremely hazardous materials used or produced in their respective operations as a result of the proposed project would be in accordance with all applicable existing or hereafter promulgated federal, state and local government rules, regulations and guidelines.
2. Each individual Proponent would be responsible for communication and/or training for its employees, visitors on a site and requirements of subcontractor programs in accordance with all applicable existing or hereafter promulgated federal, state and local government rules, regulations and guidelines.
3. Each individual Proponent would be responsible for maintaining chemical and hazardous materials records and distributing such records to appropriate entities in compliance with all applicable existing or hereafter promulgated federal, state and local government rules, regulations and guidelines.
4. A release of a hazardous substance, such as a leak or spill, in excess of the reportable quantity as established by 40 CFR Part 117.3, would be reported by each individual Proponent as required by the Comprehensive Environmental Response, Compensation, and Liability Act, Section 102 B.
5. If toxic substances are necessary, their usage would comply with provisions of the Toxic Substances Control Act of 1976, as amended (40 CFR Part 702-799).

6. Each individual Proponent would adhere to internal Hazard Waste Management policies and procedures.

### **HAZARDOUS MATERIALS MANAGEMENT SUMMARY**

This Hazardous Materials Management Summary is provided pursuant to BLM instruction memoranda which require that all National Environmental Policy Act (NEPA) documents list and describe any hazardous and/or extremely hazardous materials that would be produced, used, stored, transported or disposed of as a result of a proposed project.

Materials are considered hazardous if they contain chemicals or substances listed in the Environmental Protection Agency's (EPA's) Consolidated List of Chemicals Subject to Reporting Under Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). Extremely hazardous materials are those identified in the EPA's List of Extremely Hazardous Substances (*40 Code of Federal Regulations [CFR] 355*).

Proponents have reviewed the EPA's Consolidated List of Chemicals Subject to Reporting Under Title III of SARA (as amended) to identify any hazardous substances proposed for production, use, storage, transport or disposal by this project, as well as EPA's List of Extremely Hazardous Substances as defined in 40 CFR 355 (as amended) and have determined that various materials listed as hazardous and/or extremely hazardous would be used or generated by this project. All known hazardous and extremely hazardous materials potentially produced, used, stored, transported and/or disposed of as a result of the project are presented in the table below.

Materials anticipated to be used or produced during implementation of the proposed project generally can be included in the following categories: drilling materials, cementing and plugging materials, fracturing materials, production products, fuels, pipeline materials, emissions, compressor station/centralized processing, wellhead processing and storage facility materials and miscellaneous materials.

### **GENERIC LIST OF MATERIALS, HAZARDOUS MATERIALS AND HAZARDOUS AND EXTREMELY HAZARDOUS MATERIALS POTENTIALLY UTILIZED OR PRODUCED DURING CONSTRUCTION, DRILLING, PRODUCTION AND RECLAMATION OPERATIONS**

All materials in the following list are dependent on quantity used for determination of hazardous and/or extremely hazardous status. The following materials, dependent on the amount used, are listed as potentially hazardous and extremely hazardous materials.

This is a generic list of materials that were contained in the March 2006 Record of Decision for the Jonah Infill Drilling Project Environmental Impact Statement and in the July 2000 Record of Decision for the Pinedale Anticline Oil and Gas Exploration and Development Project Sublette County, Wyoming Environmental Impact Statement. These materials may be used during operations but not always and not by each operator.

<b>Materials</b>	<b>Hazardous Substances <sup>1</sup></b>	<b>Extremely Hazardous Substances <sup>2</sup></b>
<b>Drilling Materials</b>		
Anionic polyacrylamide		Acrylamide
Barite	Barium compounds Fine mineral fibers	
Bentonite	Fine mineral fibers	
Caustic soda	Sodium hydroxide	
Glutaraldehyde	Isopropyl alcohol	
Lime	Calcium hydroxide	
Mica	Fine mineral fibers	
Modified tannin	Ferrous sulfate Fine mineral fibers	
Phosphate esters	Methanol	
Polyacrylamides	Petroleum distillates	Acrylamide
Polyanionic cellulose	Fine mineral fibers	
Retarder	Fine mineral fibers	
<b>Cementing and Plugging Materials</b>		
Bentonite	Fine mineral fibers	
Anti-foamer	Glycol ethers	
Calcium chloride flake	Fine mineral fibers	
Cellophane flake	Fine mineral fibers	
Cements	Aluminum oxide Fine mineral fibers	
Chemical wash	Ammonium hydroxide Glycol ethers	
Diatomaceous earth	Fine mineral fibers	
Extenders	Aluminum oxide Fine mineral fibers	
Fluid loss additive	Fine mineral fibers Naphthalene	Acrylamide
Friction reducer	Fine mineral fibers Naphthalene PAHs POM	
Mud flash	Fine mineral fibers	
Retarder	Fine mineral fibers	
Salt	Fine mineral fibers	
Silica flour	Fine mineral fibers	
<b>Fracturing Materials</b>		
Biocides	Fine mineral fibers PAHs POM	
Breakers	Ammonium persulphate Ammonium sulphate Copper compounds Ethylene glycol Fine mineral fibers Glycol ethers	

<b>Materials</b>	<b>Hazardous Substances <sup>1</sup></b>	<b>Extremely Hazardous Substances <sup>2</sup></b>
Clay stabilizer	Fine mineral fibers Glycol ethers Isopropyl alcohol Methanol PAHs POM	
Crosslinkers	Ammonium chloride Methanol Potassium hydroxide Zirconium nitrate Zirconium sulfate	
Foaming agent	Glycol ethers	
Gelling agent	Benzene Ethylbenzene Methyl tert-butyl ether Naphthalene PAHs POM Sodium hydroxide Toluene m-Xylene o-Xylene p-Xylene	
pH buffers	Acetic acid Benzoic acid Fumaric acid Hydrochloric acid Sodium hydroxide	
Sands	Fine mineral fibers	
Solvents	Glycol ethers	
Surfactants	Glycol ethers Isopropyl alcohol Methanol PAHs POM	
<b>Production Products</b>		
Liquid hydrocarbons	Benzene Ethyl benzene n-Hexane PAHs POM Toluene m-Xylene o-Xylene p-Xylene	
Natural gas	n-Hexane PAHs POM	

<b>Materials</b>	<b>Hazardous Substances <sup>1</sup></b>	<b>Extremely Hazardous Substances <sup>2</sup></b>
Produced water/cuttings	Arsenic Barium Cadmium Chromium Lead Manganese Mercury Radium 226 Selenium Uranium Other radionuclides	
<b>Fuels</b>		
Diesel fuel	Benzene Cumene Ethylbenzene Methyl tert-butyl ether Naphthalene PAHs POM Toluene m-Xylene o-Xylene p-Xylene	
Gasoline	Benzene Cumene Cyclohexane Ethylbenzene n-Hexane Methyl tert-butyl ether Naphthalene PAHs POM Toluene m-Xylene o-Xylene p-Xylene	
Natural gas	n-Hexane PAHs POM	
Propane	Propylene	
<b>Pipeline Materials</b>		
Coating	Aluminum oxide	
Cupric sulfate solution	Cupric sulfate Sulfuric acid	
Diethanolamine	Diethanolamine	
LP Gas	Benzene n-Hexane Propylene	

<b>Materials</b>	<b>Hazardous Substances <sup>1</sup></b>	<b>Extremely Hazardous Substances <sup>2</sup></b>
Molecular sieves	Aluminum oxide	
Pipeline primer	Naphthalene Toluene	
Potassium hydroxide solution	Potassium hydroxide	
Rubber resin coatings	Acetone Coal tar pitch Ethyl acetate Methyl ethyl ketone Toluene Xylene	
<b>Emissions</b>		
Gases	Formaldehyde	Nitrogen dioxide Ozone Sulfur dioxide Sulfur trioxide
Hydrocarbons	Benzene Ethylbenzene n-Hexane PAHs Toluene m-Xylene o-Xylene p-Xylene	
Particulate matter	Barium Cadmium Copper Fine mineral fibers Lead Manganese Nickel POM Zinc	
Coolants	Ethylene glycol	
Crude Oil	Benzene PAHs POM	
Grease	Zinc compounds	
Heat Transfer Fluid	Benzene	
Lubricants	1,2,4-trimethylbenzene Barium Cadmium Copper n-Hexane Lead Manganese Nickel PAHs POM Zinc	
Methanol	Methanol	

<b>Materials</b>	<b>Hazardous Substances <sup>1</sup></b>	<b>Extremely Hazardous Substances <sup>2</sup></b>
Marking Paints	Hexane Naphthalene Toluene Xylene Acetone Cyclohexane	
Primers	Acetone Methanol Methyl Ethyl Ketone Naphthalene Toluene Xylene Zinc	
Plant Condensate	Benzene Ethyl benzene n-Hexane PAHs POM Toluene m-Xylene o-Xylene p-Xylene	
Silicone Seal	Silane	
<b>Miscellaneous Materials</b>		
Acids	Acetic anhydride Formic acid Sodium chromate Sulfuric acid	
Antifreeze, heat control, and dehydration agents	Acrolein Cupric sulfate Ethylene glycol Freon Phosphoric acid Potassium hydroxide Sodium hydroxide Triethylene glycol Polyethylene glycol	
Batteries	Cadmium Cadmium oxide Lead Nickel hydroxide Potassium hydroxide Sulfuric acid	
Biocides	Formaldehyde Isopropyl alcohol Methanol	
Cleaners	Hydrochloric acid	

Materials	Hazardous Substances <sup>1</sup>	Extremely Hazardous Substances <sup>2</sup>
Corrosion inhibitors	4-4' methylene dianiline Acetic acid Ammonium bisulfite Basic zinc carbonate Diethylamine Dodecylbenzenesulfonic acid Ethylene glycol Isobutyl alcohol Isopropyl alcohol Methanol Naphthalene Sodium nitrite Toluene Xylene	
Emulsion breakers	Acetic acid Acetone Ammonium chloride Benzoic acid Isopropyl alcohol Methanol Naphthalene Toluene Xylene Zinc chloride	
Fertilizers	Unknown	
Herbicides	Unknown	
Lead-free thread compound	Copper Zinc	
Lubricants	1,2,4-trimethylbenzene Barium Cadmium Copper n-Hexane Lead Manganese Nickel PAHs POM Zinc	
Methanol	Methanol	
Motor oil	Zinc compounds	

<b>Materials</b>	<b>Hazardous Substances <sup>1</sup></b>	<b>Extremely Hazardous Substances <sup>2</sup></b>
Paints	Aluminum Barium n-Butyl alcohol Cobalt Lead Manganese PAHs POM Sulfuric acid Toluene Triethylamine Xylene	
Paraffin control	Carbon disulfide Ethylbenzene Methanol Toluene Xylene	
Photoreceptors	Selenium	
Scale inhibitors	Acetic acid Ethylene diamine tetra Ethylene glycol Formaldehyde Hydrochloric acid Isopropyl alcohol Methanol Nitrilotriacetic acid	
Sealants	1,1,1-trichloroethane n-Hexane PAHs POM	
Solvents	1,1,1-trichloroethane Acetone t-Butyl alcohol Carbontetrachloride Isopropyl alcohol Methyl ethyl ketone Methanol PAHs POM Toluene Xylene	
Starting fluid	Ethyl ether	
Surfactants	Ethylene diamine Isopropyl alcohol Petroleum naphtha	
<p><sup>1</sup> Hazardous substances are those constituents listed under the Consolidated List of Chemicals Subject to Reporting Under Title III of the <i>Superfund Amendments and Reauthorization Act of 1986 (SARA)</i>, as amended.</p> <p><sup>2</sup> Extremely hazardous substances are those defined in 40 CFR 355.</p>		

## **APPENDIX 13**

### **Individual Management Area Objectives and Restrictions/Limitations for Alternative E**

### **Individual Management Area Objectives and Restrictions/Limitations for Alternative E**

This section describes management objectives and development limitations/restrictions that would be applied to all federal lands and minerals in all Management Areas (MAs) across the PAPA for Alternative E.

#### **Objectives:**

1. Continue to promote active public participation in all aspects of future exploration and development.
2. To the extent practicable, eliminate or minimize undue and unnecessary disturbance/impacts (direct and cumulative).
3. Avoid disturbances on slopes 25 percent or greater, unless otherwise specified, and on sensitive soils to prevent erosion, protect water quality and reduce impacts in sensitive viewsheds.
4. Protect cultural/Native American sacred sites.
5. Minimize impacts on recreation use and sensitive viewshed.
6. Continue maintenance of livestock grazing and trailing operations.
7. Provide for wildlife habitat given the current location and extent of development.
8. Conserve functioning sage brush habitat on a landscape-scale sufficient to support the planning areas, greater sage-grouse, pronghorn, mule deer, and other sagebrush obligate species.
9. Maintain raptor habitats and territories within the PAPA to ensure long-term species sustainability and functioning habitats in accordance with the Migratory Bird Treaty Act.
10. Protect big game migration routes.
11. Maintain and enhance big game habitat to protect wildlife habitat values.
12. Maintain sufficient, undisturbed, or minimally disturbed sensitive species habitats to ensure long-term species sustainability and functioning habitats.

To reduce the number of areas that experience production-related traffic, the use of centralized production facilities (CPFs) is required.

Proposed and cumulative development (wells, access roads, pipelines, CPFs, compressors, etc.) within each MA would be reviewed annually within the context of the Adaptive Management (AM) planning process. Monitoring would continue, and be developed as needed, to address both direct and cumulative impacts.

Each MA has an identified well pad density threshold (see table below). If the threshold is reached, no additional well pads would be authorized (except for drainage) until additional environmental analysis has been completed that includes the analysis of 1) the effects of development to-date upon the identified resource management objectives and concerns, 2) on any additional resource affected by further development, 3) existing or reasonable additional mitigation deemed necessary, and 4) public review and comment.

Well pads successfully reclaimed to interim reclamation status as defined in Appendix 8D to the Final SEIS, for one growing season, may be credited back to the MA.

Once the 700 pad limit is reached, the pad would be reclaimed to full bond-release status before additional pads would be constructed. All wells, regardless of type and surface or mineral ownership, within the PAPA boundary would count toward the 700 well pad limit.

**Individual Management Area Objectives and Restrictions/Limitations for Alternative E**

Management Area Objectives	Exploration and Development Restrictions/Limitations		
	Core	Buffer	Flanks
<b>MA 1 Lander Trail</b>			
Preserve the integrity of the trail and the trail viewshed.	<ol style="list-style-type: none"> <li>1. In compliance with the existing Oregon/California Trail Management Plan, within the 3,460 federal acres located within 0.25 miles of the Lander Trail, no new disturbance would be allowed on the trail except where existing improved roads and pipelines currently cross the trail.</li> <li>2. To minimize impacts to the trail setting, no construction activities would be allowed within 0.25 miles of the trail on federal lands and minerals, unless screened from the trail by topography.</li> <li>3. In the trail viewshed (defined as up to 3 miles north of the trail and south of the trail to Wyoming Highway 351) beyond the current 0.25 mile protective buffer, the completion of a visibility analysis would be required on a case-by-case basis so that well pads, access roads and pipelines can be located on federal lands and minerals in a manner that minimizes their visibility from the trail to the greatest extent practicable. Visibility analysis would involve completing a visual resource contrast analysis (BLM Manual H-8431-1; Form 8400-4) and utilizing viewshed analyses and/or visual simulation modeling to determine the best location to screen facilities.</li> </ol>	<ol style="list-style-type: none"> <li>1. Same as Core.</li> <li>2. Same as Core.</li> <li>3. Same as Core.</li> </ol>	<ol style="list-style-type: none"> <li>1. Same as Core.</li> <li>2. Same as Core.</li> <li>3. Same as Core.</li> </ol>

Management Area Objectives	Exploration and Development Restrictions/Limitations		
	Core	Buffer	Flanks
MA 1 Lander Trail (cont.)	4. If extensive development occurs within the trail viewshed (i.e., more than 4 well pads/square mile) on federal lands and minerals, additional measures may be required to reduce/eliminate tanks and other facilities from well locations visible from the trail.	4. Same as Core.	4. Same as Core.
<b>MA 2 Mesa Breaks</b>			
<p>Maintain the existing quality, suitability and habitat effectiveness of the Mesa Breaks deer crucial winter range. These Breaks provide thermal cover and forage during severe winters.</p> <p>Retain the existing character of the landscape and sensitive viewshed.</p> <p>Avoid disturbance on slopes 10 percent or greater and on sensitive soils to prevent erosion and altering the sensitive viewshed.</p>	<p>1. To minimize impacts to highly sensitive wildlife habitat, soils, viewshed, and seasonal recreation use area, well pads, new access roads/pipelines would avoid being placed within the Breaks on federal lands and minerals. However, if in the course of BLM review, BLM determines that the consequential environmental impacts would be less within the Breaks than outside, permits may be issued in the Breaks. There are a few areas where the width of the Breaks may exceed the technological and economic feasibility of directional drilling, in which case BLM would consider an exception under the guidelines. Under these circumstances, production facilities would be located off-site, outside the Breaks.</p> <p>2. Planning for wells within this MA would require additional public involvement and monitoring under the AM planning process. Proposed project development (e.g., well pad, pipeline, CPFs, etc.) would require the appropriate level of environmental review.</p>	<p>1. Same as Core.</p> <p>2. Same as Core.</p>	<p>1. Same as Core.</p> <p>2. Same as Core.</p>

Management Area Objectives	Exploration and Development Restrictions/Limitations		
	Core	Buffer	Flanks
MA 2 Mesa Breaks (cont.)	3. Disturbance on slopes 10 percent or greater would be avoided within the Breaks and on highly erosive soils or soils with a high degree of color contrast to prevent erosion, water quality degradation and visual contrast from disturbance.  4. Four active well pads and 80 acres of surface disturbance per section.  5. No more than 2 CPFs per operator per section would be allowed.	3. Same as Core.  4. Two active well pads and 60 acres of surface disturbance per section.  5. Permanent facilities would not be allowed in this area and would be moved to within the	3. Same as Core.  4. Two active well pads and 40 acres of surface disturbance per section.  5. Same as Core.
<b>MA 3 Unleased Federal Minerals</b>			
These federal minerals are currently unleased. The BLM would not make leasing decisions on these parcels until completion of the Pinedale Resource Management Plan (RMP) Revision.	1. Any lease parcels that expire during preparation of the RMP would be included in this MA.	1. Any lease parcels that expire during preparation of the RMP would be included in this MA.	1. Any lease parcels that expire during preparation of the RMP would be included in this MA.
<b>MA 4 Sensitive Viewshed</b>			
Protect the sensitive viewshed by retaining the existing character of the landscape.  Protect/maintain winter and crucial winter deer range.  Protect and maintain existing raptor nesting habitat.	1. Four active well pads and 80 acres of surface disturbance per section.  2. 80 acres of surface disturbance per section.	1. Same as Core.  2. 60 acres of surface disturbance per section.	1. Same as Core.  2. 40 acres of surface disturbance per section.

Management Area Objectives	Exploration and Development Restrictions/Limitations		
	Core	Buffer	Flanks
MA 4 Sensitive Viewshed (cont.)	<p>3. To the extent practicable, new roads would avoid the area of the Breaks and Sensitive Viewshed. Screening of tanks, other facilities, and road and pipeline disturbance that could degrade the visual quality of the landscape from view points within the town of Pinedale, housing development areas, and portions of U.S. Highway 191 would be required.</p> <p>4. No restriction as long as surface disturbance limits are not exceeded.</p> <p>5. Disturbance on slopes 10 percent or greater would be avoided on the face of the Mesa and on highly erosive soils or soils with a high degree of color contrast to prevent erosion, water quality degradation and visual contrast from</p>	<p>3. Same as Core.</p> <p>4. Permanent facilities would not be allowed in this area and would be moved to within the</p> <p>5. Same as Core.</p>	<p>3. Same as Core.</p> <p>4. No permanent facilities (90 days or more) that cannot be adequately mitigated for the protection of visual resources would be authorized.</p> <p>5. Same as Core.</p>

disturbance.

Management Area Objectives	Exploration and Development Restrictions/Limitations		
	Core	Buffer	Flanks
<b>MA 5 Big Game Winter Range and Sage Grouse Strutting and Nesting Habitat</b>			
<p>Limit surface disturbance and human activity which could displace deer and pronghorn from winter ranges and sage grouse from strutting and nesting habitat resulting in mortalities and reduced population levels.</p> <p>Maintain sufficient undisturbed or minimally disturbed habitats to protect wildlife habitat values.</p> <p>Implement measures to screen activities and facilities so they do not attract the attention of a casual observer in VRM Class III areas on either side of the New Fork and Green rivers.</p>	<ol style="list-style-type: none"> <li>Eight well pads and 80 acres of surface disturbance per section.</li> <li>No more than 2 CPFs per operator per section would be allowed.</li> </ol>	<ol style="list-style-type: none"> <li>Two well pads and 60 acres of surface disturbance per section.</li> <li>Permanent facilities would not be allowed in this area and would be moved to within the core.</li> </ol>	<ol style="list-style-type: none"> <li>Two well pads and 40 acres of surface disturbance per section.</li> <li>Same as Core.</li> </ol>
<b>MA 6 Sage Grouse Strutting and Nesting Habitat</b>			
<p>Protect this area from unnecessary surface disturbance and human activities which could displace sage grouse from crucial strutting and nesting habitat resulting in mortalities and reduced population levels.</p> <p>Partially retain the existing character of the landscape, on each side of U.S. Highway 191 and the Wind River Front Special Recreation Management Area (SRMA), by implementing measures which reasonably incorporate into the surface disturbance and/or facility, visual design considerations that would mitigate anticipated visual impacts so they do not dominate the view of the casual observer and so they replicate the existing characteristics of the landscape.</p> <p>Maintain sufficient undisturbed or minimally-disturbed greater sage-grouse habitats, which pertain to all seasonal habitats, to ensure long-term species sustainability and functioning habitats within the planning area.</p>	<ol style="list-style-type: none"> <li>Eight well pads and 80 acres of surface disturbance per section.</li> <li>No more than 1 CPFs per operator per section would be allowed.</li> <li>Within VRM Class III only 4 pads per section would be allowed.</li> </ol>	<ol style="list-style-type: none"> <li>One well pad per section with production activity and 40 acres of surface disturbance.</li> <li>Permanent facilities would not be allowed in this area and would be moved to within the core.</li> <li>Same as Core.</li> </ol>	<ol style="list-style-type: none"> <li>Same as Buffer.</li> <li>Same as Core.</li> <li>Same as Core.</li> </ol>

Management Area Objectives	Exploration and Development Restrictions/Limitations		
	Core	Buffer	Flanks
<b>MA 7 Ross Butte/ Blue Rim</b>			
<p>Avoid disturbance to the fossil-bearing formations on a site-specific basis and protect paleontological fossil resources.</p> <p>Avoid disturbance on highly erodible soils and maintain soil stability.</p> <p>Protect and maintain existing raptor nesting habitat.</p> <p>Protect sensitive plant species.</p> <p>Protect the visual quality of the unique badland area.</p> <p>Maintain the hydrologic function within stream segments and their associated watersheds within the Ross Butte/Blue Rim drainage area(s).</p>	<ol style="list-style-type: none"> <li>In areas of raptor nesting, on federal lands and minerals, Operators would be required to employ directional drilling, pad drilling or the installation of CPFs to reduce and minimize impacts to nesting raptors and eliminate daily and weekly maintenance traffic at individual well locations. BLM would also use the results of monitoring/ evaluation of resource impacts in determining the need/appropriateness of requiring additional measures.</li> <li>All projects would demonstrate to the satisfaction of the authorized officer consideration of BMP's as they relate to erosion control and spill prevention.</li> <li>Siting and construction plans would provide for aggressive reclamation based on site-specific pre-disturbance vegetation and soil characterization. .</li> <li>Exploratory wells (i.e. no existing wells within 1 mile radius) would evaluate the potential for using alternative construction and drilling techniques in order to minimize disturbance to sensitive soils, sensitive plants, and hydrologically sensitive watersheds.</li> <li>Four well pads per section, 80 acres of cumulative disturbance authorized.</li> </ol>	<ol style="list-style-type: none"> <li>Same as Core.</li> <li>Same as Core.</li> <li>Same as Core.</li> <li>Same as Core.</li> <li>One pad per section with production activity and 40 acres of surface disturbance.</li> </ol>	<ol style="list-style-type: none"> <li>Same as Core.</li> <li>Same as Core.</li> <li>Same as Core.</li> <li>Same as Core.</li> <li>One pad per section with production activity and 40 acres of surface disturbance.</li> </ol>

Management Area Objectives	Exploration and Development Restrictions/Limitations		
	Core	Buffer	Flanks
MA 7 Ross Butte/ Blue Rim (cont.)	<p>6. Watershed protection plans would be required for cumulative disturbances greater than 10 acres. Watershed protection plans would demonstrate the method in which Operators would prevent measureable degradation or aggradation within 5 miles of the affected stream segment. Determination of such status would be made following one year of channel condition monitoring at sites randomly chosen covering at least 10 percent of MA7. Control sections would be established for ½ of the total number of sites chosen from areas off the flank but outside of the Alternative E project Area.</p> <p>7. Not applicable.</p> <p>8. No restriction as long as surface disturbance limits are not exceeded.</p>	<p>6. Not applicable.</p> <p>7. All projects which cumulatively disturb more than 5 acres would be required to submit Erosion Control, Revegetation and Restoration Plans in accordance with PAPA ROD guidance.</p> <p>8. Permanent facilities would not be allowed in this area and would be moved to within the</p>	<p>6. Not applicable.</p> <p>7. Not applicable.</p> <p>8. No more than 1 CPFs per operator per section would be allowed.</p>
<b>MA 8 Minimal Conflict Area</b>			
MA 8 has been dissolved into other MA's and is provided only for continuity with the PAPA ROD.			
<b>MA 9 Non-Federal Lands</b>			
<p>Private and state lands not under the jurisdiction of the BLM.</p> <p>To compensate for impacts resulting from development on private and state lands, well pads in this MA would count against the 700 total well pad limit. BLM cannot impose management objectives or restrictions/limitations on these lands.</p> <p>The COE regulates the discharge of dredged or fill materials into waters of the United States, and would require operators to demonstrate that impacts to special aquatic sites, including wetlands, have been avoided and minimized to the maximum extent practicable.</p> <p>The USFWS administers migratory bird species, threatened and endangered species, and species that are proposed for listing. Operators are required to comply with the Endangered Species Act, Bald and Golden Eagle Protection Act, and Migratory Bird Treaty Act, regardless of land ownership, in the implementation of construction, drilling, and operation of natural gas development.</p>			

**APPENDIX 14**

**Wyoming Protocol Agreement**

**Robert A. Bennett**  
Wyoming BLM Director  
5353 Yellowstone Road  
Cheyenne, WY 82009



**Dave Freudenthal**  
Governor  
State Capitol  
Cheyenne, WY 82002

**PROGRAMMATIC AGREEMENT AMONG THE BUREAU OF LAND MANAGEMENT  
ADVISORY COUNCIL ON HISTORIC PRESERVATION, AND  
THE NATIONAL CONFERENCE OF STATE HISTORIC PRESERVATION OFFICERS  
REGARDING THE MANNER IN WHICH BLM  
WILL MEET ITS RESPONSIBILITIES UNDER  
THE NATIONAL HISTORIC PRESERVATION ACT**

**STATE PROTOCOL**

Between

The Wyoming Bureau of Land Management State Director  
and  
The Wyoming State Historic Preservation Officer

This Protocol supplements the above referenced national Programmatic Agreement (PA). It describes the manner in which the Wyoming State Historic Preservation Officer (SHPO) and the Wyoming Bureau of Land Management (BLM) will interact and cooperate under the national Programmatic Agreement. As a condition of the national PA, the BLM, the Advisory Council on Historic Preservation (ACHP) and the National Conference of SHPOs (NCSHPO) mutually agreed that the BLM, after revising and updating its 8100 Manual Series, will meet its responsibilities under Sections 106, 110 (f) and 111 (a) of the National Historic Preservation Act (NHPA) through the implementation of the mechanisms agreed to in the national PA rather than by following the procedure set forth in the ACHP's regulations (36 CFR Part 800). The goal of the national Programmatic Agreement and this Protocol is to forge a more meaningful and productive historic preservation partnership between BLM and SHPO that will enhance the management of historic properties under the BLM's jurisdiction.

**I. RELATIONSHIP TO OTHER AGREEMENTS**

Other PAs and Memoranda of Agreement (MOA) may be developed when specific agreement documents are needed to define procedures that are not covered under the national PA or this Protocol. Agreement documents still in effect and negotiated under the previous Protocol are listed in *Appendix A*. Agreement documents negotiated under this Protocol will be added to *Appendix A* when signed. When more than one Federal agency is involved in an undertaking and BLM accepts lead responsibility for Section 106 compliance, the BLM and SHPO agree to follow the procedures of the national PA and this Protocol instead of developing a separate agreement document as long as the other agencies agree. BLM will provide SHPO with documentation that the other agencies have agreed to follow the Protocol.

State Protocol between the BLM and SHPO

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## II. ADMINISTRATIVE INTERACTION AND REPORTING REQUIREMENTS

The BLM's Cultural Resource Management (CRM) Program Annual Report that is submitted to the Washington Office for the Secretary of the Interior's "Report to Congress on Federal Archaeological Activities" shall serve as the BLM's Annual Report to SHPO. Submission of the report to SHPO will coincide with the date the report is submitted to the Washington Office.

Two meetings will be held annually within the first quarter of the calendar year to discuss issues related to this Protocol. The first meeting will include BLM field office cultural resource staff and managers, and State Office personnel. BLM will develop an agenda that includes SHPO input and SHPO will participate. A primary purpose of this meeting will be to prepare briefing papers, summaries, and recommendations for the BLM and SHPO executive management meeting to follow.

The second meeting will be an executive management meeting to be held following the annual field office cultural resource meeting. This meeting will specifically discuss procedures, policies, amendments to the Protocol, or other matters as warranted. BLM and SHPO executive management will determine time, place, agenda, and representation at this meeting.

## III. CONSULTATION

### A. BLM Project Planning

To facilitate broader and more proactive participation by SHPO in BLM's management activities relating to cultural resources, the BLM will provide the following opportunities:

Each Field Office is responsible for preparing planning and National Environmental Policy Act (NEPA) documents such as Resource Management Plans (RMP), RMP amendments, RMP revisions, high level Environmental Assessments (EAs), or cultural resource activity plans at the regional or local level. Field Offices will, when beginning a planning effort, invite the SHPO to participate in scoping for the purpose of identifying issues that should be addressed in the plan. The BLM will formally invite the SHPO to comment on any historic properties use allocations, whether they are made in regional, local, or project plans. Field Offices will send all draft and final land use plans and historic properties project plans to the SHPO in electronic format or will provide paper copies upon request.

In preparing planning documents, BLM will utilize all relevant information tools including the SHPO web site, BLM Government Land Office (GLO) documents, municipal and county records, and other electronic databases.

### B. General Consultation

1. Project Notification: Field Managers have the responsibility to provide written notification to the SHPO about upcoming projects likely to adversely affect known historic properties, or known resources that are unevaluated but are likely to be eligible for inclusion in the National Register of Historic Places. The preferred method of notification is by e-mail and should occur as early as possible in the planning process. Field Managers should use their best judgment in determining what projects should be brought to the SHPO's attention early in the process.

2. Other Meetings and Informal Discussions: The SHPO is encouraged to meet with the Wyoming BLM State Office or a Field Manager and/or staff at any time to discuss annual work plans, specific undertakings, outreach efforts, or other issues related to the BLM's management of cultural resources. The BLM will make every effort to arrange such meetings in a timely manner and to provide information requested by SHPO. The SHPO and Field Office personnel may informally discuss specific undertakings or any aspect of BLM's cultural resource management program. Any meetings specifically designed to discuss agreement documents must be coordinated with the State Office BLM/SHPO liaison.

3. Special Conditions: Under special conditions, such as staffing shortages, unforeseen events, or non-discretionary actions, specified time frames for SHPO review may be extended or shortened through consultation between SHPO and a BLM Field Office or the BLM State Office.

4. Project Segmentation: The BLM may determine that some very large projects (e.g., linear rights-of-way that cross more than one BLM Field Office) can be more efficiently completed if segmented. If a project is to be segmented, the SHPO shall be notified by letter in advance. The notification letter will include a brief description of the overall project. SHPO and BLM tracking numbers shall be referenced by the BLM and SHPO in all subsequent documentation relating to all segments of the project. Geophysical exploration projects do not require advance notification of segmentation.

5. Field Tours: BLM Field Offices will notify the SHPO, by e-mail, of all formal field tours relating to planning and NEPA efforts that may affect historic properties, particularly when the project proponent, the public, or interested parties are invited to participate. Field tours do not include routine on-site inspections pursuant to *Onshore Oil and Gas Order No. 1 (BLM, 43CFR 3160, Federal Register/Vol. 48, No. 205)*.

#### C. Formal Consultations

Formal consultation shall occur in writing between the SHPO and the BLM as outlined in the procedures in Sections V through VIII of this document. Unless otherwise specified, all consultation shall be with the SHPO's Cheyenne office. Circumstances in which documentation should be submitted directly to the SHPO's Wyoming Cultural Records Office (WYCRO) in Laramie are specified in the appropriate sections of this Protocol.

#### D. Undertakings Requiring Consultation

At a minimum, the BLM will consult with SHPO and request comments on eligibility and effect in the following situations:

1. Non-routine interstate and/or interagency projects or programs that necessitate agreements among affected agencies to clarify roles and responsibilities
2. Undertakings adversely affecting National Historic Landmarks or National Register-eligible properties
3. Land exchanges or land sales affecting historic properties which will no longer be under BLM ownership or management
4. Undertakings that are determined by the BLM or the SHPO to be subject to unusual public attention or involve strongly opposing view points

#### E. Native American Participation

The BLM will consider the effects of its undertakings on historic properties significant to Native Americans because of an association with tribal history or because of a property's traditional religious or cultural importance to a tribe. In consulting with Indian tribes or authorized tribal representatives, the BLM will be guided by the following:

- BLM Manual 8120, *Tribal Consultation under Cultural Resource Authorities*
- BLM Handbook H-8120-1, *Guidelines for Conducting Tribal Consultation*
- Executive Order No. 13007, Indian Sacred Sites
- National Register Bulletin 38: Guidelines for Evaluating and Documenting Traditional Cultural Properties

Additionally, if Native American human remains, funerary objects, sacred objects, or objects of cultural patrimony are encountered as a result of a BLM undertaking, the BLM will comply with Section 3 of the Native American Graves Protection and Repatriation Act (NAGPRA) and its implementing regulations at 43 CFR Part 10, Subpart B. These situations will also be treated as archaeological discoveries and appropriate discovery procedures, as defined in the BLM Handbook or other guidance developed jointly between the BLM and the SHPO, will be followed.

#### F. Public Participation

The BLM will seek and consider the views of the public when carrying out actions under the terms of this Protocol. 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 (Sections V through VIII below) 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.

### IV. IDENTIFICATION

#### A. Exemptions

Undertakings that have no potential to affect historic properties, for which no inventory is necessary, are identified in *Appendix B*, subject to the following:

1. The BLM cultural resource specialist will, after reviewing a proposed undertaking, determine if

specific projects or activities have no potential to affect historic properties as described in *Appendix B*.

2. BLM and SHPO may agree that other classes of exempted actions may be added to *Appendix B*.
3. The BLM will report any undertakings exempt from inventory by entering the action in CRMtracker and will proceed with the undertaking.

#### B. Area of Potential Effect

The area of potential effect (APE) means the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The APE is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking [36 CFR 800.16(d)].

Until such time as the appropriate size of APEs for specific types of projects has been defined in the BLM Handbook or other guidance developed jointly between the BLM and the SHPO, BLM cultural resource specialists will determine that portion of the APE subject to inventory. In defining the APE, the BLM will consider potential direct, indirect, and cumulative effects to historic properties and their associated settings as applicable. The APE shall include historic properties and their associated setting where setting is an important aspect of integrity (see *Appendix C*). The size of the survey area outside of an APE shall be at the approval of the BLM manager, taking into account the recommendations of the cultural resource specialist.

#### C. Determine Information Needs

The BLM will, during the earliest feasible planning stage of any undertaking, determine the information needed to identify historic properties situated within the APE. Such determinations may be based on a file search of the SHPO/BLM cultural resource records, aerial photographs, GLO records, BLM land records, resource management plan, project-specific NEPA documents of the proposed project area and on information sought and obtained from the SHPO and from interested parties.

1. Previous Adequate Inventory: The BLM cultural resource specialist will determine whether the APE has been adequately inventoried for historic properties. If an adequate Class III inventory (see *BLM Manual 8110.21.c*) has been completed in accordance with current field methods, and BLM and SHPO have previously agreed that no historic properties will be affected, the BLM shall document the undertaking through CRMtracker and proceed. A record of these determinations shall be retained in field office files.

2. Level of Inventory: If the BLM determines that a Class III inventory of the APE is necessary, the BLM need not seek the SHPO's views on identification efforts. If the BLM determines to conduct an inventory at less than a Class III level (except as specified in Section IV.E.1 and 2 below) BLM will consult, in writing, with the SHPO on the adequacy of the inventory design prior to initiating the inventory or authorizing the proposed undertaking. SHPO will comment in 15 days of receipt of the documentation. Any disputes over the adequacy of the proposed inventory efforts shall be resolved in accordance with the dispute resolution clause in Section XI.A of this Protocol.

a. Geophysical Exploration Projects: BLM's obligations to identify National Register-eligible or listed historic properties often include non-Federal lands which are directly or indirectly affected by the Federally permitted seismic project. BLM will make a reasonable and good faith effort to identify such

properties on non-Federal lands for geophysical exploration projects through examination of existing records, or through on-the-ground inventory only at the request of the non-Federal landowner. The BLM will ensure the geophysical operator will inform non-Federal landowners of their right to request a cultural resources inventory. BLM will also ensure that historic properties are not adversely affected by the geophysical project activities.

b. Fuels Reduction or Prescribed Burns: Fuels reduction or prescribed burns that require no surface disturbance (i.e. hand thinning, hand piling, or chemical treatment) require only a reconnaissance survey to determine if rock art, rock shelters, or other types of fire sensitive or chemical-sensitive historic properties exist. The BLM fuels reduction program coordinators will consult with the BLM cultural resource specialist on all fuels reduction projects. The BLM may require special conditions as necessary to protect historic properties. If fire sensitive historic properties exist within the area of the prescribed burn, a protection plan must be submitted to SHPO. SHPO will provide comment within 30 days of receipt of the documentation. If the BLM cultural resource specialist determines that fire sensitive properties do not exist within the proposed area of the prescribed burn, BLM may notify and proceed.

#### D. Disturbed Areas

If the proposed undertaking is not listed in the exemptions found in *Appendix B*, the BLM cultural resource specialist will determine whether previous ground disturbance has modified the surface so extensively that the probability of finding intact cultural properties is negligible. If such disturbance has occurred in the APE, the BLM may proceed with the undertaking.

#### E. Areas of Low Potential for Historic Properties

The BLM may determine specific areas do not need to be inventoried because current information suggests the area has little or no potential to contain historic properties. Determinations regarding the applicability of low probability indicators may be made only by BLM cultural resource specialists following any consultation requirements discussed below:

1. Low Probability Areas: Indicators of low probability for historic properties may include steep slopes with no potential for sites such as rock art or rock shelters. Other indicators may be agreed upon as developed and included in the BLM Handbook. When BLM determines that areas are exempted from inventory because one or more of these situations applies, BLM will notify SHPO through CRMtracker and proceed with the undertaking.
2. Project-Specific: When IV.E.1 above does not apply, the BLM will request concurrence in writing from the SHPO on project-specific exemptions due to low probability for historic properties. The SHPO will be provided 15 days to comment.
3. Supplemental Protocol Agreements: Low probability for historic properties due to environmental factors or other conditions may allow large blocks of land to be exempted through a Supplemental Protocol Agreement (SPA). SPAs will be negotiated between BLM and SHPO resulting in an MOA. Executed SPAs are listed in *Appendix A* of this Protocol.

### V. DETERMINATION OF ELIGIBILITY

BLM will determine if there are historic properties within the APE by applying the criteria for evaluation found in 36 CFR Part 60.4.

#### A. No Historic Properties

1. No Cultural Resources Identified: When no cultural resources of any kind are identified by inventory, or only those described in *Appendix D* are encountered, BLM will submit the electronic record to SHPO through the CRMtracker database and will submit the project report, meeting the *Wyoming State Historic Preservation Office Format, Guidelines, and Standards for Class II and III Reports (WY Report Standards)* to the Wyoming SHPO Cultural Records Office (WYCRO). The BLM will submit the project report to WYCRO within 30 days after determining the report meets standards. Submission of the project report will include a standard signed notification (*see Appendix E*). The BLM will notify interested parties and proceed with the undertaking (see III.F of this Protocol).

2. No Historic Properties Identified: If the inventory results in no historic properties (only ineligible sites and isolated resources found) then the BLM will submit the electronic record to SHPO through the CRMtracker database and will submit the project report, meeting the *WY Report Standards* to the WYCRO. The BLM will submit the project report and Wyoming Cultural Property Forms (WYCPF) and/or Wyoming Isolated Resource Forms (WYIRF) to WYCRO within 30 days after determining the report meets standards and completing determinations of eligibility. Submission of the project report will include a standard signed notification (*see Appendix E*) containing BLM's determinations of eligibility. The BLM will notify interested parties and proceed with the undertaking.

#### B. Historic Properties Present

If historic properties are identified, the BLM will submit the electronic record to SHPO through the CRMtracker database. BLM will ensure the project report and associated forms (WYCPF and WYIRF) meet the *WY Report Standards* and will submit all documentation to either the WYCRO office or the Wyoming SHPO office in Cheyenne, for review and comment, depending upon the determination of effect (see Section VI). A discussion on the integrity of location, setting, design, materials, workmanship, feeling, and association must be included in project documentation for all historic properties.

#### C. Geophysical Projects

Cultural resource inventories conducted specifically for geophysical exploration projects will not be required to evaluate identified properties provided the properties are avoided by an appropriate distance as defined in BLM Handbook H-3150. Proper avoidance will be regarded as a “**no effect**” situation. The BLM will submit the report to the SHPO per Section VI.A and proceed with the undertaking.

### VI. DETERMINATION OF EFFECT

Standard measures for reducing effects (see Appendix C, II.D.2) for reducing effects are to be considered part of the project design. Determination of effect must be made after standard treatment measures 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.

#### A. No Historic Properties Affected

1. If there are no historic properties present, or if they are present but will not be affected by the undertaking, then a determination of “No Effect” is appropriate. The BLM will submit the electronic

record to SHPO through the CRMtracker database and will submit the project report, meeting the *WY Report Standards* to the WYCRO within 30 days after determining the report meets standards and completing determinations of eligibility and effect. Submission of the project report will include a standard signed notification (*see Appendix E*) containing BLM's determinations of eligibility and effect. The BLM will notify interested parties and proceed with the undertaking.

2. The SHPO will randomly review the BLM's determinations of "No Effect." If SHPO believes there is a pattern of inappropriate or inadequate eligibility determinations, they will begin consultation with the BLM following dispute resolution procedures in Section XI.A of this Protocol.

3. If any of the elements contributing to the defining characteristics that make the property eligible for inclusion in the National Register, including the integrity of location, setting, design, materials, workmanship, feeling and association, will be affected, then a determination of "No Effect" is not appropriate.

4. For geophysical projects appropriate avoidance of unevaluated sites or historic properties will be regarded as "No Effect." The BLM will submit the electronic record to SHPO through the CRMtracker database and will submit the project report, meeting the *WY Report Standards* to the WYCRO within 30 days after determining the report meets standards and completing determinations of eligibility and effect. Submission of the project report will include a standard signed notification (*see Appendix E*) containing BLM's determinations of eligibility and effect. The BLM will notify interested parties and proceed with the undertaking.

5. If a proposed project will not be visible from the historic property and there is no contrast between the project and the setting (*see Appendix C* of this Protocol), then a determination of "No Effect" is appropriate. The BLM will submit the electronic record to SHPO through the CRMtracker database and will submit the project report, meeting the *WY Report Standards* to the WYCRO within 30 days after determining the report meets standards and completing determinations of eligibility and effect. Submission of the project report will include a standard signed notification (*see Appendix E*) containing BLM's determinations of eligibility and effect. The BLM will notify interested parties and proceed with the undertaking.

#### B. No Adverse Effect

1. If a proposed project will cause effects to a 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, then a determination of "No Adverse Effect" is appropriate as defined in 36CFR800.5(b). If undertakings involve sites eligible under Criterion A, B, or C, the BLM will submit the electronic record to SHPO through the CRMtracker database and will submit the project report, meeting the *WY Report Standards* to the SHPO in Cheyenne within 30 days after determining the report meets standards and completing determinations of eligibility and effect. SHPO will review and comment on the effect within 15 days of receipt of the documentation. If SHPO does not respond within 15 days, BLM may assume concurrence with determinations of eligibility and effect and proceed with the undertaking.

2. If a proposed project will cause effects to a 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, then a determination of "No Adverse Effect" is appropriate as defined in 36CFR800.5(b). If undertakings involve sites eligible only under Criterion D, BLM will submit the

electronic record to SHPO through the CRMtracker database and will submit the project report, meeting the *WY Report Standards* to the WYCRO within 30 days after determining the report meets standards and completing determinations of eligibility and effect. The SHPO will randomly review the BLM's determinations of "No Adverse Effect" for Criterion D properties. If SHPO believes there is a pattern of inappropriate or inadequate eligibility determinations, they will begin consultation with the BLM following dispute resolution procedures in Section XI.A of this Protocol.

3. If it can be demonstrated only noncontributing portions of historic properties will be affected, then a determination of "No Adverse Effect" is appropriate. Justification of a noncontributing portion must be documented on a WYCPF and discussed in the project report.
4. If a proposed project will be visible, but there is weak contrast, a determination of "No Adverse Effect" is appropriate. A "Weak Contrast" occurs when the proposed project elements, or portions of the elements, can be seen but will not dominate the setting or attract the attention of the casual observer because the basic elements of form, line, color and texture found in the setting are repeated in the project's physical elements (see *Appendix C* of this Protocol). In this case, a determination of "No Adverse Effect" is appropriate.
5. If setting is an important aspect of integrity for a historic property and the project will cause a weak contrast, the BLM will submit the electronic record to SHPO through the CRMtracker database and will submit the project report meeting the *WY Report Standards* within 30 days after determining the report meets standards, and completing determinations of eligibility and effect, to the Wyoming SHPO office in Cheyenne. SHPO will review and comment on the effect within 30 days of receipt of the documentation. If SHPO does not respond within 30 days, BLM may assume concurrence with determinations of eligibility and effect and proceed with the undertaking.

#### C. Adverse Effect

An adverse effect is found when an undertaking may alter, directly or indirectly, any of the characteristics of a 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 a 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 [CFR 800.5(a)(1)].

1. Data Recovery Plan: If the historic property is eligible for inclusion in the National Register under Criterion D only, and the adverse effect will be minimized by data recovery, then the BLM will prepare a data recovery plan and follow the procedures in Section VII.A of this Protocol. A Memorandum of Agreement is not required to implement the data recovery plan.
2. Historic American Buildings Survey/Historic American Engineering Record (HABS/HAER): In consultation with the SHPO, the BLM will identify any historic property eligible for inclusion in the National Register where an adverse effect can be minimized by completing a HABS/HAER document. All HABS/HAER projects must be coordinated with the National Park Service prior to initiation of the project in order to ensure that the appropriate level of documentation is completed. The BLM will develop and submit to SHPO a project report and follow the procedures in Section VII.B of this Protocol. A Memorandum of Agreement is not required to implement a HABS/HAER.

3. Memorandum of Agreement: If there are historic properties within the APE that will be adversely affected and are eligible under National Register Criterion A, B or C, BLM will submit the project report to SHPO for review and comment. If the project involves stabilization, the BLM will submit a stabilization plan to SHPO for comment. Upon concurrence with the project report or stabilization plan, BLM will consult with SHPO to develop a Memorandum of Agreement (MOA) and follow the procedures in Section VII.D of this agreement.

If a proposed project will be visible and there is moderate or strong contrast a determination of “Adverse Effect” is appropriate. A “Moderate Contrast” occurs when the proposed project elements, or portions of the elements, begin to attract attention and begin to dominate the characteristic landscape. A “Strong Contrast” occurs when the proposed project elements, or portions of the elements, demand attention, cannot be overlooked, and are dominant on the landscape (see Appendix C of this Protocol). In this case, a determination of “Adverse Effect” is appropriate. In these cases, BLM will consult with SHPO to develop a Memorandum of Agreement (MOA) and follow the procedures in Section VII.D of this agreement.

## VII. RESOLUTION OF ADVERSE EFFECTS

### A. Data Recovery

1. Data Recovery Plan Documentation and Consultation Needs: Data Recovery plans will be consistent with the *Secretary of Interior’s Standards and Guidelines for Archeological Documentation* (48 FR 44734-37). The plan will include, at a minimum, the items in BLM Manual 8140.26A-I. Compliance with the approved data recovery plan will be included in the project Conditions of Approval. Objection to or failure to comply with the approved data recovery plan by the project proponent will require consultation with SHPO and negotiation of a MOA.

2. Data Recovery Plan Review: The BLM will submit the project report meeting the *WY Report Standards* and the data recovery plan to the Wyoming SHPO office in Cheyenne. SHPO will review and comment on the effect and the plan within 30 days of receipt of the documentation. The BLM will concurrently submit the documentation through CRMtracker database for inclusion in the master inventory. If the SHPO has no comment, and no other consulting party objects, the BLM may assume SHPO concurrence with the plan. The BLM may proceed without a Memorandum of Agreement provided there are no other historic properties eligible under Criterion A, B, or C within the APE that may be affected by the undertaking.

3. Data Recovery Report: Data recovery reports must be consistent with the *Secretary of Interior’s Standards and Guidelines for Archeological Documentation* (48 FR 44734-37). The Data Recovery Report will include, at a minimum, the items at BLM Manual 8140.27A-F. Final data recovery reports will be provided to the SHPO within 30 days of BLM review and acceptance. The BLM will concurrently submit the documentation through CRMtracker database for inclusion in the master inventory. SHPO may review the final data recovery report and provide courtesy comments to the BLM.

### B. HABS/HAER

The BLM will submit the project report meeting the *WY Report Standards* and the recommendations for HABS/HAER documentation to the Wyoming SHPO office in Cheyenne and SHPO will review and comment on the effect within 30 days of receipt of the documentation. The BLM will concurrently

submit the documentation through CRMtracker database for inclusion in the master inventory. The BLM will submit resulting documentation to the National Park Service (NPS) and SHPO within 30 days of completion. SHPO will review the final HABS/HAER documentation and provide comments to the BLM within 30 days receipt of the documentation. The project may not proceed until acceptance of adequate HABS/HAER documentation by the NPS. Compliance with the approved HABS/HAER documentation requirement will be included in the project Conditions of Approval. Objection to or failure to comply with the approved HABS/HAER plan by the project proponent will require consultation with SHPO and negotiation of a MOA.

### C. Compensatory Mitigation

Compensatory mitigation, or compensating for an impact by replacement or providing substitute resources or environments, will be considered after application of other forms of onsite mitigation, including best management practices, has been exhausted. Compensatory mitigation can occur immediately adjacent to the area impacted but can also be located anywhere in the same general geographic area or, in the case of linear properties (e.g. National Historic Trails), at other places along that specific resource. Any compensatory mitigation must result from consultation among BLM, SHPO, ACHP (if participating), the project proponent, and other interested parties. Compensatory mitigation must provide a public benefit and be appropriate to the scope of the effect being mitigated. Field offices shall notify the BLM Deputy Preservation Officer as soon as it is recognized that a proposed undertaking may require consideration of compensatory mitigation. The BLM Deputy Preservation Officer will monitor the use of compensatory mitigation for consistency of application by the BLM statewide.

The following procedures are not appropriate as compensatory mitigation measures:

1. Payment of money by the project proponent directly to BLM or SHPO
2. Data recovery at historic properties other than historic properties that will be adversely affected by an undertaking
3. Acquisition of land or a historic property, through exchange or another process, that offers no public access
4. Signage or markers where there is no public access

### D. Memorandum of Agreement

1. Consulting Parties: Consulting parties are the BLM, the SHPO, the ACHP (if participating), the project proponent and any other party who assumes responsibilities stipulated in the MOA. The agency official may invite other interested parties to concur. An interested party *invited* to concur has no responsibility under the agreement, but may be invited to sign the agreement. The refusal of any party *invited* to sign the MOA does not invalidate the MOA.

Unless otherwise agreed, the BLM is responsible for preparing the MOA. Stipulations included in the MOA should come from consultation among the consulting and *invited* concurring parties and BLM's conditions of approval.

#### 2. Memorandum of Agreement Process:

Preparation of a MOA follows consultation between BLM, SHPO, the project proponent and *invited* concurring parties. Generally the MOA will be drafted by the responsible Field Office.

- a. The BLM State Office will provide the SHPO with an electronic draft of the MOA for their comment. The BLM will concurrently request comments from the ACHP (if participating), and any other party to which a role has been assigned within the document.
- b. The SHPO shall ensure a timely response to the request for comment and SHPO comment will be sent electronically to the BLM State Office.
- c. After receiving all comments, BLM will make necessary revisions to the draft MOA or continue negotiations with parties as necessary to resolve differences. Unresolved differences should follow the dispute resolution process in Section XI of this Protocol.
- d. The BLM State Office will provide the SHPO with electronic revised drafts for review. The BLM will distribute revised drafts to any other party to which a role has been assigned within the document.
- e. The MOA shall not be finalized until the BLM has made efforts to accommodate all comments from consulting parties and all parties have notified the BLM State Office that the draft is acceptable.
- f. When the BLM State Office receives notification from SHPO and other consulting parties of satisfaction with a draft, the BLM will prepare the final the document.
- g. The BLM Field Manager will sign the final MOA and submit it to the project proponent and signatories other than SHPO and ACHP. When these signatures are affixed, the Field Office will send the signed MOA to the BLM State Office for signature by the Deputy State Director for Resources Policy and Management. Then the BLM State Office will submit it to the SHPO office in Cheyenne for signature by the SHPO. When the MOA has been executed through signature of all consulting parties, the consultation will be concluded and the MOA will be implemented.
- h. The BLM will provide a copy of the MOA with original signatures to the SHPO, the BLM Field Offices and consulting parties.

## **VIII. DISCOVERY SITUATIONS**

### **A. Planning For Discoveries**

The BLM will encourage applicant development of discovery plans for large and complex undertakings and those involving land disturbance in areas known to contain buried sites. Copies of such discovery plans will be forwarded to the SHPO for review along with BLM's determination of effect for the project. When a discovery plan has been accepted by BLM and SHPO, the BLM can meet its Section 106 requirements by following the plan when cultural properties are discovered during implementation of an undertaking. The BLM shall take prudent and feasible steps to ensure that the undertaking does not harm the property until treatment is completed in accordance with the discovery plan. BLM and SHPO may agree upon a standard discovery plan for inclusion in the BLM Handbook. A field office may follow that discovery plan without additional consultation with SHPO on the discovery plan. Until such a plan is developed for inclusion in the BLM Handbook, BLM will follow procedures outlined in Section VIII.B of this Protocol.

### **B. Unplanned Discoveries**

If the BLM determines, after completion of the review process outlined in this Protocol, an undertaking

may affect or has affected a previously unidentified property that may be eligible for the National Register, the BLM will be required to follow appropriate discovery procedures defined in the BLM Handbook or other guidance developed jointly between the BLM and the SHPO. Until the BLM Handbook procedures are developed, the BLM will make a reasonable effort to avoid or minimize harm to a discovered property until (1) the property has been assessed in terms of National Register eligibility, and (2) if the property is determined eligible, an appropriate treatment plan has been prepared. The SHPO will be provided 15 days of receipt of the documentation to comment on the treatment plan. Since implementation of the treatment plan is not covered by the land user's Conditions of Approval, implementation of the treatment plan will require a MOA among the BLM, the SHPO, and the land user.

## **IX. STAFFING AND OBTAINING SPECIALIZED CAPABILITIES**

### **A. Staffing**

The BLM will allow identification and evaluation of cultural resources only by specialists who meet the qualifications and are classified in the appropriate professional series by the Office of Personnel Management (e.g., Series 193 for archaeologists). Specialists at the GS-5 and GS-7 levels are considered to be performing duties in a trainee or developmental capacity. Reports prepared by GS-5 and GS-7 specialists, or any cultural resource consultant, must be reviewed and submitted to the SHPO by a GS-9 or higher-grade cultural resource specialist. New specialists at a GS-9 grade or higher who have not received training on this Protocol must follow the procedures required of a GS-7 cultural resource specialist.

When new managers (Field Managers, Assistant Field Managers, Supervisory Natural Resource Specialists, or Deputy State Director for Resources) or cultural resource specialists are hired, the BLM will ensure that the new managers or cultural resource specialists receive orientation, within 90 days in accordance with Section X.D of this Protocol. It shall be the responsibility of the BLM Deputy Preservation Officer (DPO) to provide appropriate orientation to new managers and cultural resource specialists. Once the orientation is completed, the DPO will notify the SHPO and the Field Office will be allowed to follow the procedures of this Protocol. If the SHPO documents persistent problems in complying with the terms of this Protocol, the Dispute Resolution Procedures at Section XI.A of the Protocol will be followed.

The Wyoming SHPO will ensure all new historic preservation specialists hired to conduct Federal Section 106 review receive training in Section 106 compliance and this Protocol within 90 days of being hired.

### **B. Specialized Capabilities**

When the BLM is involved in an undertaking requiring expertise not possessed by available BLM staff (i.e., architectural history), it will obtain that expertise for the purpose of determining National Register eligibility, effects, and treatment for the cultural properties in question. The BLM may request the assistance of SHPO staff in such cases or may obtain the necessary expertise through contracts, BLM personnel from other states, or cooperative arrangements with other agencies.

## **X. SUPPORTING PROGRAMS AND ACTIVITIES**

The BLM and the SHPO recognize the advantages of working together on a wide range of heritage preservation activities and will cooperatively pursue the following efforts:

#### A. Data Sharing and Information Management

1. Reporting Standards: BLM and SHPO will collaborate on the development of standards for preparing inventory and treatment reports, and jointly develop isolated resource and *Wyoming Cultural Properties Forms (WYCPF)*. All BLM inventory reports submitted to SHPO will follow *WY Report Standards*. All site data will be reported on Wyoming Cultural Property Forms or Wyoming Isolated Resource Forms as appropriate. Any revisions to the standards will be jointly developed by BLM and SHPO.
2. Data System Management: BLM and SHPO will maintain a Statewide automated cultural records database that is accessible from all BLM Field Offices. The BLM and SHPO will continue to collaborate on ways to synthesize and use the automated cultural data to develop Geographic Information System (GIS) capabilities. BLM and SHPO will continue to cooperate in this endeavor by providing financial, personnel, hardware and software resources as funding becomes available. If SHPO or a BLM Field Office are aware of specific backlog documentation held in either office, they should work cooperatively to provide the documentation to the office requesting it.
3. Electronic Records Submission and Project Tracking: BLM and SHPO will jointly work to implement the electronic submission of records for tracking agency actions through the use of CRMtracker. BLM and SHPO will work to insure the program meets agency and SHPO needs. The use of this program greatly increases the efficiency of data management, review, and annual reporting.

#### B. State BLM Handbook Supplement

BLM field procedures will be detailed in a Wyoming State BLM Handbook as a supplement to bureau-wide BLM Manual procedures. BLM and SHPO will collaborate on development of the handbook and set a goal of finalizing the handbook within one year of signature of this Protocol. The BLM and SHPO, in consultation with contractors permitted by the BLM to work in the state of Wyoming, will collaborate on development of a supplemental contractor handbook. Disagreement between BLM and SHPO regarding either development or implementation of Handbook procedures will be resolved in accordance with the dispute resolution procedures at Section X of this Protocol. All future changes or amendments to the Handbook procedures will be made in cooperation with the SHPO.

#### C. Public Outreach and Heritage Education

The BLM and the SHPO will work cooperatively to promote and enhance public education and outreach in historic preservation and cultural resource management through the following programs:

1. Archaeology Awareness Month: The BLM and the SHPO will participate in and support financially, as funding permits, Archaeology Awareness Month activities, including public presentations, field tours and excavations, exhibits, archaeology fairs, posters, brochures, and educational activities.
2. Project Archaeology: The BLM and SHPO will support Project Archaeology as a component of BLM's Heritage Education Program, by encouraging staff archaeologists to be trained and serve as facilitators in the program, with the goal of integrating the teaching of archaeological concepts and preservation ethics in Wyoming schools statewide.
3. Adventures in the Past/Heritage Education: The BLM and SHPO may, as funding permits, cooperatively work on the development of interpretation of cultural resources through a variety of media

including, but not limited to, exhibits, brochures, lectures, radio and television promotions, Internet web pages, and interpretive signs.

4. Wyoming Archaeological Society and the Wyoming Historical Society: The BLM and SHPO are encouraged to work cooperatively with the Wyoming Archaeological Society and the Wyoming Historical Society to promote preservation ethics, good science, and professional standards statewide to amateur archaeologists and historians by participating in society meetings, serving as chapter advisors, providing presentations and demonstrations, and other assistance as appropriate.

5. Professional Organizations: The BLM and SHPO cultural resource specialists are encouraged to participate in and work cooperatively with professional historic preservation organizations (e.g., Wyoming Association of Professional Archaeologists and the Wyoming Association of Professional Historians) to promote preservation ethics, good science and good history, professional standards statewide, and open dialogue regarding historic preservation issues .

6. Site Stewardship: The BLM and the SHPO will cooperate, as funding and staff availability permit, to develop a volunteer site stewardship program to recruit and train members of the public to serve as monitors and stewards of Wyoming's cultural resources on public lands, and to assist with educational and other activities involving cultural resources. BLM and SHPO will cooperate in efforts to obtain funding and other resources, such as grants and partnerships, for these activities.

7. Public Dissemination of Information: When appropriate, the BLM, SHPO, or a project proponent will provide funding for development and distribution of brochures, monographs, or other information documents summarizing the results of archaeological investigations for the general public. These can be either part of the Section 106 compliance responsibility or Section 110 research on public lands. Opportunities for public dissemination will especially be sought when research produces information that may be of particular interest to the general public. The BLM and SHPO will develop these materials in cooperation, either by BLM and SHPO staffs or through contracts. BLM and SHPO will cooperate in efforts to obtain funding and other resources, such as grants and partnerships, for these activities.

#### D. State-Level Historic Preservation Training and Workshops

The BLM and SHPO will cooperate and participate in both the initial training and future on-going training of BLM managers and cultural resource staff, SHPO staff, public land users, and cultural resource contractors relative to the National PA and implementation of this Protocol. Training resources shall include, but are not limited to, Wyoming BLM State Handbook or Manual Supplements, planning documents, and statewide historic context documents. Other training and workshops may include writing and negotiating agreement documents and treatment plans, Visual Contrast Rating (VCR) system, etc. Review of training needs and/or additional workshops will occur on a yearly basis at the annual cultural resource staff meeting. Emphasis will be on professional development training to expand professional skills of BLM and SHPO cultural resource staff. Orientation meetings on this Protocol will be held within six months of signature of this agreement for contractors, developers, and other interested parties.

#### E. Historic Context Development

Pursuant to the *Letter of Intent Creating a Partnership in Preservation between the State of Wyoming and the Wyoming State Office of the Bureau of Land Management* which was executed on April 23, 2004, increased emphasis will be given to the development of historic contexts. The BLM and the SHPO will cooperatively recommend statewide priorities for historic context development involving BLM lands.

These recommendations shall take into consideration context development priority recommendations made by the Governor's Historic Context Development Steering Committee. Recommendations will be considered in the BLM budget process as a statewide benefiting program. Field Managers may also develop project-specific contexts as their funding allows. In addition, the BLM will cooperate with the SHPO in the pursuit of funding to support the development of historic contexts (e.g., grant proposals). All historic contexts, must be consistent with the Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation (48 FR 44716) and the SHPO *Guidelines for the Development of Historic Contexts in Wyoming*. In accordance with Section 101(b)(3) of the NHPA, whereby the SHPO has responsibility for preparing and implementing the State's comprehensive historic preservation plan, the SHPO shall review and provide comments on all BLM historic context documents. Historic contexts which define site eligibility criteria, levels of adequate inventory, site documentation requirements, standards for assessment of effects, and/or appropriate treatment of historic properties shall require SHPO concurrence on those aspects. All jointly developed historic contexts within Wyoming shall be endorsed by all participating parties.

#### F. Collections Management

BLM and SHPO shall cooperate to support and maintain the collections (artifacts and associated field notes and other documents) at the University of Wyoming Archaeological Repository (UWAR) for curation of Federal archaeological collections. Curation of archaeological materials is supported through a formal Memorandum of Understanding between the University of Wyoming Department of Anthropology and the SHPO's Office of the Wyoming State Archaeologist. Following BLM acceptance and submission of project reports to SHPO, BLM shall continue to track progress of collections from BLM lands. Consultants and BLM shall submit artifacts, field notes, field maps, photographs, and documentation meeting UWAR's "Guidelines and Standards" as required per standard stipulations in BLM permits. UWAR will notify the BLM State Office of receipt of the collection upon arrival at UWAR. After accessioning the collection, UWAR will further notify the BLM State Office of acceptance and curation of the collection. BLM will require through its Cultural Resource Use Permit stipulations that all collections are submitted to UWAR within 60 days of the submission of the project report to BLM. The project report will be date-stamped and that date shall be the beginning of the 60-day period.

### **XI. DISPUTE RESOLUTION PROCEDURES, AMENDMENTS, AND TERMINATION**

A. If the BLM and the SHPO disagree on an issue, they will consult with one another to resolve the issue. If the disagreement is about an action in a BLM Field Office, the Field Office Manager and the SHPO will consult to resolve it.

If the disagreement is with the State Office, or the matter is referred to the State Office by a Field Office Manager or the SHPO, the BLM Deputy Preservation Officer, the SHPO, and the Wyoming State Division of Cultural Resources Administrator will consult to resolve the issue. If the matter is not resolved at this level, the matter will be referred to the BLM Deputy State Director and the Director of the Wyoming State Department of Parks and Cultural Resources.

If the issue is not satisfactorily resolved at this management level, the issue will be forwarded to the Governor and the State Director for final resolution.

Nothing in this section abrogates the signature authority of the SHPO under the NHPA.

#### B. Amendments to the Protocol

If the BLM or the SHPO wish to amend this Protocol at any time, they will consult to consider requested changes. Amendments will become effective when signed by both parties.

#### C. Termination of the Protocol

The BLM or the SHPO may terminate this Protocol by providing 90 days notice to the other party, providing that they consult during this period to seek agreement on amendments or other actions that would avoid termination. The BLM DPO may request the assistance of the BLM Preservation Board, the National Conference of State Historic Preservation Officers, or the ACHP in the consultation process. If the Protocol is terminated, the BLM will be required to comply with Section 106 of the NHPA by following the implementing regulations at 36 CFR Part 800.

#### D. Termination of the National Programmatic Agreement

Should the National Programmatic Agreement be terminated or suspended for any reason, the BLM and the SHPO shall, within 30 days, bring this Protocol to the ACHP and attempt to convert this Protocol into a stand-alone statewide programmatic agreement. If the National Programmatic Agreement is terminated, the BLM will be required to comply with Section 106 of the NHPA by following the implementing regulations at 36 CFR Part 800.

### **XII. DECERTIFICATION/SUSPENSION FOR CAUSE**

If a pattern of failure to comply with the terms of this Protocol can be demonstrated, a Field Office Manager, the DPO, or the SHPO may, upon written notification to the BLM State Director, request a review of a Field Office's status and its capability for carrying out the terms of the national Programmatic Agreement and this Protocol. The BLM State Director may request a review and recommendations from appropriate staff and/or the Preservation Board. The BLM, in consultation with the SHPO, shall develop an action plan to be followed by the Field Office under review in order to bring that office into compliance with this Protocol. After the subject Field Office believes that it has completed all of the actions specified in the plan, it will notify the BLM Deputy Preservation Officer who will review compliance with the action plan with SHPO. Based on the review, the BLM Deputy Preservation Officer will make a recommendation to the State Director.

If the Field Office has failed to comply with the action plan, the State Director may decertify and suspend a Field Office from operating under the terms of this Protocol. Decertification and suspension from this Protocol will require that the affected Field Office comply with Section 106 of the NHPA by following the implementing regulations at 36 CFR Part 800.

Recertification of the affected Field Office, which will allow that office to continue operating under the terms of this Protocol, will occur at the discretion of the BLM State Director after consultation with the

SHPO and/or Governor. The State Director will notify in writing both the Field Office and the SHPO when that Field Office is recertified.

### **XIII. IMPLEMENTATION**

The previous Protocol dated April 15, 1998 will remain in effect until all appropriate staff are trained pursuant to Section IX.A of this Protocol. The terms of this Protocol will not be effective until BLM and SHPO staff has received training on the requirements and procedures herein. Cultural resource permittees will have the opportunity to receive training on Appendix C concurrently with the BLM and SHPO.

### **XIV. APPENDICES**

- A. Special Purpose Programmatic Agreements, Memorandums of Agreement and Supplemental Agreements in Effect Under the Protocol
- B. Actions Exempt from Case-By-Case Review
- C. Guidance on the Assessment of Setting (pending)
- D. Defined Non-Sites and Property Types Requiring No Formal Documentation
- E. Standard Signed Notification

Glossary

**XIV. APPROVALS**

BUREAU OF LAND MANAGEMENT

/ signed /	03/08/2006
_____	_____
Robert A. Bennett, Wyoming State Director	Date

STATE HISTORIC PRESERVATION OFFICER

/ signed /	03/08/2006
_____	_____
Sara E. Needles, Wyoming State Historic Preservation Officer	Date

STATE OF WYOMING

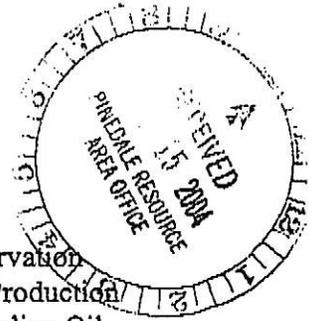
/ signed /	03/08/2006
_____	_____
Honorable Dave Freudenthal, Governor	Date

STATE OF WYOMING ATTORNEY GENERAL

/ signed /	03/08/2006
_____	_____
Kyle Smith Signature as to form	Date

## **APPENDIX 15**

### **Programmatic Agreement Shell/Ultra**



**Programmatic Agreement**

Among the Bureau of Land Management, the Wyoming State Historic Preservation Officer, the Advisory Council on Historic Preservation, Shell Exploration and Production Company and Ultra Resources, Inc., regarding the effects of the Pinedale Anticline Oil and Gas Exploration and Development in Sublette County, Wyoming, on the Lander Road Variant of the California National Historic Trail

WHEREAS, the Bureau of Land Management (BLM) proposes to approve 36 well pads for over 100 Applications for a Permit to Drill (APD) for Shell Exploration and Production Company (Shell) and Ultra Resources, Inc. (Ultra) in the Pinedale Anticline, Sublette County, Wyoming; and

WHEREAS, the BLM's approval of the APD, quality control, reclamation and rehabilitation will be implemented in accord with the Record of Decision for the Environmental Impact Statement for the Pinedale Anticline Oil and Gas Exploration and Development Project as ratified in July, 2000; and

WHEREAS, the development of well pads, drilling wells, and construction and use of access roads will have an adverse effect on the integrity of setting of the Lander Road Variant of the California National Historic Trail (Lander Road), designated by Congress as a National Historic Trail and determined eligible for listing on the National Register of Historic Places under Criteria A and C; and

WHEREAS, the BLM has established the area of potential effect (APE), as defined at 36 CFR § 800.16(d), to include the surface area within Township 31 North, Range 108 West, Sections 19, 20, 29, 30, 31, 32, 33, Township 31 North, Range 109 West, Sections 23, 24, 25 26, and the Lander Road between Township 30 North, Range 105 West, Section 22 and Township 31 North, Range 110 West, Section 35; and

WHEREAS, a quarter-mile surface protection zone has been established on either side of the Lander Road to comprise a total zone for no surface disturbance of a half-mile; and

WHEREAS, the BLM has a Nationwide Programmatic Agreement and a Wyoming State Protocol Agreement that governs this undertaking with regard to any of its effects on the Lander Road Variant other than those to its integrity of setting, and all other undertakings and effects to historic properties that may occur within the APE; and

WHEREAS, the BLM has consulted with the Wyoming State Historic Preservation Officer (SHPO) and the Advisory Council on Historic Preservation (ACHP) pursuant to Section 106 of the National Historic Preservation Act (16 U.S.C. § 470f) and 36 CFR § 800.14(b); and

WHEREAS, the BLM has invited Shell and Ultra to participate in consultation and sign this Programmatic Agreement (PA); and

WHEREAS, the BLM has consulted with the Oregon-California Trails Association (OCTA) and the National Historic Trails Administrator, National Park Service (NPS) and both parties may concur with this PA; and

WHEREAS, the BLM has consulted with the Northern Ute and Eastern Shoshone Tribes on the Lander Road and the PA and they did not express any concerns; and

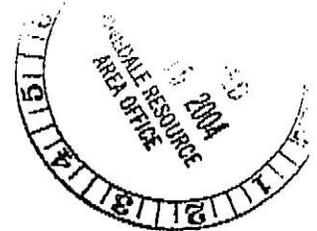
WHEREAS, the State of Wyoming and the SHPO do not waive their sovereign immunity by entering into this PA, and each fully retains all immunities and defenses provided by law with respect to any action based on or occurring as a result of this PA; and

WHEREAS, this PA represents the entire and integrated agreement between the parties and supercedes all prior negotiations, representations and agreements, whether written or oral regarding Section 106 review of the effects of Pinedale Anticline Oil and Gas Exploration and Development Project on the integrity of setting of the Lander Road Variant of the California National Historic Trail.

NOW, THEREFORE, the BLM, SHPO, ACHP, Shell and Ultra agree that the undertaking shall be implemented in accordance with the following stipulations in order to take into account the effects of the undertaking on the integrity of setting for the Lander Road.

## STIPULATIONS

The BLM shall ensure that the following stipulations are implemented.



### I. Avoidance

- A. Segments of the Lander Road within the APE will be avoided completely within the half-mile surface protection zone. BLM will identify the area to be avoided on the ground.
- B. Shell and Ultra Project Managers will instruct all employees, contractors, subcontractors and any additional parties involved in the well pad construction and drilling to keep equipment, trucks and any other gear outside of the surface protection zone.

### II. Mitigation

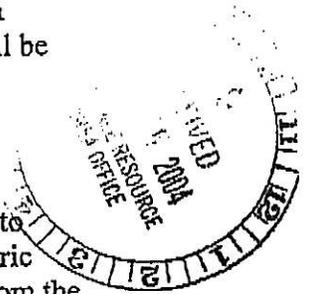
- A. Surface ground disturbance and visual intrusions will be minimized by only constructing 36 well pads. Each well pad will average 6.5 acres. The wells will conform to the Wyoming Oil and Gas Commission's Standards for the Pinedale Anticline field development.
- B. Shell and Ultra will jointly plan the construction and use of access and transportation roads and pipeline corridors. Both companies will utilize the same roads and pipeline corridors whenever possible which will limit the

number of roads and minimize visual impacts. Placing pipelines adjacent to roads will also limit ground disturbance.

- C. Shell and Ultra will use low profile tanks, approximately 10 feet in height. The tanks will be painted to be visually integrated into the landscape by color (e.g. Carlsbad Canyon {2.5Y 6/2} or Shale Green {5Y 4/2}).
- D. Visual simulations may be required for problematic well locations. The BLM will decide at the on-site for the well permit if a visual simulation is necessary. The SHPO, ACHP and OCTA will be provided with the data after a visual simulation is completed for review and comment.
- E. Ultra will plug and abandon the Pinedale Federal #2 well location, located in Township 31 North, Range 108 West, Section 29. Ultra will remove all surface facilities and subsequently reclaim the site. Plugging, facility removal and reclamation will be completed by July 1, 2005.
- F. Shell and Ultra will fund the replacement of a windmill in Township 30, Range 106 West, Section 12. The windmill will be replaced with a submersible pump. If replacement is not feasible, the windmill will be painted with non-reflective and appropriate environmental colors.

### III. Reports and Educational Products

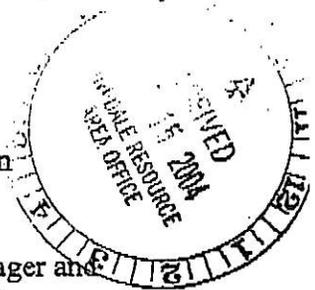
- A. An Advisory Committee (Committee) is established with this PA to develop educational materials including interpretation of the historic significance of the Lander Road for the public. Representatives from the BLM, SHPO, Ultra, Shell, OCTA and the NPS will comprise the membership. The BLM Pinedale Field Manager will have final approval authority over any educational products.
- B. The Committee will meet within three months of the execution of this PA to develop an Interpretive Plan with specific projects and a schedule for completion.
  - 1. Specific educational products to be produced may include, but will not be limited to, an illustrated popular report, augmentation of the existing Trails website, interpretive signs, kiosks, brochures, trail markers, posters, and a traveling exhibit for communities within Wyoming.
  - 2. Photographic documentation may include, but will not be limited to large format black-and-white landscape and specific segments of the Lander Road, black-and-white and color aerial photos, narrated video documentation of the affected segments of the Lander Road and copies of any archival historic photos that may exist in collections.



3. Educational interpretive products may be developed for the segment of the Lander Road between Buckskin Crossing and the Green River.
- C. Shell and Ultra will jointly fund the educational products identified in the final Interpretive Plan for a total amount not to exceed \$60,000.
- D. Implementation of the Interpretive Plan will commence within one year of the execution of this PA.
- E. The BLM will prepare an annual report as a specific requirement of this PA. The report will include the number of APD's approved for the calendar year, status of the Interpretive Plan and its' implementation, status of reclamation efforts, and a summary of any mitigation that may have been taken place during construction of the well pad, access roads or an individual APD. The report will be distributed to all signatories by March 31 of each year the PA is in effect.

#### IV. Dispute Resolution

- A. The BLM shall consult with any signatory to this PA if there is an objection by a signatory to the manner in which the terms of this agreement are implemented.
- B. If the objection cannot be resolved between the BLM Field Manager and the objecting signatory, the matter shall be referred to the BLM Deputy Preservation Officer (DPO) for resolution.
- C. If the objection cannot be resolved with the BLM DPO, then all signatories should consult to resolve the matter.
- D. If the objection cannot be resolved among the signatories, the matter shall be referred to the BLM State Director. The matter may be referred to the BLM Preservation Board which will provide recommendations for resolution to the State Director. The final decision for resolution of the objection by any signatory shall be made by the BLM State Director.
- E. The BLM Field Manager shall consider non-signatory objections to the manner in which the terms of the agreement are implemented. If the objection cannot be resolved to the satisfaction of BLM and the objecting party, the BLM Field Manager shall request the signatories to provide their opinion on the matter. Prior to making a final decision on the matter, the BLM Field Manager shall take into account all the signatory opinions received within 15 days of the request.



#### V. Amendment

Any signatory to this PA may request that the other signatories consider amending it if circumstances change over time and warrant revision of the stipulations. Amendments will be executed in the same manner as the original PA.

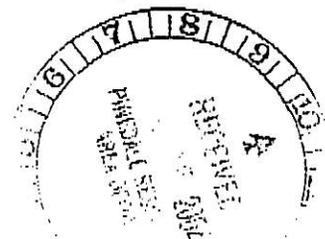
VI. Termination

- A. Any signatory to this PA may initiate consultation for termination by providing 30 business days notice to the other parties of their intent. After notification by the initiating signatory, the remaining signatories will have 60 business days to consult to seek agreement on amendments or any other actions that would address the issues and avoid termination.
- B. In the event of termination, the BLM will refer to Wyoming State Protocol Agreement to address any remaining adverse effects to the Lander Road.

VII. Sunset Terms

- A. This PA will remain in effect for ten years from the date of execution.
- B. If Shell and Ultra have not completed the development of their leaseholds in ten years, the BLM will insure the PA will be reevaluated, revised if necessary to accommodate any changes to the terms, and renewed for another ten years. All signatories will be consulted in the reevaluation of the stipulations.
- C. The BLM will ensure the PA will be reevaluated every ten years by all signatories, or until all the wells have been reclaimed and rehabilitated as specified in the BLM Pinedale Field Office Record of Decision for the Environmental Impact Statement for the Pinedale Anticline Oil and Gas Exploration and Development Project, Sublette County, Wyoming as ratified in July 2000.

Execution of the Programmatic Agreement and implementation of its terms evidence that BLM has afforded the ACHP an opportunity to comment on the undertakings that will adversely effect the integrity of the setting of the Lander Road.



**APPENDIX 16**

**Air Quality Impact Tables 2005**

**Table 16.1**  
**Summary of Maximum Modeled NO<sub>2</sub> Concentration Impacts (µg/m<sup>3</sup>) at PSD Class I and Sensitive PSD Class II Areas from Year-2005 Project Sources**

Bridger Wilderness Class I		Fitzpatrick Wilderness Class I		Grand Teton National Park Class I		Gros Ventre Wilderness Class II		North Absoroka Wilderness Class I	
Direct Modeled Impact	Total Concentration <sup>1</sup>	Direct Modeled Impact	Total Concentration <sup>1</sup>	Direct Modeled Impact	Total Concentration <sup>1</sup>	Direct Modeled Impact	Total Concentration <sup>1</sup>	Direct Modeled Impact	Total Concentration <sup>1</sup>
Annual	Annual	Annual	Annual	Annual	Annual	Annual	Annual	Annual	Annual
0.221	8.22	0.015	8.02	0.006	8.01	0.019	8.02	0.001	8.00

Popo Agie Wilderness Class II		Teton Wilderness Class I		Washakie Wilderness Class I		Wind River Roadless Area Class II		Yellowstone National Park Class I	
Direct Modeled Impact	Total Concentration <sup>1</sup>	Direct Modeled Impact	Total Concentration <sup>1</sup>	Direct Modeled Impact	Total Concentration <sup>1</sup>	Direct Modeled Impact	Total Concentration <sup>1</sup>	Direct Modeled Impact	Total Concentration <sup>1</sup>
Annual	Annual	Annual	Annual	Annual	Annual	Annual	Annual	Annual	Annual
0.046	8.05	0.003	8.00	0.002	8.00	0.033	8.03	0.001	8.00

<sup>1</sup> Total concentration includes direct modeled impact and background concentration for comparison to NAAQS/WAAQS which are 100 µg/m<sup>3</sup> on an annual basis. Annual background NO<sub>2</sub> concentration value of 8 µg/m<sup>3</sup> from Boulder monitor.

**Table 16.2  
Summary of Maximum Modeled SO<sub>2</sub> Concentration (µg/m<sup>3</sup>) at PSD Class I and  
Sensitive PSD Class II Areas from Year-2005 Project Sources**

Bridger Wilderness Class I									Fitzpatrick Wilderness Class I									Grand Teton National Park Class I									Gros Ventre Wilderness Class II									North Absaroka Wilderness Class I								
Direct Modeled Impact			Total Concentration <sup>1</sup>						Direct Modeled Impact			Total Concentration <sup>1</sup>						Direct Modeled Impact			Total Concentration <sup>1</sup>						Direct Modeled Impact			Total Concentration <sup>1</sup>														
3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual												
0.80	0.23	0.02	132.8	43.2	9.02	0.19	0.06	0.003	132.2	43.1	9.00	0.08	0.017	0.001	132.1	43.0	9.00	0.17	0.04	0.002	132.2	43.0	9.00	0.03	0.01	0.0003	132.0	43.0	9.00															

Popo Agie Wilderness Class II									Teton Wilderness Class I									Washakie Wilderness Class I									Wind River Roadless Area Class II									Yellowstone National Park Class I								
Direct Modeled Impact			Total Concentration <sup>1</sup>						Direct Modeled Impact			Total Concentration <sup>1</sup>						Direct Modeled Impact			Total Concentration <sup>1</sup>						Direct Modeled Impact			Total Concentration <sup>1</sup>														
3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual												
0.18	0.04	0.01	132.2	43.0	9.01	0.05	0.01	0.001	132.0	43.0	9.00	0.05	0.01	0.001	132.0	43.0	9.00	0.19	0.05	0.01	132.2	43.0	9.01	0.05	0.01	0.0003	132.1	43.0	9.00															

<sup>1</sup> Total concentration includes direct modeled impact and background concentration for comparison with NAAQS/WAAQS which are 1,300 µg/m<sup>3</sup> on a 3-hour basis, 365/260 µg/m<sup>3</sup> on a 24-hour basis and 80/60 µg/m<sup>3</sup> on an annual basis. Background SO<sub>2</sub> concentration values of 132 µg/m<sup>3</sup>, 43 µg/m<sup>3</sup>, and 9 µg/m<sup>3</sup>, from Craven Creek used for 3-hour, 24-hour, and annual averaging periods, respectively.

**Table 16.3**  
**Summary of Maximum Modeled PM<sub>10</sub> Concentration Impacts (µg/m<sup>3</sup>) at PSD Class I and Sensitive PSD Class II Areas from Year-2005 Project Sources**

Bridger Wilderness Class I				Fitzpatrick Wilderness Class I				Grand Teton National Park Class I				Gros Ventre Wilderness Class II				North Absaroka Wilderness Class I			
Direct Modeled Impact		Total Concentration <sup>1</sup>		Direct Modeled Impact		Total Concentration <sup>1</sup>		Direct Modeled Impact		Total Concentration <sup>1</sup>		Direct Modeled Impact		Total Concentration <sup>1</sup>		Direct Modeled Impact		Total Concentration <sup>1</sup>	
24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual
1.80	0.10	33.8	9.10	0.60	0.02	32.6	9.02	0.18	0.01	32.176	9.01	0.36	0.02	32.4	9.02	0.13	0.003	32.134	9.00

Popo Agie Wilderness Class II				Teton Wilderness Class I				Washakie Wilderness Class I				Wind River Roadless Area Class II				Yellowstone National Park Class I			
Direct Modeled Impact		Total Concentration <sup>1</sup>		Direct Modeled Impact		Total Concentration <sup>1</sup>		Direct Modeled Impact		Total Concentration <sup>1</sup>		Direct Modeled Impact		Total Concentration <sup>1</sup>		Direct Modeled Impact		Total Concentration <sup>1</sup>	
24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual
0.46	0.04	32.5	9.04	0.13	0.01	32.1	9.01	0.17	0.01	32.2	9.01	0.54	0.03	32.5	9.03	0.12	0.004	32.1	9.00

<sup>1</sup> Total concentration includes direct modeled impact and background concentration for comparison to NAAQS/WAAQS. The NAAQS and WAAQS are 150 µg/m<sup>3</sup> on a 24-hour basis, and the WAAQS is 50 µg/m<sup>3</sup> on an annual basis. The annual NAAQS for PM<sub>10</sub> was revoked by EPA effective December 18, 2006. Background PM<sub>10</sub> concentration values of 32 µg/m<sup>3</sup> and 9 µg/m<sup>3</sup>, from Boulder used for 24-hour and annual averaging periods, respectively.

**Table 16.4**  
**Summary of Maximum Modeled PM<sub>2.5</sub> Concentration Impacts (µg/m<sup>3</sup>) at PSD Class I and Sensitive PSD Class II Areas from Year-2005 Project Sources**

Bridger Wilderness Class I				Fitzpatrick Wilderness Class I				Grand Teton National Park Class I				Gros Ventre Wilderness Class II				North Absaroka Wilderness Class I			
Direct Modeled Impact		Total Concentration <sup>1</sup>		Direct Modeled Impact		Total Concentration <sup>1</sup>		Direct Modeled Impact		Total Concentration <sup>1</sup>		Direct Modeled Impact		Total Concentration <sup>1</sup>		Direct Modeled Impact		Total Concentration <sup>1</sup>	
24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual
0.72	0.10	15.7	6.10	0.19	0.02	15.2	6.02	0.11	0.01	15.1	6.01	0.15	0.02	15.2	6.02	0.05	0.003	15.0	6.00

Popo Agie Wilderness Class II				Teton Wilderness Class I				Washakie Wilderness Class I				Wind River Roadless Area Class II				Yellowstone National Park Class I			
Direct Modeled Impact		Total Concentration <sup>1</sup>		Direct Modeled Impact		Total Concentration <sup>1</sup>		Direct Modeled Impact		Total Concentration <sup>1</sup>		Direct Modeled Impact		Total Concentration <sup>1</sup>		Direct Modeled Impact		Total Concentration <sup>1</sup>	
24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual
0.26	0.04	15.3	6.04	0.06	0.01	15.1	6.01	0.07	0.01	15.1	6.01	0.26	0.03	15.3	6.03	0.06	0.004	15.1	6.00

<sup>1</sup> Total concentration includes direct modeled impact and background concentration for comparison to NAAQS/WAAQS. The NAAQS and WAAQS on a 24-hour basis are 35 µg/m<sup>3</sup> and 65 µg/m<sup>3</sup>, respectively. EPA has revised the 24-hour NAAQS effective December 18, 2006. The State of Wyoming will enter rulemaking to revise the WAAQS. The NAAQS and WAAQS on an annual basis are 15 µg/m<sup>3</sup>. Background PM<sub>2.5</sub> concentration values of 15 µg/m<sup>3</sup> and 6 µg/m<sup>3</sup>, from Pinedale used for 24-hour and annual averaging periods, respectively.

**Table 16.5**  
**Summary of Maximum Modeled NO<sub>2</sub> Concentration Impacts (µg/m<sup>3</sup>)**  
**Compared to PSD Increments from Year-2005 Project Sources**

Bridger Wilderness Class I		Fitzpatrick Wilderness Class I		Grand Teton National Park Class I		Gros Ventre Wilderness Class II		North Absoroka Wilderness Class I	
Direct Modeled Impact	PSD Increment	Direct Modeled Impact	PSD Increment	Direct Modeled Impact	PSD Increment	Direct Modeled Impact	PSD Increment	Direct Modeled Impact	PSD Increment
Annual	Annual	Annual	Annual	Annual	Annual	Annual	Annual	Annual	Annual
0.221	2.5	0.015	2.5	0.006	2.5	0.019	25.0	0.001	2.5

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Popo Agie Wilderness Class II		Teton Wilderness Class I		Washakie Wilderness Class I		Wind River Roadless Area Class II		Yellowstone National Park Class I	
Direct Modeled Impact	PSD Increment	Direct Modeled Impact	PSD Increment	Direct Modeled Impact	PSD Increment	Direct Modeled Impact	PSD Increment	Direct Modeled Impact	PSD Increment
Annual	Annual	Annual	Annual	Annual	Annual	Annual	Annual	Annual	Annual
0.046	25.0	0.003	2.5	0.002	2.5	0.033	25.0	0.001	2.5

<sup>1</sup> All NEPA analysis comparisons to the PSD increments are intended to evaluate a threshold of concern and do not represent a regulatory PSD Increment Consumption Analysis.

**Table 16.6  
Summary of Maximum Modeled SO<sub>2</sub> Concentration (µg/m<sup>3</sup>) Compared to  
PSD Increments from Year-2005 Project Sources<sup>1</sup>**

Bridger Wilderness Class I						Fitzpatrick Wilderness Class I						Grand Teton National Park Class I						Gros Ventre Wilderness Class II						North Absaroka Wilderness Class I					
Direct Modeled Impact			PSD Increment			Direct Modeled Impact			PSD Increment			Direct Modeled Impact			PSD Increment			Direct Modeled Impact			PSD Increment			Direct Modeled Impact			PSD Increment		
3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual
0.80	0.23	0.02	25.0	5.0	2.0	0.19	0.06	0.003	25.0	5.0	2.0	0.08	0.017	0.001	25.0	5.0	2.0	0.17	0.04	0.002	512.0	91.0	20.0	0.03	0.01	0.0003	25.0	5.0	2.0

Popo Agie Wilderness Class II						Teton Wilderness Class I						Washakie Wilderness Class I						Wind River Roadless Area Class II						Yellowstone National Park Class I					
Direct Modeled Impact			PSD Increment			Direct Modeled Impact			PSD Increment			Direct Modeled Impact			PSD Increment			Direct Modeled Impact			PSD Increment			Direct Modeled Impact			PSD Increment		
3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual
0.18	0.04	0.01	512.0	91.0	20.0	0.05	0.01	0.001	25.0	5.0	2.0	0.05	0.01	0.001	25.0	5.0	2.0	0.19	0.05	0.01	512.0	91.0	20.0	0.05	0.01	0.0003	25.0	5.0	2.0

<sup>1</sup> All NEPA analysis comparisons to the PSD increments are intended to evaluate a threshold of concern and do not represent a regulatory PSD Increment Consumption Analysis.

**Table 16.7  
Summary of Maximum Modeled PM<sub>10</sub> Concentration Impacts (µg/m<sup>3</sup>) from  
Year-2005 Project Sources Compared to PSD Increments<sup>1</sup>**

Bridger Wilderness Class I				Fitzpatrick Wilderness Class I				Grand Teton National Park Class I				Gros Ventre Wilderness Class II				North Absaroka Wilderness Class I			
Direct Modeled Impact		PSD Increment		Direct Modeled Impact		PSD Increment		Direct Modeled Impact		PSD Increment		Direct Modeled Impact		PSD Increment		Direct Modeled Impact		PSD Increment	
24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual
1.80	0.10	8.0	4.0	0.60	0.02	8.0	4.0	0.18	0.01	8.000	4.0	0.36	0.02	30.0	17.0	0.13	0.003	8.000	4.0

Popo Agie Wilderness Class II				Teton Wilderness Class I				Washakie Wilderness Class I				Wind River Roadless Area Class II				Yellowstone National Park Class I			
Direct Modeled Impact		PSD Increment		Direct Modeled Impact		PSD Increment		Direct Modeled Impact		PSD Increment		Direct Modeled Impact		PSD Increment		Direct Modeled Impact		PSD Increment	
24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual
0.46	0.04	30.0	17.0	0.13	0.01	8.0	4.0	0.17	0.01	8.0	4.0	0.54	0.03	30.0	17.0	0.12	0.004	8.0	4.0

<sup>1</sup> All NEPA analysis comparisons to the PSD increments are intended to evaluate a threshold of concern and do not represent a regulatory PSD Increment Consumption Analysis.

**Table 16.8  
Summary of Maximum Modeled In-field Pollutant Concentrations ( $\mu\text{g}/\text{m}^3$ ) from Year-2005 Project Sources**

NO <sub>2</sub>				SO <sub>2</sub>											
Direct Modeled Impact <sup>1</sup>	PSD Class II Increment <sup>2</sup>	Total Concentration <sup>3</sup>	NAAQS/WAAQS	Direct Modeled Impact <sup>1</sup>			PSD Class II Increment <sup>2</sup>			Total Concentration <sup>3</sup>			NAAQS/WAAQS		
Annual	Annual	Annual	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual
31.6	25.0	39.6	100	76.1	14.9	2.3	512.0	91.0	20.0	208.1	57.9	11.3	1,300	365/260	80/60

PM <sub>10</sub>								PM <sub>2.5</sub>					
Direct Modeled Impact <sup>1</sup>		PSD Class II Increment <sup>2</sup>		Total Concentration <sup>3</sup>		NAAQS/ WAAQS		Direct Modeled Impact		Total Concentration <sup>3</sup>		NAAQS/ WAAQS	
24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual
76.3	20.9	30.0	17.0	108.3	29.9	150	50 <sup>4</sup>	15.0	5.4	30.0	11.4	35 <sup>5</sup> (65) <sup>6</sup>	15

<sup>1</sup> Background concentrations are not added to modeled concentrations for comparison to the PSD increment.  
<sup>2</sup> All NEPA analysis comparisons to the PSD increments are intended to evaluate a threshold of concern and do not represent a regulatory PSD Increment Consumption Analysis.  
<sup>3</sup> Total concentration includes direct modeled impact and background concentration.  
 Annual background NO<sub>2</sub> concentration value of 8  $\mu\text{g}/\text{m}^3$  from Boulder monitor.  
 Background SO<sub>2</sub> concentration values of 132  $\mu\text{g}/\text{m}^3$ , 43  $\mu\text{g}/\text{m}^3$ , and 9  $\mu\text{g}/\text{m}^3$ , from Craven Creek used for 3-hour, 24-hour, and annual averaging periods, respectively.  
 Background PM<sub>10</sub> concentration values of 32  $\mu\text{g}/\text{m}^3$  and 9  $\mu\text{g}/\text{m}^3$ , from Boulder used for 24-hour and annual averaging periods, respectively.  
 Background PM<sub>2.5</sub> concentration values of 15  $\mu\text{g}/\text{m}^3$  and 6  $\mu\text{g}/\text{m}^3$ , from Pinedale used for 24-hour and annual averaging periods, respectively.  
<sup>4</sup> Annual NAAQS for PM<sub>10</sub> was revoked by EPA effective December 18, 2006.  
<sup>5</sup> Revised NAAQS effective December 18, 2006.  
<sup>6</sup> EPA has revised the NAAQS effective December 18, 2006. The State of Wyoming will enter rulemaking to revise the WAAQS.

**Table 16.9**  
**Summary of Maximum Modeled Visibility Impacts from Year-2005 at PSD Class I and Sensitive PSD Class II Areas**  
**from Year-2005 Project Sources Using FLAG Background Data - (MVISBK=6)**

Bridger Wilderness Class I		Fitzpatrick Wilderness Class I		Grand Teton National Park Class I		Gros Ventre Wilderness Class II		North Absaroka Wilderness Class I	
Maximum Visibility Impact ( $\Delta$ dv)	Number of Days > 1.0 $\Delta$ dv (days)	Maximum Visibility Impact ( $\Delta$ dv)	Number of Days > 1.0 $\Delta$ dv (days)	Maximum Visibility Impact ( $\Delta$ dv)	Number of Days > 1.0 $\Delta$ dv (days)	Maximum Visibility Impact ( $\Delta$ dv)	Number of Days > 1.0 $\Delta$ dv (days)	Maximum Visibility Impact ( $\Delta$ dv)	Number of Days > 1.0 $\Delta$ dv (days)
6.1	45	3.9	5	1.1	1	2.8	2	0.5	0

Popo Agie Wilderness Class II		Teton Wilderness Class I		Washakie Wilderness Class I		Wind River Roadless Area Class II		Yellowstone National Park Class I	
Maximum Visibility Impact ( $\Delta$ dv)	Number of Days > 1.0 $\Delta$ dv (days)	Maximum Visibility Impact ( $\Delta$ dv)	Number of Days > 1.0 $\Delta$ dv (days)	Maximum Visibility Impact ( $\Delta$ dv)	Number of Days > 1.0 $\Delta$ dv (days)	Maximum Visibility Impact ( $\Delta$ dv)	Number of Days > 1.0 $\Delta$ dv (days)	Maximum Visibility Impact ( $\Delta$ dv)	Number of Days > 1.0 $\Delta$ dv (days)
2.3	6	0.8	0	0.9	0	2.9	6	0.5	0

Note:  $\Delta$ dv = change in deciview.

**Table 16.10**  
**Summary of Maximum Modeled Visibility Impacts at Wyoming Regional Community Locations**  
**from Year-2005 Project Sources Using Boulder Background Data**

Boulder		Cora		Pinedale	
Maximum Visibility Impact ( $\Delta dv$ ) <sup>1</sup>	Number of Days > 1.0 $\Delta dv$ <sup>1</sup> (days)	Maximum Visibility Impact ( $\Delta dv$ ) <sup>1</sup>	Number of Days > 1.0 $\Delta dv$ <sup>1</sup> (days)	Maximum Visibility Impact ( $\Delta dv$ ) <sup>1</sup>	Number of Days > 1.0 $\Delta dv$ <sup>1</sup> (days)
12.2	108	8.5	36	10.3	55

<sup>1</sup>  $\Delta dv$  = change in deciview.

**Table 16.11**  
**Summary of Maximum Modeled Total Nitrogen (N) Deposition Impacts (kg/ha-yr) at**  
**PSD Class I and Sensitive PSD Class II Areas from Year-2005 Project Sources<sup>1</sup>**

Bridger Wilderness Class I		Fitzpatrick Wilderness Class I		Grand Teton National Park Class I		Gros Ventre Wilderness Class II		North Absaroka Wilderness Class I	
Modeled Impact	Total Impact <sup>2</sup>	Modeled Impact	Total Impact <sup>2</sup>	Modeled Impact	Total Impact <sup>3</sup>	Modeled Impact	Total Impact <sup>2</sup>	Modeled Impact	Total Impact <sup>3</sup>
0.058	1.478	0.007	1.427	0.004	1.294	0.008	1.428	0.003	1.293

Popo Agie Wilderness Class II		Teton Wilderness Class I		Washakie Wilderness Class I		Wind River Roadless Area Class II		Yellowstone National Park Class I	
Modeled Impact	Total Impact <sup>2</sup>	Modeled Impact	Total Impact <sup>3</sup>	Modeled Impact	Total Impact <sup>3</sup>	Modeled Impact	Total Impact <sup>2</sup>	Modeled Impact	Total Impact <sup>3</sup>
0.020	1.440	0.003	1.293	0.003	1.293	0.012	1.432	0.002	1.292

<sup>1</sup> Nitrogen deposition analysis level of concern for total impacts - 3.00 kg/ha-yr.

<sup>2</sup> Includes N deposition value of 1.42 kg/ha-yr measured at the CASTNET/NADP site near Pinedale for the year 2004.

<sup>3</sup> Includes N deposition value of 1.29 kg/ha-yr measured at the CASTNET/NADP site at Yellowstone National Park for the year 2005.

**Table 16.12**  
**Summary of Maximum Modeled Total Sulfur (S) Deposition Impacts (kg/ha-yr) at PSD Class I**  
**and Sensitive PSD Class II Areas from Year-2005 Project Sources<sup>1</sup>**

Bridger Wilderness Class I		Fitzpatrick Wilderness Class I		Grand Teton National Park Class I		Gros Ventre Wilderness Class II		North Absaroka Wilderness Class I	
Modeled Impact	Total Impact <sup>2</sup>	Modeled Impact	Total Impact <sup>2</sup>	Modeled Impact	Total Impact <sup>3</sup>	Modeled Impact	Total Impact <sup>2</sup>	Modeled Impact	Total Impact <sup>3</sup>
0.0098	0.750	0.0015	0.741	0.0006	0.681	0.0013	0.741	0.0004	0.680

Popo Agie Wilderness Class II		Teton Wilderness Class I		Washakie Wilderness Class I		Wind River Roadless Area Class II		Yellowstone National Park Class I	
Modeled Impact	Total Impact <sup>2</sup>	Modeled Impact	Total Impact <sup>3</sup>	Modeled Impact	Total Impact <sup>3</sup>	Modeled Impact	Total Impact <sup>2</sup>	Modeled Impact	Total Impact <sup>3</sup>
0.0042	0.744	0.0005	0.680	0.0006	0.681	0.0026	0.743	0.0004	0.680

<sup>1</sup> Sulfur deposition analysis level of concern for total impacts = 5.0 kg/ha-y.

<sup>2</sup> Includes S deposition value of 0.74 kg/ha-yr measured at the CASTNET/NADP site near Pinedale for the year 2004.

<sup>3</sup> Includes S deposition value of 0.68 kg/ha-yr measured at the CASTNET/NADP site at Yellowstone National Park for the year 2005.

**Table 16.13**  
**Summary of Maximum Modeled Change in ANC ( $\mu\text{eq/L}$ ) at Acid-Sensitive Lakes from Year-2005 Project Sources**

Alternative	Black Joe Lake		Deep Lake		Hobbs Lake		Lazy Boy Lake		Lower Saddlebag		Ross Lake		Upper Frozen	
	Bridger Wilderness Class I		Bridger Wilderness Class I		Bridger Wilderness Class I		Bridger Wilderness Class I		Popo Agie Wilderness Class II		Fitzpatrick Wilderness Class I		Bridger Wilderness Class I	
	ANC Change ( $\mu\text{eq/L}$ )	ANC Change (%)	ANC Change ( $\mu\text{eq/L}$ )	ANC Change (%)	ANC Change ( $\mu\text{eq/L}$ )	ANC Change (%)	ANC Change ( $\mu\text{eq/L}$ )	ANC Change (%)	ANC Change ( $\mu\text{eq/L}$ )	ANC Change (%)	ANC Change ( $\mu\text{eq/L}$ )	ANC Change (%)	ANC Change ( $\mu\text{eq/L}$ )	ANC Change (%)
Level of Acceptable Change( $\mu\text{eq/L}$ )	6.71	10%	5.97	10%	6.99	10%	1.00	--	5.52	10%	5.37	10%	1.00	--
Background	67.1	--	59.7	--	69.9	--	10.8	--	55.2	--	53.7	--	6.0	--
Predicted change in ANC	0.18	0.27%	0.20	0.34%	0.10	0.15%	0.06	--	0.19	0.35%	0.05	0.10%	0.22	--

<sup>1</sup> USFS Level of Acceptable Change; 10% change in ANC for lakes with ANC background values greater than 25  $\mu\text{eq/L}$ ,  
<sub>1</sub>  $\mu\text{eq/L}$  for lakes with ANC values less than or equal to 25  $\mu\text{eq/L}$ .

## **APPENDIX 17**

### **Wildlife Technical Report**

## **Wildlife Technical Report**

### **Mule Deer Over-Winter Mortality in the Sublette Herd Unit**

#### **INTRODUCTION**

Potential impacts to mule deer by natural gas development in the vicinity of Pinedale, Wyoming, were addressed by Bureau of Land Management (BLM) in the *Draft Environmental Impact Statement (DEIS) for the Pinedale Anticline Oil and Gas Exploration and Development Project Sublette County, Wyoming* (BLM, 1999). In this document and the accompanying Technical Report, BLM observed that human-related factors causing mule deer to expend energy during winter, in addition to the energy that would be expended without these factors, could lead to increased over-winter mortality. Migratory mule deer that normally wintered in the vicinity of natural gas development are expected to avoid them, potentially forced to depend on inferior habitats for over-winter survival (BLM, 1999). Potential for similar impacts to wintering mule deer by natural gas development have been echoed by Sawyer et al. (2002) and Lutz et al. (2003).

The Pinedale Anticline Project Area (PAPA) is within winter range utilized by mule deer in the Sublette Herd Unit. Recognizing the importance of the PAPA to wintering mule deer and other big game, the Record of Decision (ROD) on the *Environmental Impact Statement (EIS) for the Pinedale Anticline Oil and Gas Exploration and Development Project Sublette County, Wyoming* issued by BLM stated (page 19, BLM, 2000a):

*To ensure protection of wintering big game, all surface-disturbing or human activity associated with construction, including roads, pipelines well pads, drilling, completion or workover operations, will be seasonally and location restricted pursuant to the Mitigation Guidelines and Standard Practices described in Appendix A (of the EIS, BLM 2000b). To protect important big game winter habitat, activities or surface use will not be allowed from November 15 through April 30 within certain areas encompassed by the authorization.*

In 2004, Questar Exploration and Development Company (Questar) proposed to modify its strategy for future development of its 14,800-acre leasehold in the PAPA. Questar proposed year-round drilling within their leases in the northern portion of the PAPA. BLM analyzed the environmental consequences of Questar's proposal (including various applicant-committed measures to avoid or minimize environmental harm) in an Environmental Assessment (Questar EA) and issued a Decision Record for the Questar Year-Round Drilling Proposal (EA Number WY-100-EA5-034) with a Finding of No Significant Impact (BLM, 2004).

In 2005, Anschutz, Shell and Ultra (ASU) submitted a proposal to BLM for a year-round demonstration project in the PAPA. In September 2005, BLM issued a Decision Record which approved drilling operations between November 15, 2005 and July 31, 2006 in big games crucial winter ranges. It also allowed completion operations beginning May 1, 2006. BLM analyzed the environmental consequences of the ASU proposal (including various applicant-committed measures to avoid or minimize environmental harm) in an Environmental Assessment (ASU EA) and issued a Decision Record for the ASU Year-Round Drilling Demonstration Project - EA Number WY-100-EA05-254 with a Finding of No Significant Impact (BLM, 2005). The Decision Record allowed up to two rigs drilling on each of three well pads between November 15, 2005 and July 31, 2006.

In addition to these two amended actions that were evaluated through the NEPA process, BLM evaluated multiple requests from Operators for exceptions to lease stipulations to continue or conduct surface disturbing activities that would not otherwise be allowed from November 15 through April 30 in big game crucial winter ranges. An exception is a one-time exemption to a lease stipulation, determined on a case-by-case basis. From winters 2001-02 through 2006-07, 315 exceptions to development within big game crucial winter ranges (during winter while mule deer and pronghorn were present) were requested by Operators in the PAPA. BLM granted 256 of those requests, which may have been for only a few days within the period from November 15 to April 30, or longer. BLM partially granted 21 requests for exceptions and denied 38.

Wildlife technical reports were appended to the Questar EA (Appendix E in BLM, 2004) and the ASU EA (Appendix C in BLM, 2005) which examined mule deer over-winter mortality in the Sublette Herd Unit. Analyses of over-winter fawn mortality in both technical reports indicated that fawn mortality rate increased with increasing winter snowfall estimated for each month on crucial winter ranges used by the population. Over-winter fawn mortality has also been affected by drought conditions, specifically the total amount of precipitation during the two years prior to the onset of winter. As reported in the ASU EA (BLM 2005), fawn mortality increased with increasing total snowfall between November and March but decreased with more total precipitation in the two water years prior to that winter. Consequently, similar mortality rates may be observed during winters with very different amounts of snow, the effects of which are ameliorated or exacerbated by overall moist or dry conditions during the two previous years. The minimum temperature observed each November also influenced over-winter fawn mortality. Fewer fawns died in years with higher minimum temperatures at the onset of winter compared to mortality rates with lower minimum temperatures in November.

This Wildlife Technical Report provides an analysis of the variation in demographic parameters of mule deer in the Sublette Herd Unit before and during natural gas developments on the PAPA with the addition of data collected for winters 2005-06 and 2006-07.

## METHODS

**Over-winter Survival Rates.** Wyoming Game and Fish Department (WGFD) biologists have been collecting data useful for estimating adult and fawn over-winter survival rates for mule deer in the Sublette Herd Unit (Doug McWhirter, Scott Smith, Dean Clause) since winter 1992-93. The required data are 1) counts of fawns and adults alive during early winter, usually December, 2) counts of fawns and adults alive during spring, usually April, and 3) counts of fawn and adult carcasses made in late April or early May, after the spring survey of surviving animals. Three ratios, **A**, **B**, and **C** are constructed from these 3 counts (White et al., 1996):

**A** = fawns counted in December/adults counted in December (pre-winter)

**B** = fawns counted in April/adults counted in April (post-winter)

**C** = fawn carcasses counted in April-May/adult carcasses counted in April-May (post-winter).

Estimates of adult over-winter survival ( $\hat{S}_a$ ) and fawn over-winter survival ( $\hat{S}_f$ ) are computed from these 3 ratios (see White et al., 1996 for derivation of the estimates):

$$\hat{S}_a = \left( \frac{C - A}{C - B} \right)$$

and

$$\hat{S}_f = \left( \frac{C - A}{C - B} \right) \cdot \left( \frac{B}{A} \right)$$

Variances for the estimated survival rates were computed by the delta method (see Appendix in White et al., 1996) and 90% confidence intervals were estimated as  $\pm 1.64 \hat{S}E(\hat{S})$ . Estimates of over-winter mortality rates ( $\hat{W}$ ) are related to survival by  $\hat{W} = 1 - \hat{S}$ .

**Climatological Data.** Total monthly precipitation (inches of water), total monthly snowfall (inches of snow), and average maximum and minimum temperatures ( $^{\circ}F$ ) for each month were compiled for all National Weather Service (NWS) Cooperative Observer stations in western Wyoming, southeastern Idaho, and northeastern Utah (Western Regional Climate Center, Historical Climate Summaries, available at <http://www.wrcc.dri.edu/climsum.html>) from January 1970 through June 2007. These data were compiled by Water Year (also called a hydrologic year), October of one year through September of the next year, rather than by calendar year.

All monthly totals (precipitation, snowfall) and averages (temperature) reported by each NWS station were examined for missing data (number of days not reported in a given month). Data for months with >5 days of missing data were determined to be inadequate following NWS protocol for computing annual summary statistics and were designated the same as if no data were reported for that month. NWS provides latitude and longitude for each reporting station. Because not all of the winter ranges utilized by mule deer in the Sublette Herd Unit are proximate to NWS stations and many NWS stations report >5 days of missing data or no data at all for varying periods, climatological data were estimated for winter ranges by interpolation.

Latitude and longitude at the approximate center of the crucial winter range were the average over all crucial winter ranges delineated for the Sublette Herd Unit. Distances (km) from the winter range average center point were computed to each NWS station, based on the reported coordinates for each station. A routine was developed to select the closest 5 stations (an arbitrary number) with adequate data to the winter range center point for each month in each water year, 1971 to 2007. The computation requires use of the Great Circle Distance Formula converting latitude and longitude from degrees to radians (Meridian World Data, 2007) to compute the distance,  $D$  (in km), between two points:

$$D = 3963.0 \cdot \arccos[\sin(\text{lat1}) \cdot \sin(\text{lat2}) + \cos(\text{lat1}) \cdot \cos(\text{lat2}) \cdot \cos(\text{lon2} - \text{lon1})]$$

where lat1 and lon1 are the latitude and longitude (converted to radians) for the winter range center point and lat2, lon2 are similarly the coordinates for each NWS station.

The value of a particular climatological variable,  $Y$ , for each month at the approximate centers of crucial winter range complexes,  $x$ , was interpolated as the weighted average of the variable's value at the 5 closest stations ( $x_i$ ) (see page 153, Burrough 1986):

$$\hat{Y}(x) = \sum_{i=1}^5 \lambda_i Y(x_i) \text{ where } \sum \lambda_i = 1$$

The weights,  $\lambda_i$ , are reciprocals of distance,  $d_i$ , between a NWS station and the approximate winter range center point divided by the sum of those values for all 5 NWS stations having adequate data:

$$\lambda_i = (1/d_i) / \sum_{i=1}^5 (1/d_i)$$

Thus, climatological variables measured at NWS stations close to a crucial winter range complex have greater influence on that variable's estimate  $\hat{Y}(\mathbf{x})$  on the complex than more distant NWS stations.

## RESULTS AND DISCUSSION

**Over-winter Mortality Rates – Sublette Herd Unit.** Raw data collected by WGFD biologists on Sublette Herd Unit winter ranges each year are provided in Table 1. Included are the 3 ratios, **A**, **B**, and **C** that are used to estimate over-winter survival of fawn and adult mule deer. Estimates of fawn and adult survival rates are provided in Table 2.

**Table 1**  
Data Collected by Wyoming Game and Fish Department for Mule Deer in the Sublette Herd Unit and 3 Ratios Derived from the Data That Are Used to Estimate Over-winter Survival Rates for Fawns and Adults

Winter	Counts in December		Ratio A	Counts in April		Ratio B	Carcasses Counted		Ratio C
	Fawns	Adults		Fawns	Adults		Fawns	Adults	
1992-93	2090	4658	0.449	329	1544	0.213	105	45	2.333
1993-94	1587	4241	0.374	536	1483	0.361	13	6	2.167
1994-95	2698	5370	0.502	681	1629	0.418	21	13	1.615
1995-96	2358	5406	0.436	691	2506	0.276	35	25	1.400
1996-97	2181	3967	0.550	709	2081	0.341	182	49	3.714
1997-98	2694	4218	0.639	931	1796	0.518	65	56	1.161
1998-99	3115	5843	0.533	1120	2441	0.459	43	13	3.308
1999-00	3064	5248	0.584	1258	2349	0.536	16	10	1.600
2000-01	3227	5273	0.612	1185	2640	0.449	56	50	1.120
2001-02	3730	7139	0.522	760	2156	0.353	183	57	3.211
2002-03	2727	5429	0.502	724	2193	0.330	51	52	0.981
2003-04	3664	6040	0.607	760	2986	0.255	485	194	2.500
2004-05	3066	5556	0.552	1234	3042	0.406	45	15	3.000
2005-06	2925	5650	0.518	863	2852	0.303	145	42	3.452
2006-07	3410	5722	0.596	1466	3518	0.417	54	10	5.400

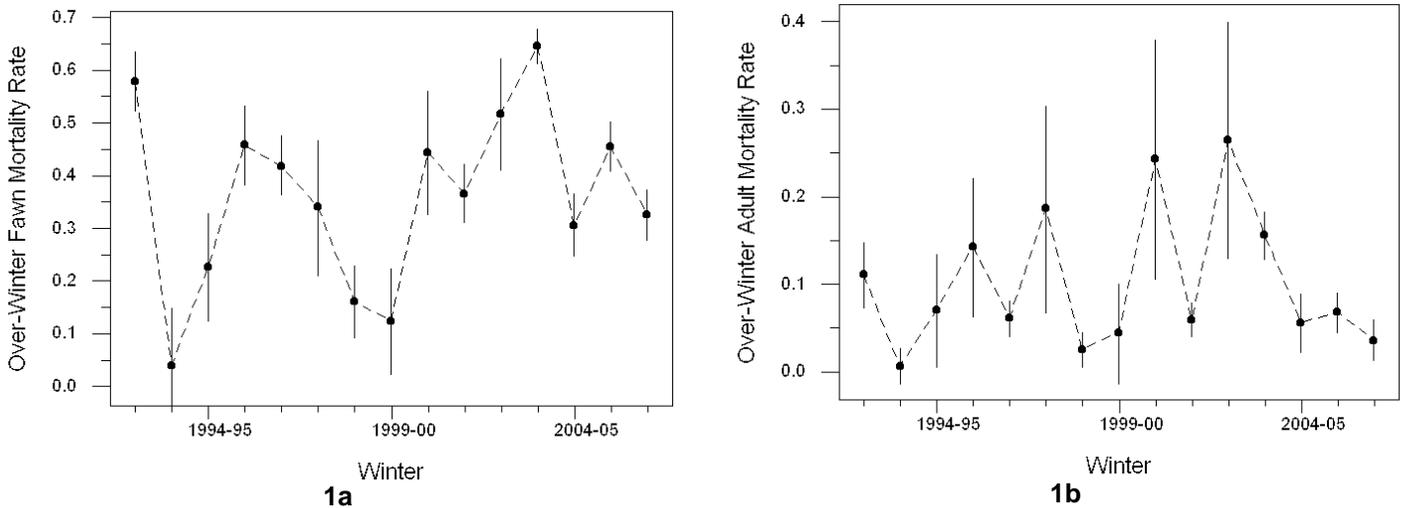
Ratios **A** and **B** are related to fawn and adult survival rates by  $\hat{S}_f / \hat{S}_a = \mathbf{B} / \mathbf{A}$  (see equation 9 in Paulik and Robson, 1969). Consequently,  $\hat{S}_f < \hat{S}_a$  for any given winter. To be consistent with analyses presented in the 1999 PAPA DEIS and Technical Report (BLM, 1999), survival rates were converted to mortality rates ( $\hat{W} = 1 - \hat{S}$ ) and so,  $\hat{W}_f > \hat{W}_a$  for any given winter. Time series plots of fawn and adult mortality rates are provided in Figure 1.

Variance estimates on survival rates (likewise on mortality rates) are large for many years with corresponding wide confidence intervals, in part due to small samples of fawn and adult carcasses in those years. With some exceptions, fawn over-winter mortality rates on the Sublette Herd Unit winter range complex do not differ significantly ( $P > 0.10$ ) from the previous year's mortality rate, as evident from overlapping 90% confidence intervals. In 1993-94 fawn

mortality was significantly less than in the previous year 1992-93. The first year of this study was winter 1992-93 and carcasses of mule deer that died in winters prior to that winter may have been included in the tallies. That issue is addressed below.

**Table 2**  
**Over-winter Survival Rate Estimates for Fawns ( $\hat{S}_f$ ) and Adults ( $\hat{S}_a$ ), Mortality Rate Estimates for Fawns ( $\hat{W}_f$ ) and Adults ( $\hat{W}_a$ ), Variances (Var), Standard Errors (SE), and 90% Confidence Intervals (90%CI) for Each Winter on the Sublette Herd Unit**

Winter	Fawns					Adults				
	$\hat{S}_f$	$\hat{W}_f$	Var	SE	90%CI	$\hat{S}_a$	$\hat{W}_a$	Var	SE	90%CI
1992-93	0.42	0.58	0.0011	0.033	±0.05	0.89	0.11	0.0005	0.023	±0.04
1993-94	0.96	0.04	0.0045	0.067	±0.11	0.99	0.01	0.0002	0.012	±0.02
1994-95	0.77	0.23	0.0037	0.061	±0.10	0.93	0.07	0.0014	0.038	±0.06
1995-96	0.54	0.46	0.0021	0.046	±0.08	0.86	0.14	0.0023	0.048	±0.08
1996-97	0.58	0.42	0.0012	0.034	±0.06	0.94	0.06	0.0002	0.013	±0.02
1997-98	0.66	0.34	0.0061	0.078	±0.13	0.81	0.19	0.0051	0.071	±0.12
1998-99	0.84	0.16	0.0018	0.042	±0.07	0.97	0.03	0.0001	0.012	±0.02
1999-00	0.88	0.12	0.0037	0.061	±0.10	0.95	0.05	0.0012	0.035	±0.06
2000-01	0.56	0.44	0.0051	0.072	±0.12	0.76	0.24	0.0070	0.083	±0.14
2001-02	0.63	0.37	0.0012	0.034	±0.06	0.94	0.06	0.0001	0.012	±0.02
2002-03	0.48	0.52	0.0042	0.065	±0.11	0.74	0.26	0.0068	0.082	±0.14
2003-04	0.35	0.65	0.0004	0.020	±0.03	0.84	0.16	0.0003	0.016	±0.03
2004-05	0.69	0.31	0.0013	0.036	±0.06	0.94	0.06	0.0004	0.021	±0.03
2005-06	0.54	0.46	0.0008	0.029	±0.05	0.93	0.07	0.0002	0.014	±0.02
2006-07	0.67	0.33	0.0009	0.030	±0.05	0.96	0.04	0.0002	0.014	±0.02



**Figure 1**  
**Mule Deer Mortality Rate Estimates (With 90% CI on the Estimates) for Fawn (1a) and Adult (1b) Mule Deer on the Sublette Herd Unit Winter Ranges.**

Fawn mortality in 1995-96 was significantly greater than the year before, 1994-1995 (Figure 1a). Also, fawn mortality rates from winters 2000-2001 through 2005-2006 have been significantly higher than for the two winters 1998-1999 and 1999-2000. Fawn mortality in 2003-2004 was significantly greater than for any year prior to 2000-2001, except 1992-1993. In 2004-2005 however, fawn mortality declined so that it was significantly less than in 2003-2004. Fawn mortality in 2006-2007 was also significantly less than the year before. Likewise, the adult mortality rate in 2005 was significantly less than the mortality rate observed in 2004 (Figure 1b).

**Comparison of Mortality Rates on Two Winter Range Complexes.** Two mule deer winter range complexes – the Mesa and Pinedale Front – have served as treatment (the Mesa) and control (Pinedale Front) areas in Phase II of the Sublette Mule Deer Study (Sawyer et al., 2006). The study was designed to detect changes in mule deer habitat use, animal distribution, abundance, and population parameters due to natural gas development on the Mesa (treatment area). Data for computing over-winter mortality have been collected by WGFD biologists on both of winter ranges and reported most consistently since winter 1994-95. Raw data and the 3 ratios, **A**, **B**, and **C** are provided in Table 3.

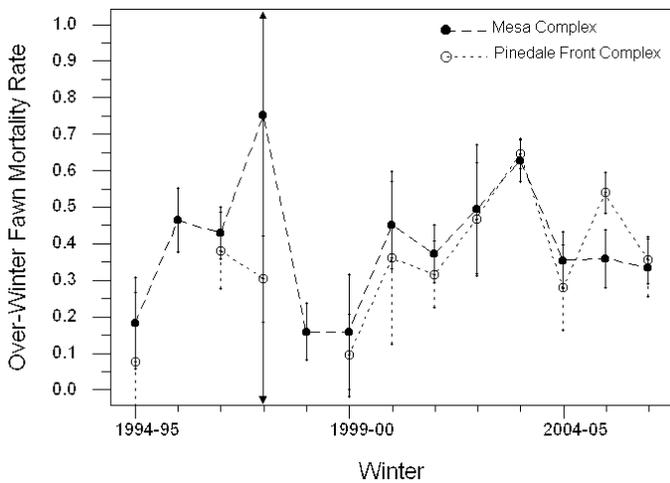
**Table 3**  
**Data Collected by WGFD for Mule Deer on the Mesa and Pinedale Front Winter Range Complexes from 1994-95 through 2006-07 and 3 Ratios Derived from the Data Required to Estimate Over-winter Survival Rates for Fawns and Adults in Table 4.**

Winter Range Complex	Winter	Counts in December		Ratio A	Counts in April		Ratio B	Carcasses Counted		Ratio C
		Fawns	Adults		Fawns	Adults		Fawns	Adults	
Mesa Winter Range Complex	1994-95	1136	2476	0.459	521	1312	0.397	18	12	1.500
	1995-96	889	2125	0.418	511	1962	0.260	35	25	1.400
	1996-97	1026	1873	0.548	501	1508	0.332	99	25	3.960
	1997-98	1042	1567	0.665	512	931	0.550	20	28	0.714
	1998-99	1473	2996	0.492	828	1982	0.418	21	3	7.000
	1999-00	1547	2550	0.607	764	1390	0.550	12	9	1.333
	2000-01	1458	2420	0.602	707	1685	0.420	41	32	1.281
	2001-02	1275	2546	0.501	460	1366	0.337	121	43	2.814
	2002-03	914	1864	0.490	470	1489	0.316	9	8	1.125
	2003-04	1201	2063	0.582	319	1215	0.263	273	130	2.100
	2004-05	1183	2162	0.547	547	1477	0.370	33	8	4.125
2005-06	1112	2099	0.530	458	1288	0.356	47	10	4.700	
2006-07	1314	2202	0.597	772	1838	0.420	18	5	3.600	
Pinedale Front Winter Range Complex	1994-95	1562	2894	0.540	160	317	0.505	3	1	3.000
	1995-96	1469	3281	0.448	180	544	0.331	no data	no data	none
	1996-97	1155	2094	0.552	208	573	0.363	83	24	3.458
	1997-98	1652	2651	0.623	419	865	0.484	45	25	1.800
	1998-99	1642	2847	0.577	292	459	0.636	22	10	2.200
	1999-00	1517	2698	0.562	494	959	0.515	4	1	4.000
	2000-01	1769	2853	0.620	478	955	0.501	15	14	1.071
	2001-02	2455	4593	0.535	300	790	0.380	62	14	4.429
	2002-03	1813	3565	0.509	254	704	0.361	42	44	0.955
	2003-04	2463	3977	0.619	441	1771	0.249	212	64	3.313
	2004-05	1883	3394	0.555	687	1565	0.439	12	7	1.714
2005-06	1813	3551	0.511	405	1564	0.259	98	32	3.063	
2006-07	2017	3340	0.604	674	1680	0.401	36	5	7.200	

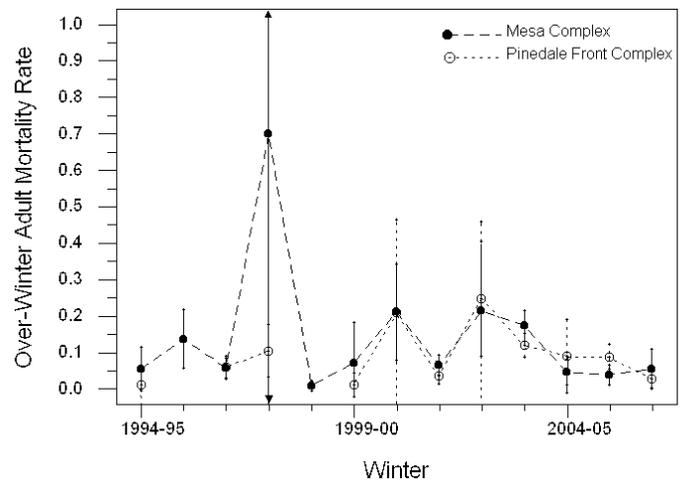
Sample sizes, particularly numbers of fawn and adult carcasses, are very small during several years when separated between the two winter range complexes (Table 3). Hence, variances for estimates of fawn and adult mortality rates are large and corresponding 90% confidence intervals on the estimates are wide (Table 4 and Figure 2). In most winters from 1994-1995 through 2004-2005, fawn mortality rates on the Mesa winter range complex have tended to be slightly higher than rates on the Pinedale Front complex, when adequate data have been collected on the two areas. Because of the large variances, none of the mortality estimates for one area is significantly different from estimates on the other area in any given year. The one notable exception was observed following the winter 2005-06, when fawn mortality on the Pinedale Front Complex was significantly higher ( $P < 0.1$ ) than on the Mesa Winter Range Complex (Figure 2a).

**Table 4**  
**Over-winter Survival Rate Estimates for Fawns ( $\hat{S}_f$ ) and Adults ( $\hat{S}_a$ ), Mortality Rate Estimates for Fawns ( $\hat{W}_f$ ) and Adults ( $\hat{W}_a$ ), Variances (Var), Standard Errors (SE), and 90% Confidence Intervals (90%CI) on the Mesa and Pinedale Front Winter Range Complexes**

Winter Range Complex	Winter	Fawns					Adults				
		$\hat{S}_f$	$\hat{W}_f$	Var	SE	90%CI	$\hat{S}_a$	$\hat{W}_a$	Var	SE	90%CI
Mesa Winter Range Complex	1994-95	0.82	0.18	0.0057	0.075	±0.12	0.94	0.06	0.0013	0.037	±0.06
	1995-96	0.54	0.46	0.0028	0.053	±0.09	0.86	0.14	0.0023	0.048	±0.08
	1996-97	0.57	0.43	0.0018	0.042	±0.07	0.94	0.06	0.0003	0.016	±0.03
	1997-98	0.25	0.75	0.5667	0.753	±1.24	0.30	0.70	0.8224	0.907	±1.49
	1998-99	0.84	0.16	0.0022	0.047	±0.08	0.99	0.01	0.0001	0.008	±0.01
	1999-00	0.84	0.16	0.0091	0.095	±0.16	0.93	0.07	0.0045	0.067	±0.11
	2000-01	0.55	0.45	0.0052	0.072	±0.12	0.79	0.21	0.0064	0.080	±0.13
	2001-02	0.63	0.37	0.0022	0.047	±0.08	0.93	0.07	0.0003	0.017	±0.03
	2002-03	0.50	0.50	0.0115	0.107	±0.18	0.78	0.22	0.0221	0.149	±0.24
	2003-04	0.37	0.63	0.0012	0.034	±0.06	0.83	0.17	0.0006	0.025	±0.04
	2004-05	0.64	0.36	0.0022	0.047	±0.08	0.95	0.05	0.0005	0.022	±0.04
2005-06	0.64	0.36	0.0023	0.048	±0.08	0.96	0.04	0.0003	0.016	±0.03	
2006-07	0.66	0.34	0.0023	0.048	±0.08	0.94	0.06	0.0011	0.033	±0.05	
Pinedale Front Winter Range Complex	1994-95	0.92	0.08	0.0131	0.115	±0.19	0.99	0.01	0.0008	0.028	±0.05
	1995-96	-	-	-	-	-	-	-	-	-	-
	1996-97	0.62	0.38	0.0040	0.063	±0.10	0.94	0.06	0.0004	0.019	±0.03
	1997-98	0.70	0.30	0.0051	0.071	±0.12	0.89	0.11	0.0019	0.044	±0.07
	1998-99	-	-	-	-	-	-	-	-	-	-
	1999-00	0.90	0.10	0.0047	0.068	±0.11	0.99	0.01	0.0004	0.020	±0.03
	2000-01	0.64	0.36	0.0205	0.143	±0.24	0.79	0.21	0.0239	0.155	±0.25
	2001-02	0.68	0.32	0.0030	0.055	±0.09	0.96	0.04	0.0002	0.014	±0.02
	2002-03	0.53	0.47	0.0088	0.094	±0.15	0.75	0.25	0.0092	0.096	±0.16
	2003-04	0.35	0.65	0.0006	0.024	±0.04	0.88	0.12	0.0004	0.020	±0.03
	2004-05	0.72	0.28	0.0050	0.071	±0.12	0.91	0.09	0.0037	0.061	±0.10
2005-06	0.46	0.54	0.0011	0.034	±0.06	0.91	0.09	0.0004	0.021	±0.03	
2006-07	0.64	0.36	0.0015	0.038	±0.06	0.97	0.03	0.0002	0.016	±0.03	



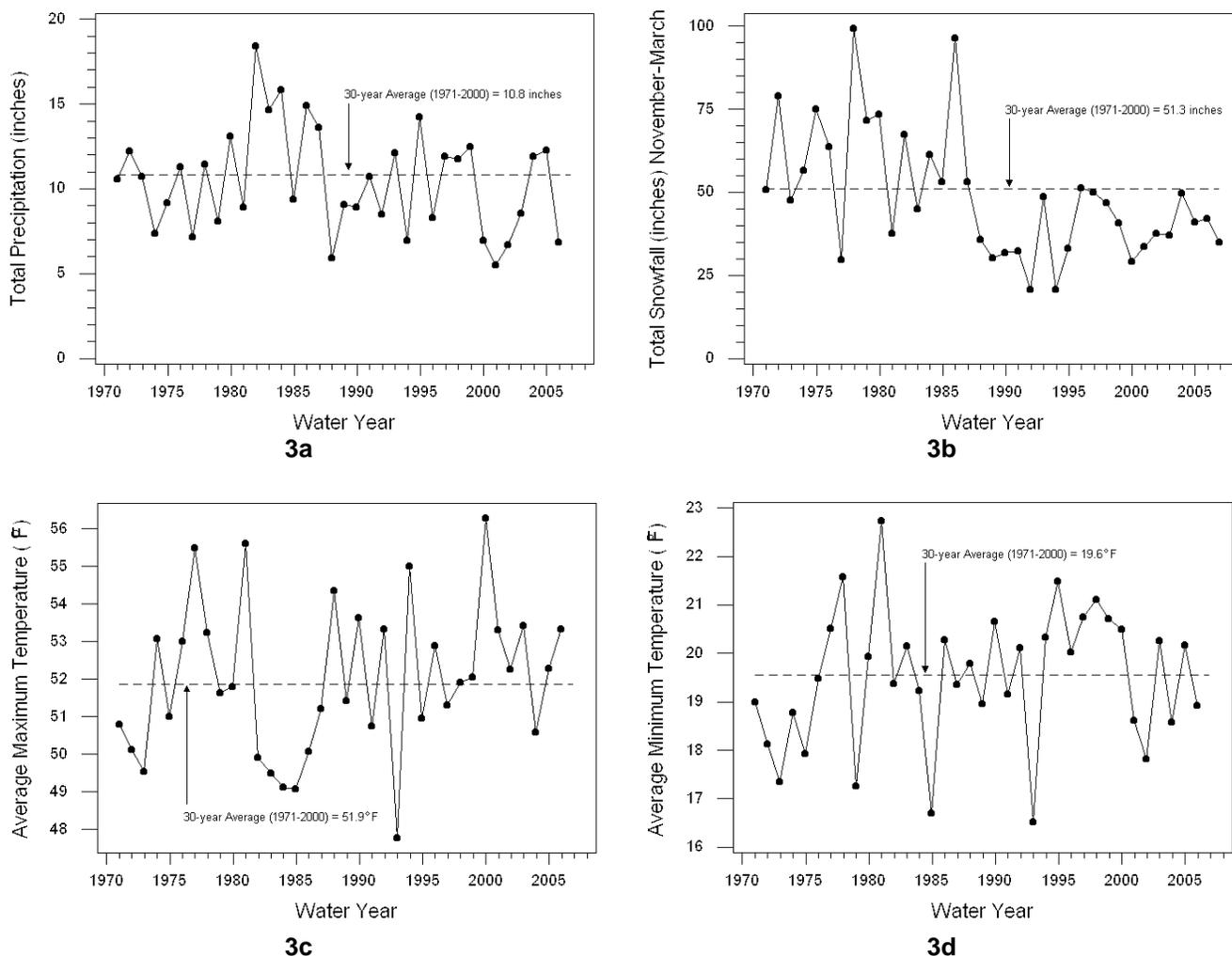
2a



2b

**Figure 2**  
**Comparisons of Mule Deer Mortality Rate Estimates (With 90% CI on the Estimates) for Fawn (2a) and Adult (2b) Mule Deer on the Mesa and Pinedale Front Winter Range Complexes**

**Climatological Trends.** NWS stations used to interpolate monthly precipitation and snowfall at the approximate center of crucial winter ranges in the Sublette Herd Unit (latitude 42.68 °N, longitude -109.79 °W) were listed in Table 2.3-3 of Appendix E in the Questar EA (BLM, 2004). Data from the same NWS stations were used to estimate minimum and maximum monthly temperatures on mule deer crucial winter range. Estimates of total precipitation for each water year, total snowfall from November through March, maximum and minimum temperatures averaged for each water year are shown in Figure 3. In each plot, 30-year averages from water years 1971 through 2000 are shown as estimated at the approximate center of the Sublette Herd Unit winter range complex.



**Figure 3**  
**Total Water Year Precipitation (3a), Total Snowfall November Through March (3b), Average Maximum (3c) and Average Minimum (3d) Temperatures for Each Water Year Since 1971 With 30-Year Averages (From 1971 Through 2000) Estimated on the Sublette Winter Range Complex**

During the 4-year period from 2000 through 2003, total precipitation on mule deer crucial winter range had been consistently below the 30-year average, whereas total precipitation in water years 2004 and 2005 were above average (Figure 3a). Total precipitation in Water Year 2006 was well below the 30-year average. Total snowfall between November and March has been at or below the 30-year average since water year 1987 (Figure 3b). Snowfall was at the 30-year

average in water year 1996, and nearly so in 2004 but below average since then, through winter 2006-2007.

Average maximum temperatures (Figure 3c) and average minimum temperatures (Figure 3d) for each Water Year since 1971 have varied above and below the respective 30-year averages through 2006-2007. There are no apparent increasing or decreasing trends in maximum or minimum temperatures averaged for water years since 1971.

**Relationships of Fawn Mortality to Climatological Conditions.** Noted in the Questar EA, WGFD biologist Doug McWhirter expressed reservations about the validity of mule deer carcass counts made during the first year of data collection (1993). Specifically, carcasses of mule deer that died in winters prior to the first year of study may have been included in the tallies. Consequently, data from winter 1992-93 are not included in the following analyses.

In the 2004 Technical Report prepared for the Questar EA (BLM, 2004 - Appendix E), over-winter fawn mortality rates in the Sublette Herd Unit from 1994 through 2000 were found to have a significant relationship to total snowfall, November through March. Alternatively, fawn mortality rates from 2001 through 2004 were found to have a significant positive relationship to total snowfall, October through April. Total precipitation had been well below average on winter ranges since Water Year 2000 and by 2003 there were four consecutive water years of below-average precipitation. Total precipitation in each Water Year, 2004 and 2005, was above the 30-year average but fell well below that average in 2006 (Figure 3a). As discovered in 2005 and described below, the two independent variables (winter snowfall and precipitation) had a very pronounced combined effect on over-winter fawn mortality.

Reported in 2005 (in the Technical Report appended to the ASU EA), the total precipitation for two consecutive years immediately prior to any given winter had a significant effect on over-winter fawn mortality. The important relationship of winter snowfall and total precipitation in the two years prior to each winter to over-winter fawn mortality, as discovered in 2005, has continued to be demonstrated with data collected and analyzed through 2007. When total snowfall from November through March, and total precipitation in the two previous water years are used in linear multiple regression, the over-winter fawn mortality in the Sublette Herd Unit can be visualized on a continuous surface in three-dimensional space (Figure 4). The relationship, shown in Figure 4 is  $Y$  (Over-Winter Fawn Mortality Rate) =  $0.241 + 0.013 X_1$  (Total Snowfall November-March) -  $0.020 X_2$  (Total Precipitation 2 Previous Years) - with multiple  $r^2 = 0.702$ ,  $P = 0.001$ . Those two independent variables - Total Snowfall November-March and Total Precipitation 2 Previous Years - explain roughly 70 percent of the variation in the over-winter fawn mortality rate.

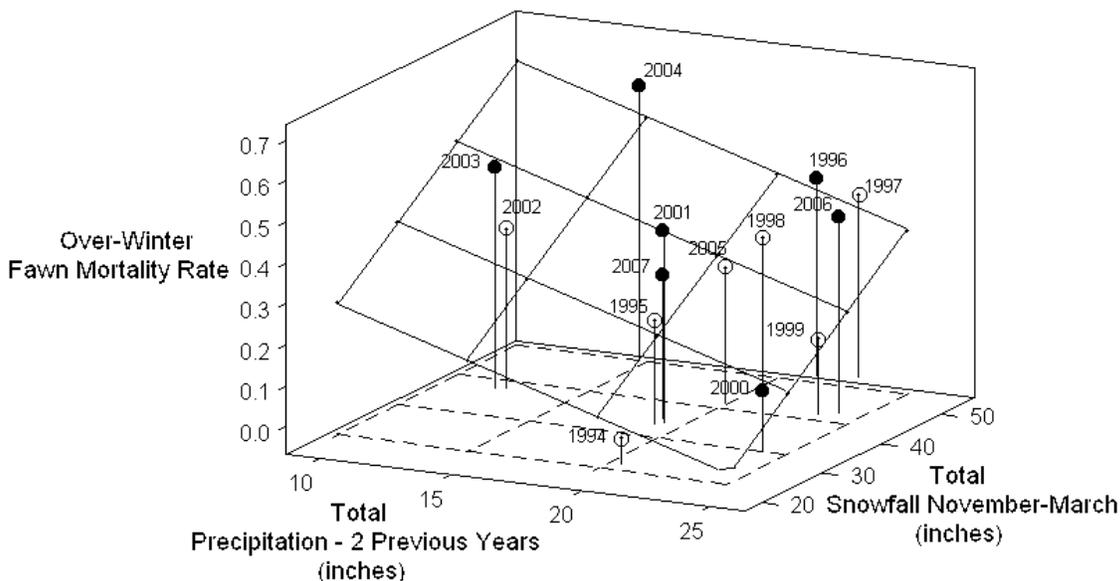
Further analysis in the 2005 Technical Report appended to the ASU EA determined that the Average Minimum Temperature during November of any year also significantly affected fawn mortality rates, though not by itself but in combination with the variables Total Snowfall November-March and Total Precipitation Two Previous Years. The importance of that variable has continued with data collected and analyzed through 2007. Using data collected from winter 1993-94 through winter 2006-07, the resultant multiple regression equation with three independent variables is  $Y$  (Over-Winter Fawn Mortality Rate) =  $0.162 + 0.015 X_1$  (Total Snowfall November-March) -  $0.016 X_2$  (Total Precipitation 2 Previous Years) -  $0.011 X_3$  (November Average Minimum Temperature); with multiple  $r^2 = 0.781$ ,  $P = 0.001$ .

As discussed in the 2005 Technical Report appended to the ASU EA (BLM, 2005), fawn mortality increased with increasing snowfall totaled from November through March but

decreased with more total precipitation in the two Water Years prior to any particular winter. Consequently, similar mortality rates may be observed during winters with very different amounts of snow, the effects of which are ameliorated or exacerbated by overall moist or dry conditions during the two previous years. The inverse influence of November Average Minimum Temperature on fawn mortality is possibly due to duration of early winter snow cover with low temperatures and/or crusting snow - melting during the day but freezing at night - that persists through much or all of the remaining winter.

**Table 5**  
**Over-Winter Fawn Mortality Rates and Values of Three**  
**Independent Variables Used in Multiple Regression Analysis**

Winter	Over-Winter Fawn Mortality Rate	Independent Variables In Multiple Regression		
		Total Snowfall November through March (inches)	Total Precipitation During Previous Two Water Years (inches)	November Average Minimum Temperature (°F)
1993-94	0.04	20.83	20.61	3.5
1994-95	0.23	33.06	19.07	6.7
1995-96	0.46	51.42	21.19	16.4
1996-97	0.42	49.93	22.52	15.4
1997-98	0.34	46.71	20.19	9.0
1998-99	0.16	40.89	23.66	13.7
1999-00	0.12	29.22	24.21	11.1
2000-01	0.44	33.68	19.40	0.5
2001-02	0.37	37.58	12.44	14.2
2002-03	0.52	36.14	12.19	7.8
2003-04	0.65	49.86	15.37	1.0
2004-05	0.31	40.93	20.60	12.5
2005-06	0.46	42.10	24.18	12.2
2006-07	0.33	34.88	19.10	10.5



**Figure 4**  
**Modeled Surface of Data Relationships from 1993-94 through 2006-07 by the Equation  $Y$  (Over-Winter Fawn Mortality Rate) = 0.241 + 0.013  $X_1$  (Total Snowfall November-March) – 0.020  $X_2$  (Total Precipitation 2 Previous Years); multiple  $r^2 = 0.702$ ,  $P = 0.001$ . Years with Fawn Mortality Values as Solid Circles are Above the Regression Surface, Years with Open Circles are Below the Surface.**

Noted above, the three independent variables (Total Snowfall November-March, Total Precipitation 2 Previous Years, and November Average Minimum Temperature) account for over 78 percent of the variation in fawn mortality in the Sublette Herd Unit.

The point was made earlier that for the first time in this study, over-winter fawn mortality rates on the two winter range complexes had been significantly different ( $P < 0.1$ ) following winter 2005-06; the fawn mortality rate on the Pinedale Front complex was significantly higher than the fawn mortality rate observed on the Mesa winter range complex. The mortality rate of fawns on the Mesa complex was estimated to be 0.36 (with 90% CI of  $\pm 0.08$ , see Table 4). On the other hand, the mortality rate of fawns on the Pinedale Front was estimated to be 0.54 (with 90% CI of  $\pm 0.06$ , see Table 4), significantly higher than the over-winter mortality rate observed on the Mesa complex.

Using the climatological values estimated on each winter range complex in the multiple regression model developed for fawn mortality on the entire Sublette Herd Unit, winter conditions on the Mesa in 2005-06 predicted a fawn mortality rate of 0.47, higher, though not significantly so, than the observed rate of 0.36. The fawn mortality rate predicted on the Pinedale Front was 0.26, significantly lower, given the estimated climatological values, than the observed rate of 0.54. Winter conditions estimated by interpolation for the Pinedale Front did not reflect conditions that likely occurred there in winter 2005-06. Indeed, anecdotal reports indicated more severe conditions throughout that winter range complex, particularly later in the winter, than suggested by the estimates from NWS stations (Smith, 2006 and Sawyer, 2006). Because there are no NWS stations on the Pinedale Front winter range complex, the discrepancies between anecdotes and interpolations point to the limitations of utilizing NWS data for evaluating mule deer mortality on that portion of the Sublette Herd Unit.

There is no evidence to suggest displacement of mule deer from the Mesa to the Pinedale Front. Such displacement and subsequent increased densities on the Pinedale Front might have explained the significant difference in fawn mortality observed during winter 2005-06. During winter 2006-07, fawn mortality was again similar on the Mesa and Pinedale Front. If the difference in fawn mortality on the two sites noted the year before was due, even in part, to increased mule deer densities on the Pinedale Front as densities on the Mesa declined, then a similar significant difference in fawn mortality would have been expected in winter 2006-07. No significant difference was observed.

Results of the Sublette Mule Deer Study have shown that emigration rates of deer from the impacted Mesa Complex have been consistently low, averaging 2 percent per year (Sawyer et al., 2006). The authors of that study suggest that the overall decline of mule deer on winter ranges within the Mesa Complex are likely due to reduced adult and fawn survival and reduced survival rates are associated with wellfield developments (Sawyer et al., 2006).

Because a smaller proportion of mule deer utilize crucial winter ranges within the Mesa complex than during the past, fawn and adult deer survival on other crucial winter ranges (e.g., the Pinedale Front Complex) would become proportionately more significant to the entire population. Results of the Sublette Mule Deer Study and the present study emphasize the importance of all crucial winter ranges to the population. If the wintering population becomes dependent on only a few, confined winter ranges, density independent events on those winter ranges can have more severe consequences to the population than if it was dispersed on several winter ranges across a wider landscape.

## CONCLUSION

Other investigators have demonstrated direct relationships between mule deer over-winter mortality and snowfall or snow on the ground (Roper and Lipscomb, 1973; Leckenby and Adams, 1986; Bartmann and Bowden, 1984). Energy expense by mule deer traveling through snow increases exponentially with increasing snow depth relative to the height of a deer or relative to animals' sinking depth in snow (Parker et al., 1984). Fawns will expend more energy than adult deer when moving through snow. Such differential energy cost of locomotion through snow contributes to higher mortality rates in fawns (Hobbs, 1989). Increased over-winter fawn mortality was an expected consequence of increased energy expense during winter if deer were escaping from vehicular traffic and other natural gas activities within crucial winter range (BLM, 1999).

From 1993-94 through 2006-07, there was a very strong relationship found between fawn mortality rates, total winter snowfall, precipitation in the two previous years, and minimum temperature at the onset of winter, in November. The relationship established that fawn mortality on the Sublette Herd Unit increased with increasing snowfall but decreased with more total precipitation in the two water years prior to that winter. Vegetation growth and nutritional content on Sublette Herd Unit crucial winter ranges has undoubtedly been enhanced or limited by precipitation regimes in a given growing season, as well as the previous growing season. Ultimately, availability of nutritional forage as a function of precipitation is most likely one key factor in fawn over-winter survival (McKinney, 2003). The influence of average minimum temperature in November on fawn mortality is possibly due to duration of early winter snow cover with low temperatures and/or crusting snow - melting during the day but freezing at night - that persists through much or all of the remaining winter.

The fawn mortality rate rates observed in 2005-06 did not conform to the relationship established for previous winters. Fawn mortality compiled for the Mesa and the Pinedale Front winter range complexes was significantly higher than predicted by the climatological conditions estimated at the approximate geographic center of all crucial winter ranges within the Sublette Herd Unit. Fawn mortality on the Pinedale Front complex was significantly higher than on the Mesa complex and that observed very high mortality rate influenced the estimate for the entire herd unit. Apparently, the distribution of and climatological measurements available from NWS stations proximate to the Pinedale Front winter range complex were not sufficient to account for the extreme fawn mortality observed there. Nevertheless, the following winter, 2006-07, fawn mortality was again nearly identical on the Mesa and Pinedale Front. Similar to observations made since 1993-94, fawn mortality observed in winter 2006-07 was consistent with the ongoing, long-term relationship to total winter snowfall, precipitation in the two previous years, and minimum temperature at the onset of winter, in November.

One justifiable conclusion from the preceding discussion would be establishment of climatological measuring stations throughout the crucial winter ranges utilized by mule deer so estimates by interpolating data from distant NWS stations would be unnecessary. Another more basic conclusion points to the importance of all crucial winter ranges utilized by a population. Unmeasured though presumably density-independent events on one winter range may have significant effects on the over-winter survival for the portion of the population that depends on it, reflected in lower over-winter survival for the entire mule deer population. With differential over-winter survival on the two winter range complexes utilized by mule deer in the Sublette Herd Unit, demonstrated above, the importance of all winter ranges to the population must be reiterated.

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## **APPENDIX 18**

### **Air Quality Impact Tables Project Alternative Modeling**

**Table 18.1**  
**Summary of Maximum Modeled Near-field NO<sub>2</sub> Concentrations**  
**from Direct Project Sources Compared to Ambient Air Quality Standards**  
**and PSD Class II Increments<sup>1</sup>**

Alternative	Averaging Time	Direct Modeled Impact <sup>2,3</sup>	PSD Class II Increment <sup>2</sup>	Background Concentration <sup>2</sup>	Total Concentration <sup>2</sup>	NAAQS/WAAQS <sup>2</sup>	Percent of NAAQS/WAAQS
No Action Alternative	Annual	34.5	25	8	42.5	100	43
Alternative B	Annual	34.5	25	8	42.5	100	43

<sup>1</sup> All NEPA analysis comparisons to the PSD increments are intended to evaluate a threshold of concern and do not represent a regulatory PSD Increment Consumption Analysis.

<sup>2</sup> In µg/m<sup>3</sup>.

<sup>3</sup> Background concentrations are not added to modeled concentrations for comparison to the PSD increment.

**Table 18.2**  
**Summary of Maximum Modeled Near-field CO Concentrations**  
**from Direct Project Sources Compared to Ambient Air Quality Standards**

Alternative	Averaging Time	Direct Modeled Impact <sup>1</sup>	Background Concentration <sup>1</sup>	Total Concentration <sup>1</sup>	NAAQS/WAAQS <sup>1</sup>	Percent of NAAQS/WAAQS
No Action Alternative	1-hour	329	1,979	2,308	40,000	6
Alternative B	8-hour	232	931	1,163	10,000	12
	1-hour	329	1,979	2,308	40,000	6
	8-hour	232	931	1,163	10,000	12

<sup>1</sup> In µg/m<sup>3</sup>.

**Table 18.3**  
**Summary of Maximum Modeled Near-field SO<sub>2</sub> Concentrations from Direct Project**  
**Sources Compared to Ambient Air Quality Standards**

Alternative	Averaging Time	Direct Modeled Impact <sup>1</sup>	Background Concentration <sup>1</sup>	Total Concentration <sup>1</sup>	NAAQS/WAAQS <sup>1</sup>	Percent of NAAQS/WAAQS
No Action Alternative	3-hour	13.5	132	145.5	1,300	11
Alternative B	24-hour	3.2	43	46.2	365/260	13/18
	Annual	0.7	9	9.7	80/60	12/16
	3-hour	13.5	132	145.5	1,300	11
	24-hour	3.2	43	46.2	365/260	13/18
	Annual	0.7	9	9.7	80/60	12/16

<sup>1</sup> In µg/m<sup>3</sup>.

**Table 18.4**  
**Summary of Maximum Modeled Near-field PM<sub>10</sub> Concentrations from Direct Project Sources Compared to Ambient Air Quality Standards**

Alternative	Averaging Time	Direct Modeled Impact <sup>1</sup>	Background Concentration <sup>1</sup>	Total Concentration <sup>1</sup>	NAAQS/WAAQS	Percent of NAAQS/WAAQS
No Action Alternative	24-hour	74.2	32	106.2	150	71
	Annual	1.7	9	10.7	50 <sup>2</sup>	21
Alternative B	24-hour	74.2	32	106.2	150	71
	Annual	1.7	9	10.7	50 <sup>2</sup>	21

<sup>1</sup> In  $\mu\text{g}/\text{m}^3$ .

<sup>2</sup> Annual NAAQS for PM<sub>10</sub> was revoked by EPA effective December 18, 2006.

**Table 18.5**  
**Summary of Maximum Modeled Near-field PM<sub>2.5</sub> Concentrations from Direct Project Sources Compared to Ambient Air Quality Standards**

Alternative	Averaging Time	Direct Modeled Impact <sup>1</sup>	Background Concentration <sup>1</sup>	Total Concentration <sup>1</sup>	NAAQS/WAAQS	Percent of NAAQS/WAAQS
No Action	24-hour	14.3	15	29.3	35 <sup>2</sup> (65) <sup>3</sup>	84 (45)
	Annual	1.7	6	7.7	15	51
Proposed Action	24-hour	14.3	15	29.3	35 <sup>2</sup> (65) <sup>3</sup>	84 (45)
	Annual	1.7	6	7.7	15	51

<sup>1</sup> In  $\mu\text{g}/\text{m}^3$ .

<sup>2</sup> Revised NAAQS effective December 18, 2006.

<sup>3</sup> EPA has revised the NAAQS effective December 18, 2006. The State of Wyoming will enter rulemaking to revise the WAAQS.

**Table 18.6**  
**Summary of Maximum Modeled HAP Concentrations from Direct Project Sources**

Alternative	Averaging Period	Benzene			Toluene			Ethylbenzene		
		Health-based Level <sup>1,2</sup>	Modeled Concentration <sup>2</sup>	Percent of Health-based Standard	Health-based Level <sup>1,2</sup>	Modeled Concentration <sup>2</sup>	Percent of Health-based Standard	Health-based Level <sup>1,2</sup>	Modeled Concentration <sup>2</sup>	Percent of Health-based Standard
No Action	1-Hour	,300	128	9.8	37,000	249	0.7	350,000	15	0.004
Alternative	Annual	30	0.2	0.8	5000	0.6	0.01	1,000	0.03	0.003
Alternative B	1-Hour	1,300	128	9.8	37,000	249	0.7	350,000	15	0.004
	Annual <sup>1</sup>	30	0.5	1.5	5000	1.2	0.02	1,000	0.1	0.01

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Alternative	Averaging Period	Xylene			n-Hexane			Formaldehyde		
		Health-based Level <sup>1,2</sup>	Modeled Concentration <sup>2</sup>	Percent of Health-based Standard	Health-based Level <sup>1,2</sup>	Modeled Concentration <sup>2</sup>	Percent of Health-based Standard	Health-based Level <sup>1,2</sup>	Modeled Concentration <sup>2</sup>	Percent of Health-based Standard
No Action	1-Hour	22,000	190	0.9	390,000	82	0.02	94	79.3	84.4
Alternative	Annual	100	0.4	0.4	700	0.1	0.01	9.8	0.2	1.8
Alternative B	1-Hour	22,000	190	0.9	390,000	82	0.02	94	79.3	84.4
	Annual	100	1.0	1.0	700	0.1	0.01	9.8	0.2	1.8

<sup>1</sup> Based on EPA, 2007a and 2007b.  
<sup>2</sup> In µg/m<sup>3</sup>.

**Table 18.7**  
**Summary of Long-Term MLE and MEI Cancer Risk Analyses from Direct Project Sources<sup>1</sup>**

Alternative	HAP Constituent	Modeled Concentration <sup>2</sup>	MLE			MEI		
			Unit Risk Factor <sup>3</sup>	Exposure Adjustment Factor	Cancer Risk	Unit Risk Factor <sup>3</sup>	Exposure Adjustment Factor	Cancer Risk
No Action Alternative	Benzene	0.24	7.8E-06	0.0949	1.8E-07	7.8E-06	0.86	1.6E-06
	Formaldehyde		1.3E-05	0.0949	2.2E-07	1.3E-05	0.86	2.0E-06
	Total Combined							
Alternative B	Benzene	0.18	7.8E-06	0.0949	3.3E-07	7.8E-06	0.86	3.0E-06
	Formaldehyde	0.18	1.3E-05	0.0949	2.2E-07	1.3E-05	0.86	2.0E-06
	Total Combined				4.0E-07			3.6E-06

<sup>1</sup> Based on EPA 1993 and 2007b.

<sup>2</sup> In  $\mu\text{g}/\text{m}^3$ .

<sup>3</sup> In  $1/\mu\text{g}/\text{m}^3$ .

5.5E-07

5.0E-06

**Table 18.8**  
**Summary of Maximum Modeled NO<sub>2</sub> Concentration Impacts (µg/m<sup>3</sup>) at PSD Class I**  
**and Sensitive PSD Class II Areas from Direct Project Sources**

Alternative	Bridger Wilderness Class I		Fitzpatrick Wilderness Class I		Grand Teton National Park Class I		Gros Ventre Wilderness Class II		North Absoroka Wilderness Class I	
	Direct Modeled Impact	Total Concentration <sup>1</sup>	Direct Modeled Impact	Total Concentration <sup>1</sup>	Direct Modeled Impact	Total Concentration <sup>1</sup>	Direct Modeled Impact	Total Concentration <sup>1</sup>	Direct Modeled Impact	Total Concentration <sup>2</sup>
No Action Alternative	0.35	8.35	0.02	8.02	0.01	8.01	0.03	8.03	0.001	8.00
Alternative B	0.34	8.34	0.02	8.02	0.01	8.01	0.03	8.03	0.001	8.00
Alternative C	0.22	8.22	0.02	8.02	0.01	8.01	0.02	8.02	0.001	8.00
Alternative C - 80 % Drill Rig Mitigation	0.08	8.08	0.01	8.01	0.002	8.00	0.01	8.01	0.0002	8.00
Alternative B - Maximum Field Production	0.12	8.12	0.01	8.01	0.003	8.00	0.01	8.01	0.0003	8.00

Alternative	Popo Agie Wilderness Class II		Teton Wilderness Class I		Washakie Wilderness Class I		Wind River Roadless Area Class II		Yellowstone National Park Class I	
	Direct Modeled Impact	Total Concentration <sup>1</sup>	Direct Modeled Impact	Total Concentration <sup>1</sup>	Direct Modeled Impact	Total Concentration <sup>1</sup>	Direct Modeled Impact	Total Concentration <sup>1</sup>	Direct Modeled Impact	Total Concentration <sup>2</sup>
No Action Alternative	0.08	8.08	0.004	8.00	0.004	8.00	0.05	8.05	0.003	8.00
Alternative B	0.07	8.07	0.004	8.00	0.004	8.00	0.05	8.05	0.002	8.00
Alternative C	0.04	8.04	0.003	8.00	0.002	8.00	0.03	8.03	0.001	8.00
Alternative C - 80 % Drill Rig Mitigation	0.02	8.02	0.001	8.00	0.001	8.00	0.01	8.01	0.001	8.00
Alternative B - Maximum Field Production	0.03	8.03	0.002	8.00	0.002	8.00	0.02	8.02	0.001	8.00

<sup>1</sup> Total concentration includes direct modeled impact and background concentration for comparison to NAAQS/WAAQS which are 100 µg/m<sup>3</sup> on an annual basis. Annual background NO<sub>2</sub> concentration value of 8 µg/m<sup>3</sup> from Boulder monitor.

**Table 18.9**  
**Summary of Maximum Modeled SO<sub>2</sub> Concentration Impacts (µg/m<sup>3</sup>) at PSD Class I**  
**and Sensitive PSD Class II Areas from Direct Project Sources**

Alternative	Bridger Wilderness Class I									Fitzpatrick Wilderness Class I									Grand Teton National Park Class I									Gros Ventre Wilderness Class II									North Absaroka Wilderness Class I								
	Direct Modeled Impact			Total Concentration <sup>1</sup>			Direct Modeled Impact			Total Concentration <sup>1</sup>			Direct Modeled Impact			Total Concentration <sup>1</sup>			Direct Modeled Impact			Total Concentration <sup>1</sup>			Direct Modeled Impact			Total Concentration <sup>1</sup>			Direct Modeled Impact			Total Concentration <sup>1</sup>											
	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual												
No Action Alternative	0.24	0.06	0.01	132.2	43.1	9.01	0.05	0.01	0.0008	132.0	43.0	9.00	0.02	0.01	0.0003	132.0	43.0	9.00	0.05	0.01	0.001	132.1	43.0	9.00	0.01	0.002	0.0001	132.0	43.0	9.00	0.01	0.002	0.0001	132.0	43.0	9.00									
Alternative B	0.23	0.08	0.01	132.2	43.1	9.01	0.06	0.02	0.001	132.1	43.0	9.00	0.02	0.01	0.0003	132.0	43.0	9.00	0.05	0.01	0.001	132.1	43.0	9.00	0.01	0.003	0.0001	132.0	43.0	9.00	0.01	0.003	0.0001	132.0	43.0	9.00									
Alternative C	0.67	0.23	0.02	132.7	43.2	9.02	0.20	0.06	0.003	132.2	43.1	9.00	0.07	0.02	0.0009	132.1	43.0	9.00	0.16	0.04	0.002	132.2	43.0	9.00	0.03	0.01	0.0003	132.0	43.0	9.00	0.03	0.01	0.0003	132.0	43.0	9.00									
Alternative C - 80 % Drill Rig Mitigation	0.16	0.06	0.01	132.2	43.1	9.01	0.04	0.01	0.0007	132.0	43.0	9.00	0.02	0.004	0.0002	132.0	43.0	9.00	0.04	0.01	0.001	132.0	43.0	9.00	0.01	0.002	0.0001	132.0	43.0	9.00	0.01	0.002	0.0001	132.0	43.0	9.00									
Alternative B - Maximum Field Production	0.01	0.00	0.0002	132.0	43.0	9.00	0.003	0.001	0.0000	132.0	43.0	9.00	0.001	0.0002	0.0000	132.0	43.0	9.00	0.002	0.001	0.0000	132.0	43.0	9.00	0.0005	0.0001	0.0000	132.0	43.0	9.00	0.0005	0.0001	0.0000	132.0	43.0	9.00									

Alternative	Popo Agie Wilderness Class II									Teton Wilderness Class I									Washakie Wilderness Class I									Wind River Roadless Area Class II									Yellowstone National Park Class I								
	Direct Modeled Impact			Total Concentration <sup>1</sup>			Direct Modeled Impact			Total Concentration <sup>1</sup>			Direct Modeled Impact			Total Concentration <sup>1</sup>			Direct Modeled Impact			Total Concentration <sup>1</sup>			Direct Modeled Impact			Total Concentration <sup>1</sup>			Direct Modeled Impact			Total Concentration <sup>1</sup>											
	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual												
No Action Alternative	0.05	0.02	0.002	132.1	43.0	9.00	0.01	0.004	0.0002	132.0	43.0	9.00	0.01	0.004	0.0002	132.0	43.0	9.00	0.07	0.02	0.001	132.1	43.0	9.00	0.01	0.003	0.0001	132.0	43.0	9.00	0.01	0.003	0.0001	132.0	43.0	9.00									
Alternative B	0.06	0.01	0.002	132.1	43.0	9.00	0.02	0.003	0.0002	132.0	43.0	9.00	0.02	0.004	0.0002	132.0	43.0	9.00	0.06	0.02	0.002	132.1	43.0	9.00	0.02	0.003	0.0001	132.0	43.0	9.00	0.02	0.003	0.0001	132.0	43.0	9.00									
Alternative C	0.18	0.04	0.01	132.2	43.0	9.01	0.05	0.01	0.0006	132.0	43.0	9.00	0.05	0.01	0.0007	132.0	43.0	9.00	0.18	0.05	0.005	132.2	43.0	9.00	0.05	0.01	0.0003	132.0	43.0	9.00	0.05	0.01	0.0003	132.0	43.0	9.00									
Alternative C - 80 % Drill Rig Mitigation	0.04	0.01	0.002	132.0	43.0	9.00	0.01	0.002	0.0001	132.0	43.0	9.00	0.01	0.003	0.0002	132.0	43.0	9.00	0.04	0.01	0.001	132.0	43.0	9.00	0.01	0.002	0.0001	132.0	43.0	9.00	0.01	0.002	0.0001	132.0	43.0	9.00									
Alternative B - Maximum Field Production	0.002	0.001	0.0001	132.0	43.0	9.00	0.00	0.0002	0.0000	132.0	43.0	9.00	0.001	0.0002	0.0000	132.0	43.0	9.00	0.003	0.001	0.0001	132.0	43.0	9.00	0.001	0.0001	0.0000	132.0	43.0	9.00	0.001	0.0001	0.0000	132.0	43.0	9.00									

<sup>1</sup> Total concentration includes direct modeled impact and background concentration for comparison with NAAQS/WAAQS which are 1,300 µg/m<sup>3</sup> on a 3-hour basis, 365/260 µg/m<sup>3</sup> on a 24-hour basis and 80/60 µg/m<sup>3</sup> on an annual basis. Background SO<sub>2</sub> concentration values of 132 µg/m<sup>3</sup>, 43 µg/m<sup>3</sup>, and 9 µg/m<sup>3</sup>, from Craven Creek used for 3-hour, 24-hour, and annual averaging periods, respectively.

**Table 18.10**  
**Summary of Maximum Modeled PM<sub>10</sub> Concentration Impacts (µg/m<sup>3</sup>) at PSD Class I**  
**and Sensitive PSD Class II Areas from Direct Project Sources**

Alternative	Bridger Wilderness Class I				Fitzpatrick Wilderness Class I				Grand Teton National Park Class I				Gros Ventre Wilderness Class II				North Absaroka Wilderness Class I			
	Direct Modeled Impact		Total Concentration <sup>1</sup>		Direct Modeled Impact		Total Concentration <sup>1</sup>		Direct Modeled Impact		Total Concentration <sup>1</sup>		Direct Modeled Impact		Total Concentration <sup>1</sup>		Direct Modeled Impact		Total Concentration <sup>2</sup>	
	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual
No Action Alternative	2.54	0.13	34.5	9.13	0.75	0.03	32.8	9.03	0.31	0.01	32.3	9.01	0.60	0.02	32.6	9.02	0.16	0.005	32.2	9.00
Alternative B	2.69	0.13	34.7	9.13	0.88	0.03	32.9	9.03	0.26	0.01	32.3	9.01	0.49	0.03	32.5	9.03	0.20	0.005	32.2	9.00
Alternative C	1.93	0.10	33.9	9.10	0.60	0.02	32.6	9.02	0.18	0.01	32.2	9.01	0.34	0.02	32.3	9.02	0.14	0.003	32.1	9.00
Alternative C - 80 % Drill Rig Mitigation	0.85	0.04	32.8	9.04	0.25	0.01	32.2	9.01	0.08	0.004	32.1	9.00	0.18	0.01	32.2	9.01	0.06	0.002	32.1	9.00
Alternative B - Maximum Field Production	0.55	0.04	32.5	9.04	0.37	0.01	32.4	9.01	0.10	0.004	32.1	9.00	0.15	0.01	32.1	9.01	0.07	0.002	32.1	9.00

Alternative	Popo Agie Wilderness Class II				Teton Wilderness Class I				Washakie Wilderness Class I				Wind River Roadless Area Class II				Yellowstone National Park Class I			
	Direct Modeled Impact		Total Concentration <sup>1</sup>		Direct Modeled Impact		Total Concentration <sup>1</sup>		Direct Modeled Impact		Total Concentration <sup>1</sup>		Direct Modeled Impact		Total Concentration <sup>1</sup>		Direct Modeled Impact		Total Concentration <sup>2</sup>	
	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual
No Action Alternative	0.61	0.05	32.6	9.05	0.18	0.01	32.2	9.01	0.22	0.01	32.2	9.01	0.70	0.04	32.7	9.04	0.17	0.01	32.2	9.01
Alternative B	0.70	0.05	32.7	9.05	0.20	0.01	32.2	9.01	0.26	0.01	32.3	9.01	0.81	0.04	32.8	9.04	0.17	0.01	32.2	9.01
Alternative C	0.48	0.04	32.5	9.04	0.14	0.01	32.1	9.01	0.18	0.01	32.2	9.01	0.56	0.03	32.6	9.03	0.12	0.004	32.1	9.00
Alternative C - 80 % Drill Rig Mitigation	0.18	0.02	32.2	9.02	0.06	0.002	32.1	9.00	0.07	0.002	32.1	9.00	0.22	0.01	32.2	9.01	0.05	0.002	32.1	9.00
Alternative B - Maximum Field Production	0.25	0.02	32.2	9.02	0.08	0.003	32.1	9.00	0.10	0.003	32.1	9.00	0.30	0.01	32.3	9.01	0.06	0.002	32.1	9.00

<sup>1</sup> Total concentration includes direct modeled impact and background concentration for comparison to NAAQS/WAAQS. The NAAQS and WAAQS are 150 µg/m<sup>3</sup> on a 24-hour basis, and the WAAQS is 50 µg/m<sup>3</sup> on an annual basis. The annual NAAQS for PM<sub>10</sub> was revoked by EPA effective December 18, 2006.  
 Background PM<sub>10</sub> concentration values of 32 µg/m<sup>3</sup> and 9 µg/m<sup>3</sup>, from Boulder used for 24-hour and annual averaging periods, respectively.

**Table 18.11**  
**Summary of Maximum Modeled PM<sub>2.5</sub> Concentration Impacts (µg/m<sup>3</sup>) at PSD Class I**  
**and Sensitive PSD Class II Areas from Direct Project Sources**

Alternative	Bridger Wilderness Class I				Fitzpatrick Wilderness Class I				Grand Teton National Park Class I				Gros Ventre Wilderness Class II				North Absaroka Wilderness Class I			
	Direct Modeled Impact		Total Concentration <sup>1</sup>		Direct Modeled Impact		Total Concentration <sup>1</sup>		Direct Modeled Impact		Total Concentration <sup>1</sup>		Direct Modeled Impact		Total Concentration <sup>1</sup>		Direct Modeled Impact		Total Concentration <sup>2</sup>	
	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual
No Action Alternative	0.96	0.13	16.0	6.13	0.24	0.03	15.2	6.03	0.18	0.01	15.2	6.01	0.25	0.02	15.3	6.02	0.07	0.005	15.1	6.00
Alternative B	1.08	0.13	16.1	6.13	0.27	0.03	15.3	6.03	0.16	0.01	15.2	6.01	0.22	0.03	15.2	6.03	0.08	0.005	15.1	6.00
Alternative C	0.77	0.10	15.8	6.10	0.19	0.02	15.2	6.02	0.11	0.01	15.1	6.01	0.16	0.02	15.2	6.02	0.05	0.003	15.1	6.00
Alternative C - 80 % Drill Rig Mitigation	0.32	0.04	15.3	6.04	0.07	0.01	15.1	6.01	0.05	0.004	15.1	6.00	0.07	0.01	15.1	6.01	0.02	0.002	15.0	6.00
Alternative B - Maximum Field Production	0.32	0.04	15.3	6.04	0.10	0.01	15.1	6.01	0.05	0.004	15.0	6.00	0.08	0.01	15.1	6.01	0.02	0.002	15.0	6.00

Alternative	Popo Agie Wilderness Class II				Teton Wilderness Class I				Washakie Wilderness Class I				Wind River Roadless Area Class II				Yellowstone National Park Class I			
	Direct Modeled Impact		Total Concentration <sup>1</sup>		Direct Modeled Impact		Total Concentration <sup>1</sup>		Direct Modeled Impact		Total Concentration <sup>1</sup>		Direct Modeled Impact		Total Concentration <sup>1</sup>		Direct Modeled Impact		Total Concentration <sup>2</sup>	
	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual
No Action Alternative	0.31	0.05	15.3	6.05	0.11	0.01	15.1	6.01	0.10	0.01	15.1	6.01	0.31	0.04	15.3	6.04	0.09	0.01	15.1	6.01
Alternative B	0.32	0.05	15.3	6.05	0.09	0.01	15.1	6.01	0.10	0.01	15.1	6.01	0.32	0.04	15.3	6.04	0.08	0.01	15.1	6.01
Alternative C	0.22	0.04	15.2	6.04	0.06	0.01	15.1	6.01	0.07	0.01	15.1	6.01	0.22	0.03	15.2	6.03	0.06	0.004	15.1	6.00
Alternative C - 80 % Drill Rig Mitigation	0.09	0.02	15.1	6.02	0.03	0.002	15.0	6.00	0.03	0.002	15.0	6.00	0.09	0.01	15.1	6.01	0.03	0.002	15.0	6.00
Alternative B - Maximum Field Production	0.10	0.02	15.1	6.02	0.04	0.003	15.0	6.00	0.04	0.003	15.0	6.00	0.11	0.01	15.1	6.01	0.03	0.002	15.0	6.00

<sup>1</sup> Total concentration includes direct modeled impact and background concentration for comparison to NAAQS/WAAQS. The NAAQS and WAAQS on a 24-hour basis are 35 µg/m<sup>3</sup> and 65 µg/m<sup>3</sup>, respectively. EPA has revised the 24-hour NAAQS effective December 18, 2006. The State of Wyoming will enter rulemaking to revise the WAAQS. The NAAQS and WAAQS on an annual basis are 15 µg/m<sup>3</sup>. Background PM<sub>2.5</sub> concentration values of 15 µg/m<sup>3</sup> and 6 µg/m<sup>3</sup>, from Pinedale used for 24-hour and annual averaging periods, respectively.

**Table 18.12  
Summary of Maximum Modeled NO<sub>2</sub> Concentration Impacts (µg/m<sup>3</sup>) from  
Direct Project Sources Compared to PSD Increments<sup>1</sup>**

Alternative	Bridger Wilderness Class I		Fitzpatrick Wilderness Class I		Grand Teton National Park Class I		Gros Ventre Wilderness Class II		North Absoroka Wilderness Class I	
	Direct Modeled Impact	PSD Increment	Direct Modeled Impact	PSD Increment	Direct Modeled Impact	PSD Increment	Direct Modeled Impact	PSD Increment	Direct Modeled Impact	PSD Increment
	Annual	Annual	Annual	Annual	Annual	Annual	Annual	Annual	Annual	Annual
No Action Alternative	0.35	2.5	0.02	2.5	0.01	2.5	0.03	25.0	0.001	2.5
Alternative B	0.34	2.5	0.02	2.5	0.01	2.5	0.03	25.0	0.001	2.5
Alternative C	0.22	2.5	0.02	2.5	0.01	2.5	0.02	25.0	0.001	2.5
Alternative C - 80 % Drill Rig Mitigation	0.08	2.5	0.01	2.5	0.002	2.5	0.01	25.0	0.0002	2.5
Alternative B - Maximum Field Production	0.12	2.5	0.01	2.5	0.003	2.5	0.01	25.0	0.0003	2.5

Alternative	Popo Agie Wilderness Class II		Teton Wilderness Class I		Washakie Wilderness Class I		Wind River Roadless Area Class II		Yellowstone National Park Class I	
	Direct Modeled Impact	PSD Increment	Direct Modeled Impact	PSD Increment	Direct Modeled Impact	PSD Increment	Direct Modeled Impact	PSD Increment	Direct Modeled Impact	PSD Increment
	Annual	Annual	Annual	Annual	Annual	Annual	Annual	Annual	Annual	Annual
No Action Alternative	0.08	25.0	0.004	2.5	0.004	2.5	0.05	25.0	0.003	2.5
Alternative B	0.07	25.0	0.004	2.5	0.004	2.5	0.05	25.0	0.002	2.5
Alternative C	0.04	25.0	0.003	2.5	0.002	2.5	0.03	25.0	0.001	2.5
Alternative C - 80 % Drill Rig Mitigation	0.02	25.0	0.001	2.5	0.001	2.5	0.01	25.0	0.001	2.5
Alternative B - Maximum Field Production	0.03	25.0	0.002	2.5	0.002	2.5	0.02	25.0	0.001	2.5

<sup>1</sup> All NEPA analysis comparisons to the PSD increments are intended to evaluate a threshold of concern and do not represent a regulatory PSD Increment Consumption Analysis.

**Table 18.13**  
**Summary of Maximum Modeled SO<sub>2</sub> Concentration Impacts (µg/m<sup>3</sup>) from**  
**Direct Project Sources Compared to PSD Increments<sup>1</sup>**

Alternative	Bridger Wilderness Class I						Fitzpatrick Wilderness Class I						Grand Teton National Park Class I						Gros Ventre Wilderness Class II						North Absaroka Wilderness Class I					
	Direct Modeled Impact			PSD Increment			Direct Modeled Impact			PSD Increment			Direct Modeled Impact			PSD Increment			Direct Modeled Impact			PSD Increment			Direct Modeled Impact			PSD Increment		
	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual
No Action Alternative	0.24	0.06	0.01	25.0	5.0	2.0	0.05	0.01	0.001	25.0	5.0	2.0	0.02	0.01	0.0003	25.0	5.0	2.0	0.05	0.01	0.001	512.0	91.0	20.0	0.01	0.002	0.0001	25.0	5.0	2.0
Alternative B	0.23	0.08	0.01	25.0	5.0	2.0	0.06	0.02	0.001	25.0	5.0	2.0	0.02	0.01	0.0003	25.0	5.0	2.0	0.05	0.01	0.001	512.0	91.0	20.0	0.01	0.003	0.0001	25.0	5.0	2.0
Alternative C	0.67	0.23	0.02	25.0	5.0	2.0	0.20	0.06	0.003	25.0	5.0	2.0	0.07	0.02	0.0009	25.0	5.0	2.0	0.16	0.04	0.002	512.0	91.0	20.0	0.03	0.01	0.0003	25.0	5.0	2.0
Alternative C - 80 % Drill Rig Mitigation	0.16	0.06	0.01	25.0	5.0	2.0	0.04	0.01	0.001	25.0	5.0	2.0	0.02	0.004	0.0002	25.0	5.0	2.0	0.04	0.01	0.001	512.0	91.0	20.0	0.01	0.002	0.0001	25.0	5.0	2.0
Alternative B - Maximum Field Production	0.01	0.002	0.0002	25.0	5.0	2.0	0.003	0.001	0.0000	25.0	5.0	2.0	0.001	0.0002	0.0000	25.0	5.0	2.0	0.002	0.001	0.0000	512.0	91.0	20.0	0.0005	0.0001	0.0000	25.0	5.0	2.0

Alternative	Popo Agie Wilderness Class II						Teton Wilderness Class I						Washakie Wilderness Class I						Wind River Roadless Area Class II						Yellowstone National Park Class I					
	Direct Modeled Impact			PSD Increment			Direct Modeled Impact			PSD Increment			Direct Modeled Impact			PSD Increment			Direct Modeled Impact			PSD Increment			Direct Modeled Impact			PSD Increment		
	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual
No Action Alternative	0.05	0.02	0.002	512.0	91.0	20.0	0.01	0.004	0.0002	25.0	5.0	2.0	0.01	0.004	0.0002	25.0	5.0	2.0	0.07	0.02	0.001	512.0	91.0	20.0	0.01	0.003	0.0001	25.0	5.0	2.0
Alternative B	0.06	0.01	0.002	512.0	91.0	20.0	0.02	0.003	0.0002	25.0	5.0	2.0	0.02	0.004	0.0002	25.0	5.0	2.0	0.06	0.02	0.002	512.0	91.0	20.0	0.02	0.003	0.0001	25.0	5.0	2.0
Alternative C	0.18	0.04	0.01	512.0	91.0	20.0	0.05	0.01	0.0006	25.0	5.0	2.0	0.05	0.01	0.0007	25.0	5.0	2.0	0.18	0.05	0.005	512.0	91.0	20.0	0.05	0.01	0.0003	25.0	5.0	2.0
Alternative C - 80 % Drill Rig Mitigation	0.04	0.01	0.002	512.0	91.0	20.0	0.01	0.002	0.0001	25.0	5.0	2.0	0.01	0.003	0.0002	25.0	5.0	2.0	0.04	0.01	0.001	512.0	91.0	20.0	0.01	0.002	0.0001	25.0	5.0	2.0
Alternative B - Maximum Field Production	0.002	0.001	0.0001	512.0	91.0	20.0	0.00	0.0002	0.0000	25.0	5.0	2.0	0.001	0.0002	0.0000	25.0	5.0	2.0	0.003	0.001	0.0001	512.0	91.0	20.0	0.001	0.0001	0.0000	25.0	5.0	2.0

<sup>1</sup> All NEPA analysis comparisons to the PSD increments are intended to evaluate a threshold of concern and do not represent a regulatory PSD Increment Consumption Analysis.

**Table 18.14**  
**Summary of Maximum Modeled PM<sub>10</sub> Concentration Impacts (µg/m<sup>3</sup>) from**  
**Direct Project Sources Compared to PSD Increments<sup>1</sup>**

Alternative	Bridger Wilderness Class I				Fitzpatrick Wilderness Class I				Grand Teton National Park Class I				Gros Ventre Wilderness Class II				North Absaroka Wilderness Class I			
	Direct Modeled Impact		PSD Increment		Direct Modeled Impact		PSD Increment		Direct Modeled Impact		PSD Increment		Direct Modeled Impact		PSD Increment		Direct Modeled Impact		PSD Increment	
	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual
No Action Alternative	2.54	0.13	8.0	4.0	0.75	0.03	8.0	4.0	0.31	0.01	8.0	4.0	0.60	0.02	30.0	17.0	0.16	0.005	8.0	4.0
Alternative B	2.69	0.13	8.0	4.0	0.88	0.03	8.0	4.0	0.26	0.01	8.0	4.0	0.49	0.03	30.0	17.0	0.20	0.005	8.0	4.0
Alternative C	1.93	0.10	8.0	4.0	0.60	0.02	8.0	4.0	0.18	0.01	8.0	4.0	0.34	0.02	30.0	17.0	0.14	0.003	8.0	4.0
Alternative C - 80 % Drill Rig Mitigation	0.85	0.04	8.0	4.0	0.25	0.01	8.0	4.0	0.08	0.004	8.0	4.0	0.18	0.01	30.0	17.0	0.06	0.002	8.0	4.0
Alternative B - Maximum Field Production	0.55	0.04	8.0	4.0	0.37	0.01	8.0	4.0	0.10	0.004	8.0	4.0	0.15	0.01	30.0	17.0	0.07	0.002	8.0	4.0

Alternative	Popo Agie Wilderness Class II				Teton Wilderness Class I				Washakie Wilderness Class I				Wind River Roadless Area Class II				Yellowstone National Park Class I			
	Direct Modeled Impact		PSD Increment		Direct Modeled Impact		PSD Increment		Direct Modeled Impact		PSD Increment		Direct Modeled Impact		PSD Increment		Direct Modeled Impact		PSD Increment	
	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual
No Action Alternative	0.61	0.05	30.0	17.0	0.18	0.01	8.0	4.0	0.22	0.01	8.0	4.0	0.70	0.04	30.0	17.0	0.17	0.01	8.0	4.0
Alternative B	0.70	0.05	30.0	17.0	0.20	0.01	8.0	4.0	0.26	0.01	8.0	4.0	0.81	0.04	30.0	17.0	0.17	0.01	8.0	4.0
Alternative C	0.48	0.04	30.0	17.0	0.14	0.01	8.0	4.0	0.18	0.01	8.0	4.0	0.56	0.03	30.0	17.0	0.12	0.004	8.0	4.0
Alternative C - 80 % Drill Rig Mitigation	0.18	0.02	30.0	17.0	0.06	0.002	8.0	4.0	0.07	0.002	8.0	4.0	0.22	0.01	30.0	17.0	0.05	0.002	8.0	4.0
Alternative B - Maximum Field Production	0.25	0.02	30.0	17.0	0.08	0.003	8.0	4.0	0.10	0.003	8.0	4.0	0.30	0.01	30.0	17.0	0.06	0.002	8.0	4.0

<sup>1</sup> All NEPA analysis comparisons to the PSD increments are intended to evaluate a threshold of concern and do not represent a regulatory PSD Increment Consumption Analysis.

**Table 18.15**  
**Summary of Maximum Modeled In-field Pollutant Concentrations ( $\mu\text{g}/\text{m}^3$ ) from Direct Project Sources**

Alternative	NO <sub>2</sub>				SO <sub>2</sub>											
	Direct Modeled Impact <sup>1</sup>	PSD Class II Increment <sup>2</sup>	Total Concentration <sup>3</sup>	NAAQS/WAAQS	Direct Modeled Impact <sup>1</sup>			PSD Class II Increment <sup>2</sup>			Total Concentration <sup>3</sup>			NAAQS/WAAQS		
					Annual	Annual	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual
No Action Alternative	52.8	25.0	60.8	100	32.8	5.3	0.7	512.0	91.0	20.0	164.8	48.3	9.7	1,300	365/260	80/60
Alternative B	60.5	25.0	68.5	100	32.6	5.4	0.7	512.0	91.0	20.0	164.6	48.4	9.7	1,300	365/260	80/60
Alternative C	37.0	25.0	45.0	100	112.6	18.2	2.3	512.0	91.0	20.0	244.6	61.2	11.3	1,300	365/260	80/60
Alternative C - 80 % Drill Rig Mitigation	10.3	25.0	18.3	100	22.6	3.8	0.5	512.0	91.0	20.0	154.6	46.8	9.5	1,300	365/260	80/60
Alternative B - Maximum Field Production	8.3	25.0	16.3	100	0.5	0.1	0.0	512.0	91.0	20.0	132.5	43.1	9.0	1,300	365/260	80/60

Alternative	PM <sub>10</sub>				PM <sub>2.5</sub>									
	Direct Modeled Impact <sup>1</sup>		PSD Class II Increment <sup>2</sup>		Total Concentration <sup>3</sup>		NAAQS/WAAQS		Direct Modeled Impact		Total Concentration <sup>3</sup>		NAAQS/WAAQS	
	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual
No Action Alternative	51.4	18.3	30.0	17.0	83.4	27.3	150	50 <sup>4</sup>	14.1	5.2	29.1	11.2	35 <sup>5</sup> (65) <sup>6</sup>	15
Alternative B	24.6	8.5	30.0	17.0	56.6	17.5	150	50 <sup>4</sup>	12.1	3.4	27.1	9.4	35 <sup>5</sup> (65) <sup>6</sup>	15
Alternative C	29.9	10.8	30.0	17.0	61.9	19.8	150	50 <sup>4</sup>	9.9	3.5	24.9	9.5	35 <sup>5</sup> (65) <sup>6</sup>	15
Alternative C - 80 % Drill Rig Mitigation	29.6	9.7	30.0	17.0	61.6	18.7	150	50 <sup>4</sup>	5.7	2.3	20.7	8.3	35 <sup>5</sup> (65) <sup>6</sup>	15
Alternative B - Maximum Field Production	17.5	4.9	30.0	17.0	49.5	13.9	150	50 <sup>4</sup>	4.0	1.2	19.0	7.2	35 <sup>5</sup> (65) <sup>6</sup>	15

<sup>1</sup> Background concentrations are not added to modeled concentrations for comparison to the PSD increment.  
<sup>2</sup> All NEPA analysis comparisons to the PSD increments are intended to evaluate a threshold of concern and do not represent a regulatory PSD Increment Consumption Analysis.  
<sup>3</sup> Total concentration includes direct modeled impact and background concentration.  
 Annual background NO<sub>2</sub> concentration value of 8  $\mu\text{g}/\text{m}^3$  from Boulder monitor.  
 Background SO<sub>2</sub> concentration values of 132  $\mu\text{g}/\text{m}^3$ , 43  $\mu\text{g}/\text{m}^3$ , and 9  $\mu\text{g}/\text{m}^3$ , from Craven Creek used for 3-hour, 24-hour, and annual averaging periods, respectively.  
 Background PM<sub>10</sub> concentration values of 32  $\mu\text{g}/\text{m}^3$  and 9  $\mu\text{g}/\text{m}^3$ , from Boulder used for 24-hour and annual averaging periods, respectively.  
 Background PM<sub>2.5</sub> concentration values of 15  $\mu\text{g}/\text{m}^3$  and 6  $\mu\text{g}/\text{m}^3$ , from Pinedale used for 24-hour and annual averaging periods, respectively.  
<sup>4</sup> Annual NAAQS for PM<sub>10</sub> was revoked by EPA effective December 18, 2006.  
<sup>5</sup> Revised NAAQS effective December 18, 2006.  
<sup>6</sup> EPA has revised the NAAQS effective December 18, 2006. The State of Wyoming will enter rulemaking to revise the WAAQS.

**Table 18.16  
Summary of Maximum Modeled Visibility Impacts at PSD Class I and Sensitive PSD Class II Areas from  
Direct Project Sources Using FLAG Background Data - (MVISBK=6)**

Alternative	Bridger Wilderness Class I		Fitzpatrick Wilderness Class I		Grand Teton National Park Class I		Gros Ventre Wilderness Class II		North Absaroka Wilderness Class I	
	Maximum Visibility Impact (Δdv)	Number of Days > 1.0 Δdv (days)	Maximum Visibility Impact (Δdv)	Number of Days > 1.0 Δdv (days)	Maximum Visibility Impact (Δdv)	Number of Days > 1.0 Δdv (days)	Maximum Visibility Impact (Δdv)	Number of Days > 1.0 Δdv (days)	Maximum Visibility Impact (Δdv)	Number of Days > 1.0 Δdv (days)
No Action Alternative	7.4	62.0	4.8	8.0	1.6	2.0	3.6	6.0	0.9	0.0
Alternative B	8.5	67.0	5.6	10.0	1.7	3.0	4.1	8.0	0.7	0.0
Alternative C	6.3	40.0	4.0	5.0	1.2	1.0	2.9	2.0	0.5	0.0
Alternative C - 80 % Drill Rig Mitigation	2.6	10.0	1.5	1.0	0.4	0.0	1.2	1.0	0.2	0.0
Alternative B - Maximum Field Production	3.3	16.0	2.1	3.0	0.8	0.0	1.8	1.0	0.3	0.0

Alternative	Popo Agie Wilderness Class II		Teton Wilderness Class I		Washakie Wilderness Class I		Wind River Roadless Area Class II		Yellowstone National Park Class I	
	Maximum Visibility Impact (Δdv)	Number of Days > 1.0 Δdv (days)	Maximum Visibility Impact (Δdv)	Number of Days > 1.0 Δdv (days)	Maximum Visibility Impact (Δdv)	Number of Days > 1.0 Δdv (days)	Maximum Visibility Impact (Δdv)	Number of Days > 1.0 Δdv (days)	Maximum Visibility Impact (Δdv)	Number of Days > 1.0 Δdv (days)
No Action Alternative	2.8	12.0	1.1	1.0	1.1	2.0	3.7	9.0	0.8	0.0
Alternative B	3.2	14.0	1.2	1.0	1.3	2.0	4.2	10.0	0.8	0.0
Alternative C	2.2	6.0	0.8	0.0	0.9	0.0	3.0	5.0	0.5	0.0
Alternative C - 80 % Drill Rig Mitigation	0.9	0.0	0.3	0.0	0.3	0.0	1.3	1.0	0.2	0.0
Alternative B - Maximum Field Production	1.5	1.0	0.5	0.0	0.5	0.0	1.8	2.0	0.3	0.0

Note: Δdv = change in deciview.

**Table 18.17**  
**Summary of Maximum Modeled Visibility Impacts at Wyoming Regional Community Locations**  
**from Direct Project Sources Using Boulder Background Data**

Alternative	Boulder		Cora		Pinedale	
	Maximum Visibility Impact ( $\Delta dv$ ) <sup>1</sup>	Number of Days > 1.0 $\Delta dv$ <sup>1</sup> (days)	Maximum Visibility Impact ( $\Delta dv$ ) <sup>1</sup>	Number of Days > 1.0 $\Delta dv$ <sup>1</sup> (days)	Maximum Visibility Impact ( $\Delta dv$ ) <sup>1</sup>	Number of Days > 1.0 $\Delta dv$ <sup>1</sup> (days)
No Action Alternative	13.1	126	11.2	58	12.5	89
Alternative B	15.3	138	12.5	62	12.3	91
Alternative C	12.2	107	9.5	47	9.4	70
Alternative C - 80 % Drill Rig Mitigation	6.6	45	4.0	12	4.4	25
Alternative B - Maximum Field Production	6.8	54	3.3	12	5.2	23

<sup>1</sup>  $\Delta dv$  = change in deciview.

**Table 18.18**  
**Summary of Maximum Modeled Total Nitrogen (N) Deposition Impacts (kg/ha-yr) at PSD Class I**  
**and Sensitive PSD Class II Areas from Direct Project Sources<sup>1</sup>**

Alternative	Bridger Wilderness Class I		Fitzpatrick Wilderness Class I		Grand Teton National Park Class I		Gros Ventre Wilderness Class II		North Absaroka Wilderness Class I	
	Modeled Impact	Total Impact <sup>2</sup>	Modeled Impact	Total Impact <sup>2</sup>	Modeled Impact	Total Impact <sup>3</sup>	Modeled Impact	Total Impact <sup>2</sup>	Modeled Impact	Total Impact <sup>3</sup>
No Action Alternative	0.097	1.517	0.012	1.432	0.007	1.297	0.014	1.434	0.004	1.294
Alternative B	0.089	1.509	0.012	1.432	0.006	1.296	0.013	1.433	0.004	1.294
Alternative C	0.056	1.476	0.007	1.427	0.004	1.294	0.008	1.428	0.003	1.293
Alternative C - 80 % Drill Rig Mitigation	0.021	1.441	0.003	1.423	0.001	1.291	0.003	1.423	0.001	1.291
Alternative B - Maximum Field Production	0.031	1.451	0.004	1.424	0.002	1.292	0.004	1.424	0.002	1.292

Alternative	Popo Agie Wilderness Class II		Teton Wilderness Class I		Washakie Wilderness Class I		Wind River Roadless Area Class II		Yellowstone National Park Class I	
	Modeled Impact	Total Impact <sup>2</sup>	Modeled Impact	Total Impact <sup>3</sup>	Modeled Impact	Total Impact <sup>3</sup>	Modeled Impact	Total Impact <sup>2</sup>	Modeled Impact	Total Impact <sup>3</sup>
No Action Alternative	0.036	1.456	0.005	1.295	0.005	1.295	0.022	1.442	0.004	1.294
Alternative B	0.032	1.452	0.005	1.295	0.005	1.295	0.020	1.440	0.004	1.294
Alternative C	0.020	1.440	0.003	1.293	0.003	1.293	0.013	1.433	0.002	1.292
Alternative C - 80 % Drill Rig Mitigation	0.008	1.428	0.001	1.291	0.001	1.291	0.005	1.425	0.001	1.291
Alternative B - Maximum Field Production	0.011	1.431	0.002	1.292	0.002	1.292	0.007	1.427	0.001	1.291

<sup>1</sup> Nitrogen deposition analysis level of concern for total impacts - 3.00 kg/ha-yr.

<sup>2</sup> Includes N deposition value of 1.42 kg/ha-yr measured at the CASTNET/NADP site near Pinedale for the year 2004.

<sup>3</sup> Includes N deposition value of 1.29 kg/ha-yr measured at the CASTNET/NADP site at Yellowstone National Park for the year 2005.

**Table 18.19**  
**Summary of Maximum Modeled Total Sulfur (S) Deposition Impacts (kg/ha-yr) at PSD Class I**  
**and Sensitive PSD Class II Areas from Direct Project Sources<sup>1</sup>**

Alternative	Bridger Wilderness Class I		Fitzpatrick Wilderness Class I		Grand Teton National Park Class I		Gros Ventre Wilderness Class II		North Absaroka Wilderness Class I	
	Modeled Impact	Total Impact <sup>2</sup>	Modeled Impact	Total Impact <sup>2</sup>	Modeled Impact	Total Impact <sup>3</sup>	Modeled Impact	Total Impact <sup>2</sup>	Modeled Impact	Total Impact <sup>3</sup>
No Action Alternative	0.0030	0.743	0.0004	0.740	0.0002	0.680	0.0004	0.740	0.0001	0.680
Alternative B	0.0032	0.743	0.0005	0.740	0.0002	0.680	0.0004	0.740	0.0001	0.680
Alternative C	0.0032	0.743	0.0005	0.740	0.0002	0.680	0.0004	0.740	0.0001	0.680
Alternative C - 80 % Drill Rig Mitigation	0.0022	0.742	0.0003	0.740	0.0001	0.680	0.0003	0.740	0.0001	0.680
Alternative B - Maximum Field Production	0.0001	0.740	0.0000	0.740	0.0000	0.680	0.0000	0.740	0.0000	0.680

Alternative	Popo Agie Wilderness Class II		Teton Wilderness Class I		Washakie Wilderness Class I		Wind River Roadless Area Class II		Yellowstone National Park Class I	
	Modeled Impact	Total Impact <sup>2</sup>	Modeled Impact	Total Impact <sup>3</sup>	Modeled Impact	Total Impact <sup>3</sup>	Modeled Impact	Total Impact <sup>2</sup>	Modeled Impact	Total Impact <sup>3</sup>
No Action Alternative	0.0014	0.741	0.0002	0.680	0.0002	0.680	0.0008	0.741	0.0001	0.680
Alternative B	0.0014	0.741	0.0002	0.680	0.0002	0.680	0.0009	0.741	0.0001	0.680
Alternative C	0.0014	0.741	0.0002	0.680	0.0002	0.680	0.0009	0.741	0.0001	0.680
Alternative C - 80 % Drill Rig Mitigation	0.0010	0.741	0.0001	0.680	0.0001	0.680	0.0006	0.741	0.0001	0.680
Alternative B - Maximum Field Production	0.0000	0.740	0.0000	0.680	0.0000	0.680	0.0000	0.740	0.0000	0.680

<sup>1</sup> Sulfur deposition analysis level of concern for total impacts = 5.0 kg/ha-yr.

<sup>2</sup> Includes S deposition value of 0.74 kg/ha-yr measured at the CASTNET/NADP site near Pinedale for the year 2004.

<sup>3</sup> Includes S deposition value of 0.68 kg/ha-yr measured at the CASTNET/NADP site at Yellowstone National Park for the year 2005.

**Table 18.20**  
**Summary of Maximum Modeled Change in ANC ( $\mu\text{eq/L}$ ) at Acid-Sensitive Lakes from Direct Project Sources**

Alternative	Black Joe Lake		Deep Lake		Hobbs Lake		Lazy Boy Lake		Lower Saddlebag		Ross Lake		Upper Frozen	
	Bridger Wilderness Class I		Bridger Wilderness Class I		Bridger Wilderness Class I		Bridger Wilderness Class I		Popo Agie Wilderness Class II		Fitzpatrick Wilderness Class I		Bridger Wilderness Class I	
	ANC Change ( $\mu\text{eq/L}$ )	ANC Change (%)	ANC Change ( $\mu\text{eq/L}$ )	ANC Change (%)	ANC Change ( $\mu\text{eq/L}$ )	ANC Change (%)	ANC Change ( $\mu\text{eq/L}$ )	ANC Change (%)	ANC Change ( $\mu\text{eq/L}$ )	ANC Change (%)	ANC Change ( $\mu\text{eq/L}$ )	ANC Change (%)	ANC Change ( $\mu\text{eq/L}$ )	ANC Change (%)
Level of Acceptable Change( $\mu\text{eq/L}$ )	6.71	10%	5.97	10%	6.99	10%	1.00	--	5.52	10%	5.37	10%	1.00	--
Background	67.1	--	59.7	--	69.9	--	10.8	--	55.2	--	53.7	--	6.0	--
No Action Alternative	0.28	0.42%	0.31	0.52%	0.15	0.21%	0.09	--	0.30	0.55%	0.08	0.14%	0.34	--
Alternative B	0.25	0.37%	0.28	0.46%	0.15	0.21%	0.08	--	0.26	0.48%	0.07	0.13%	0.30	--
Alternative C	0.18	0.27%	0.20	0.33%	0.10	0.15%	0.06	--	0.19	0.35%	0.05	0.10%	0.22	--
Alternative C - 80 % Drill Rig Mitigation	0.07	0.10%	0.07	0.12%	0.04	0.05%	0.02	--	0.07	0.13%	0.02	0.03%	0.08	--
Alternative B - Maximum Field Production	0.08	0.12%	0.09	0.15%	0.05	0.07%	0.03	--	0.09	0.17%	0.03	0.05%	0.10	--

<sup>1</sup> USFS Level of Acceptable Change; 10% change in ANC for lakes with ANC background values greater than 25  $\mu\text{eq/L}$ ,

<sub>1</sub>  $\mu\text{eq/L}$  for lakes with ANC values less than or equal to 25  $\mu\text{eq/L}$ .

**Table 18.21 RFD Projects Included in Cumulative Analysis**

Atlantic Rim	Lower Greys River - MA 32
Bitter Creek	Monell Oil Recovery
BTA Bravo	Moxa Arch
Burley	Moxa Arch Infill
Burlington Little Monument	Mulligan Draw
Cave Gulch	Pacific Rim
Cliff Creek - USFS Management Area (MA) 22	Piney Creeks - MA 26
Compressor Station, Pipeline- Williams	Pioneer Gas Plant
Cooper Reservoir (1998)	Powder River Basin
Cottonwood Creek - MA 25	Riley Ridge
Desolation Flats	Road Hollow Gas Plant
Fontenelle Natural Gas Infill Drilling	Scotty Lake
Ham's Fork Pipeline	Seminole Road
Hay Reservoir Pilot	Sierra Madre
Hickey Mountain-Table Mountain	Soda Unit
Horse Creek - MA 24	South Baggs
Horse Trap	South Piney
Jack Morrow Hills	Stage Coach
Jonah Enterprise	Upper Hoback – MA 23
Jonah Infill	Vermillion Basin
LaBarge Creek - MA 12	Willow Creek - MA 49
Little Greys River - MA 31	Wind Dancer
Lower Bush Creek CBM (Kennedy Oil	Wind River (Bureau of Indian Affairs - lead agency)

**Table 18.22**  
**Summary of Maximum Modeled Cumulative NO<sub>2</sub> Concentration Impacts (µg/m<sup>3</sup>) at**  
**PSD Class I and Sensitive PSD Class II Areas from Direct Project and Regional Sources**

Alternative	Bridger Wilderness Class I		Fitzpatrick Wilderness Class I		Grand Teton National Park Class I		Gros Ventre Wilderness Class II		North Absoroka Wilderness Class I	
	Direct Modeled Impact	Total Concentration <sup>1</sup>	Direct Modeled Impact	Total Concentration <sup>1</sup>	Direct Modeled Impact	Total Concentration <sup>1</sup>	Direct Modeled Impact	Total Concentration <sup>1</sup>	Direct Modeled Impact	Total Concentration <sup>2</sup>
No Action Alternative	0.40	8.40	0.03	8.03	0.12	8.12	0.04	8.04	0.002	8.00
Alternative B	0.39	8.39	0.03	8.03	0.11	8.11	0.04	8.04	0.002	8.00
Alternative C	0.26	8.26	0.02	8.02	0.11	8.11	0.03	8.03	0.002	8.00
Alternative C - 80 % Drill Rig Mitigation	0.13	8.13	0.01	8.01	0.11	8.11	0.02	8.02	0.001	8.00
Alternative B - Maximum Field Production	0.16	8.16	0.02	8.02	0.11	8.11	0.02	8.02	0.001	8.00

Alternative	Popo Agie Wilderness Class II		Teton Wilderness Class I		Washakie Wilderness Class I		Wind River Roadless Area Class II		Yellowstone National Park Class I	
	Direct Modeled Impact	Total Concentration <sup>1</sup>	Direct Modeled Impact	Total Concentration <sup>1</sup>	Direct Modeled Impact	Total Concentration <sup>1</sup>	Direct Modeled Impact	Total Concentration <sup>1</sup>	Direct Modeled Impact	Total Concentration <sup>2</sup>
No Action Alternative	0.09	8.09	0.01	8.01	0.005	8.00	0.06	8.06	0.003	8.00
Alternative B	0.09	8.09	0.01	8.01	0.005	8.00	0.06	8.06	0.003	8.00
Alternative C	0.06	8.06	0.004	8.00	0.003	8.00	0.04	8.04	0.002	8.00
Alternative C - 80 % Drill Rig Mitigation	0.03	8.03	0.002	8.00	0.002	8.00	0.02	8.02	0.001	8.00
Alternative B - Maximum Field Production	0.04	8.04	0.003	8.00	0.003	8.00	0.03	8.03	0.001	8.00

<sup>1</sup> Total concentration includes direct modeled impact and background concentration for comparison to NAAQS/WAAQS which are 100 µg/m<sup>3</sup> on an annual basis. Annual background NO<sub>2</sub> concentration value of 8 µg/m<sup>3</sup> from Boulder monitor.

**Table 18.23**  
**Summary of Maximum Modeled Cumulative SO<sub>2</sub> Concentration Impacts (µg/m<sup>3</sup>) at PSD Class I and Sensitive PSD Class II Areas from Direct Project and Regional Sources**

Alternative	Bridger Wilderness Class I									Fitzpatrick Wilderness Class I									Grand Teton National Park Class I									Gros Ventre Wilderness Class II									North Absaroka Wilderness Class I								
	Direct Modeled Impact			Total Concentration <sup>1</sup>			Direct Modeled Impact			Total Concentration <sup>1</sup>			Direct Modeled Impact			Total Concentration <sup>1</sup>			Direct Modeled Impact			Total Concentration <sup>1</sup>			Direct Modeled Impact			Total Concentration <sup>1</sup>			Direct Modeled Impact			Total Concentration <sup>1</sup>											
	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual												
No Action Alternative	0.25	0.08	0.01	132.3	43.1	9.01	0.07	0.02	0.001	132.1	43.0	9.00	0.03	0.01	0.001	132.0	43.0	9.00	0.07	0.02	0.001	132.1	43.0	9.00	0.02	0.01	0.0003	132.0	43.0	9.00	0.03	0.01	0.0003	132.0	43.0	9.00									
Alternative B	0.30	0.09	0.01	132.3	43.1	9.01	0.09	0.03	0.001	132.1	43.0	9.00	0.03	0.01	0.001	132.0	43.0	9.00	0.07	0.02	0.001	132.1	43.0	9.00	0.02	0.01	0.0003	132.0	43.0	9.00	0.02	0.01	0.0003	132.0	43.0	9.00									
Alternative C	0.76	0.24	0.02	132.8	43.2	9.02	0.22	0.07	0.003	132.2	43.1	9.00	0.08	0.02	0.001	132.1	43.0	9.00	0.18	0.04	0.003	132.2	43.0	9.00	0.03	0.01	0.0005	132.0	43.0	9.00	0.03	0.01	0.0005	132.0	43.0	9.00									
Alternative C - 80 % Drill Rig Mitigation	0.24	0.07	0.01	132.2	43.1	9.01	0.07	0.02	0.001	132.1	43.0	9.00	0.03	0.01	0.0005	132.0	43.0	9.00	0.06	0.01	0.001	132.1	43.0	9.00	0.02	0.01	0.0003	132.0	43.0	9.00	0.02	0.01	0.0003	132.0	43.0	9.00									
Alternative B - Maximum Field Production	0.10	0.03	0.002	132.1	43.0	9.00	0.03	0.01	0.001	132.0	43.0	9.00	0.01	0.004	0.0003	132.0	43.0	9.00	0.03	0.01	0.0004	132.0	43.0	9.00	0.02	0.01	0.0002	132.0	43.0	9.00	0.02	0.01	0.0002	132.0	43.0	9.00									

Alternative	Popo Agie Wilderness Class II									Teton Wilderness Class I									Washakie Wilderness Class I									Wind River Roadless Area Class II									Yellowstone National Park Class I								
	Direct Modeled Impact			Total Concentration <sup>1</sup>			Direct Modeled Impact			Total Concentration <sup>1</sup>			Direct Modeled Impact			Total Concentration <sup>1</sup>			Direct Modeled Impact			Total Concentration <sup>1</sup>			Direct Modeled Impact			Total Concentration <sup>1</sup>			Direct Modeled Impact			Total Concentration <sup>1</sup>											
	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual												
No Action Alternative	0.08	0.02	0.003	132.1	43.0	9.00	0.02	0.01	0.0004	132.0	43.0	9.00	0.02	0.01	0.0005	132.0	43.0	9.00	0.09	0.02	0.002	132.1	43.0	9.00	0.02	0.01	0.0002	132.0	43.0	9.00	0.02	0.01	0.0002	132.0	43.0	9.00									
Alternative B	0.09	0.02	0.003	132.1	43.0	9.00	0.02	0.01	0.0004	132.0	43.0	9.00	0.03	0.01	0.0005	132.0	43.0	9.00	0.10	0.02	0.002	132.1	43.0	9.00	0.02	0.01	0.0003	132.0	43.0	9.00	0.02	0.01	0.0003	132.0	43.0	9.00									
Alternative C	0.19	0.05	0.008	132.2	43.1	9.01	0.06	0.01	0.0008	132.1	43.0	9.00	0.06	0.01	0.0010	132.1	43.0	9.00	0.19	0.06	0.006	132.2	43.1	9.01	0.06	0.01	0.0005	132.1	43.0	9.00	0.06	0.01	0.0005	132.1	43.0	9.00									
Alternative C - 80 % Drill Rig Mitigation	0.08	0.02	0.003	132.1	43.0	9.00	0.02	0.01	0.0003	132.0	43.0	9.00	0.02	0.01	0.0005	132.0	43.0	9.00	0.09	0.02	0.002	132.1	43.0	9.00	0.02	0.01	0.0002	132.0	43.0	9.00	0.02	0.01	0.0002	132.0	43.0	9.00									
Alternative B - Maximum Field Production	0.06	0.01	0.001	132.1	43.0	9.00	0.01	0.01	0.0002	132.0	43.0	9.00	0.02	0.01	0.0003	132.0	43.0	9.00	0.06	0.01	0.001	132.1	43.0	9.00	0.01	0.003	0.0002	132.0	43.0	9.00	0.01	0.003	0.0002	132.0	43.0	9.00									

<sup>1</sup> Total concentration includes direct modeled impact and background concentration for comparison with NAAQS/WAAQS which are 1,300 µg/m<sup>3</sup> on a 3-hour basis, 365/260 µg/m<sup>3</sup> on a 24-hour basis and 80/60 µg/m<sup>3</sup> on an annual basis. Background SO<sub>2</sub> concentration values of 132 µg/m<sup>3</sup>, 43 µg/m<sup>3</sup>, and 9 µg/m<sup>3</sup>, from Craven Creek used for 3-hour, 24-hour, and annual averaging periods, respectively.

**Table 18.24**  
**Summary of Maximum Modeled Cumulative PM10 Concentration Impacts ( $\mu\text{g}/\text{m}^3$ ) at PSD Class I and Sensitive PSD Class II Areas from Direct Project and Regional Sources**

Alternative	Bridger Wilderness Class I				Fitzpatrick Wilderness Class I				Grand Teton National Park Class I				Gros Ventre Wilderness Class II				North Absaroka Wilderness Class I			
	Direct Modeled Impact		Total Concentration <sup>1</sup>		Direct Modeled Impact		Total Concentration <sup>1</sup>		Direct Modeled Impact		Total Concentration <sup>1</sup>		Direct Modeled Impact		Total Concentration <sup>1</sup>		Direct Modeled Impact		Total Concentration <sup>2</sup>	
	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual
No Action Alternative	3.28	0.17	35.3	9.17	1.05	0.04	33.0	9.04	1.00	0.07	33.0	9.07	0.70	0.04	32.7	9.04	0.27	0.01	32.3	9.01
Alternative B	2.98	0.18	35.0	9.18	1.11	0.04	33.1	9.04	1.00	0.07	33.0	9.07	0.57	0.04	32.6	9.04	0.31	0.01	32.3	9.01
Alternative C	2.22	0.14	34.2	9.14	0.89	0.04	32.9	9.04	0.97	0.06	33.0	9.06	0.48	0.03	32.5	9.03	0.25	0.01	32.2	9.01
Alternative C - 80 % Drill Rig Mitigation	1.13	0.09	33.1	9.09	0.69	0.02	32.7	9.02	0.87	0.06	32.9	9.06	0.45	0.02	32.5	9.02	0.17	0.01	32.2	9.01
Alternative B - Maximum Field Production	0.97	0.08	33.0	9.08	0.73	0.02	32.7	9.02	0.89	0.06	32.9	9.06	0.46	0.02	32.5	9.02	0.19	0.01	32.2	9.01

Alternative	Popo Agie Wilderness Class II				Teton Wilderness Class I				Washakie Wilderness Class I				Wind River Roadless Area Class II				Yellowstone National Park Class I			
	Direct Modeled Impact		Total Concentration <sup>1</sup>		Direct Modeled Impact		Total Concentration <sup>1</sup>		Direct Modeled Impact		Total Concentration <sup>1</sup>		Direct Modeled Impact		Total Concentration <sup>1</sup>		Direct Modeled Impact		Total Concentration <sup>2</sup>	
	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual
No Action Alternative	0.89	0.08	32.9	9.08	0.56	0.04	32.6	9.04	0.38	0.02	32.4	9.02	1.14	0.08	33.1	9.08	0.27	0.01	32.3	9.01
Alternative B	0.99	0.08	33.0	9.08	0.56	0.04	32.6	9.04	0.42	0.02	32.4	9.02	1.26	0.08	33.3	9.08	0.24	0.01	32.2	9.01
Alternative C	0.77	0.07	32.8	9.07	0.56	0.04	32.6	9.04	0.34	0.02	32.3	9.02	1.01	0.08	33.0	9.08	0.19	0.01	32.2	9.01
Alternative C - 80 % Drill Rig Mitigation	0.64	0.05	32.6	9.05	0.56	0.03	32.6	9.03	0.23	0.01	32.2	9.01	0.70	0.07	32.7	9.07	0.13	0.01	32.1	9.01
Alternative B - Maximum Field Production	0.67	0.05	32.7	9.05	0.56	0.03	32.6	9.03	0.26	0.01	32.3	9.01	0.75	0.07	32.8	9.07	0.15	0.01	32.1	9.01

<sup>1</sup> Total concentration includes direct modeled impact and background concentration for comparison to NAAQS/WAAQS. The NAAQS and WAAQS are 150  $\mu\text{g}/\text{m}^3$  on a 24-hour basis, and the WAAQS is 50  $\mu\text{g}/\text{m}^3$  on an annual basis. The annual NAAQS for PM<sub>10</sub> was revoked by EPA effective December 18, 2006. Background PM<sub>10</sub> concentration values of 32  $\mu\text{g}/\text{m}^3$  and 9  $\mu\text{g}/\text{m}^3$ , from Boulder used for 24-hour and annual averaging periods, respectively.

**Table 18.25**  
**Summary of Maximum Modeled Cumulative PM<sub>2.5</sub> Concentration Impacts (µg/m<sup>3</sup>) at PSD Class I and Sensitive PSD Class II Areas from Direct Project and Regional Sources**

Alternative	Bridger Wilderness Class I				Fitzpatrick Wilderness Class I				Grand Teton National Park Class I				Gros Ventre Wilderness Class II				North Absaroka Wilderness Class I			
	Direct Modeled Impact		Total Concentration <sup>1</sup>		Direct Modeled Impact		Total Concentration <sup>1</sup>		Direct Modeled Impact		Total Concentration <sup>1</sup>		Direct Modeled Impact		Total Concentration <sup>1</sup>		Direct Modeled Impact		Total Concentration <sup>2</sup>	
	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual
No Action Alternative	1.08	0.17	19.1	6.17	0.33	0.04	18.3	6.04	0.41	0.07	18.4	6.07	0.32	0.04	18.3	6.04	0.10	0.01	18.1	6.01
Alternative B	1.25	0.17	19.3	6.17	0.36	0.04	18.4	6.04	0.41	0.06	18.4	6.06	0.33	0.04	18.3	6.04	0.11	0.01	18.1	6.01
Alternative C	0.95	0.13	19.0	6.13	0.27	0.03	18.3	6.03	0.40	0.06	18.4	6.06	0.27	0.03	18.3	6.03	0.09	0.01	18.1	6.01
Alternative C - 80 % Drill Rig Mitigation	0.51	0.08	18.5	6.08	0.19	0.02	18.2	6.02	0.36	0.06	18.4	6.06	0.17	0.02	18.2	6.02	0.06	0.01	18.1	6.01
Alternative B - Maximum Field Production	0.51	0.08	18.5	6.08	0.19	0.02	18.2	6.02	0.36	0.06	18.4	6.06	0.18	0.02	18.2	6.02	0.07	0.01	18.1	6.01

Alternative	Popo Agie Wilderness Class II				Teton Wilderness Class I				Washakie Wilderness Class I				Wind River Roadless Area Class II				Yellowstone National Park Class I			
	Direct Modeled Impact		Total Concentration <sup>1</sup>		Direct Modeled Impact		Total Concentration <sup>1</sup>		Direct Modeled Impact		Total Concentration <sup>1</sup>		Direct Modeled Impact		Total Concentration <sup>1</sup>		Direct Modeled Impact		Total Concentration <sup>2</sup>	
	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual
No Action Alternative	0.49	0.08	18.5	6.08	0.30	0.04	18.3	6.04	0.15	0.02	18.1	6.02	0.55	0.08	18.6	6.08	0.13	0.01	18.1	6.01
Alternative B	0.52	0.08	18.5	6.08	0.30	0.04	18.3	6.04	0.16	0.02	18.2	6.02	0.58	0.08	18.6	6.08	0.13	0.01	18.1	6.01
Alternative C	0.45	0.07	18.4	6.07	0.30	0.04	18.3	6.04	0.13	0.02	18.1	6.02	0.50	0.08	18.5	6.08	0.10	0.01	18.1	6.01
Alternative C - 80 % Drill Rig Mitigation	0.34	0.05	18.3	6.05	0.28	0.03	18.3	6.03	0.09	0.01	18.1	6.01	0.44	0.07	18.4	6.07	0.07	0.01	18.1	6.01
Alternative B - Maximum Field Production	0.37	0.05	18.4	6.05	0.29	0.03	18.3	6.03	0.10	0.01	18.1	6.01	0.45	0.07	18.4	6.07	0.07	0.01	18.1	6.01

<sup>1</sup> Total concentration includes direct modeled impact and background concentration for comparison to NAAQS/WAAQS. The NAAQS and WAAQS on a 24-hour basis are 35 µg/m<sup>3</sup> and 65 µg/m<sup>3</sup>, respectively. EPA has revised the 24-hour NAAQS effective December 18, 2006. The State of Wyoming will enter rulemaking to revise the WAAQS. The NAAQS and WAAQS on an annual basis are 15 µg/m<sup>3</sup>. Background PM<sub>2.5</sub> concentration values of 15 µg/m<sup>3</sup> and 6 µg/m<sup>3</sup>, from Pinedale used for 24-hour and annual averaging periods, respectively.

**Table 18.26**  
**Summary of Maximum Modeled Cumulative NO2 Concentration Impacts ( $\mu\text{g}/\text{m}^3$ ) from**  
**Direct Project and Regional Sources Compared to PSD Increments<sup>1</sup>**

Alternative	Bridger Wilderness Class I		Fitzpatrick Wilderness Class I		Grand Teton National Park Class I		Gros Ventre Wilderness Class II		North Absoroka Wilderness Class I	
	Direct Modeled Impact	PSD Increment	Direct Modeled Impact	PSD Increment	Direct Modeled Impact	PSD Increment	Direct Modeled Impact	PSD Increment	Direct Modeled Impact	PSD Increment
	Annual	Annual	Annual	Annual	Annual	Annual	Annual	Annual	Annual	Annual
No Action Alternative	0.40	2.5	0.03	2.5	0.12	2.5	0.04	25.0	0.002	2.5
Alternative B	0.39	2.5	0.03	2.5	0.11	2.5	0.04	25.0	0.002	2.5
Alternative C	0.26	2.5	0.02	2.5	0.11	2.5	0.03	25.0	0.002	2.5
Alternative C - 80 % Drill Rig Mitigation	0.13	2.5	0.01	2.5	0.11	2.5	0.02	25.0	0.001	2.5
Alternative B - Maximum Field Production	0.16	2.5	0.02	2.5	0.11	2.5	0.02	25.0	0.001	2.5

Alternative	Popo Agie Wilderness Class II		Teton Wilderness Class I		Washakie Wilderness Class I		Wind River Roadless Area Class II		Yellowstone National Park Class I	
	Direct Modeled Impact	PSD Increment	Direct Modeled Impact	PSD Increment	Direct Modeled Impact	PSD Increment	Direct Modeled Impact	PSD Increment	Direct Modeled Impact	PSD Increment
	Annual	Annual	Annual	Annual	Annual	Annual	Annual	Annual	Annual	Annual
No Action Alternative	0.09	25.0	0.005	2.5	0.005	2.5	0.06	25.0	0.003	2.5
Alternative B	0.09	25.0	0.006	2.5	0.005	2.5	0.06	25.0	0.003	2.5
Alternative C	0.06	25.0	0.004	2.5	0.003	2.5	0.04	25.0	0.002	2.5
Alternative C - 80 % Drill Rig Mitigation	0.03	25.0	0.002	2.5	0.002	2.5	0.02	25.0	0.001	2.5
Alternative B - Maximum Field Production	0.04	25.0	0.003	2.5	0.003	2.5	0.03	25.0	0.001	2.5

<sup>1</sup> All NEPA analysis comparisons to the PSD increments are intended to evaluate a threshold of concern and do not represent a regulatory PSD Increment Consumption Analysis.

**Table 18.27**  
**Summary of Maximum Modeled Cumulative SO<sub>2</sub> Concentrations (µg/m<sup>3</sup>) from**  
**Direct Project and Regional Sources Compared to PSD Increments<sup>1</sup>**

Alternative	Bridger Wilderness Class I						Fitzpatrick Wilderness Class I						Grand Teton National Park Class I						Gros Ventre Wilderness Class II						North Absaroka Wilderness Class I					
	Direct Modeled Impact			PSD Increment			Direct Modeled Impact			PSD Increment			Direct Modeled Impact			PSD Increment			Direct Modeled Impact			PSD Increment			Direct Modeled Impact			PSD Increment		
	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual
No Action Alternative	0.25	0.08	0.01	25.0	5.0	2.0	0.07	0.02	0.001	25.0	5.0	2.0	0.03	0.01	0.001	25.0	5.0	2.0	0.07	0.02	0.001	512.0	91.0	20.0	0.02	0.01	0.0003	25.0	5.0	2.0
Alternative B	0.30	0.09	0.01	25.0	5.0	2.0	0.09	0.03	0.001	25.0	5.0	2.0	0.03	0.01	0.001	25.0	5.0	2.0	0.07	0.02	0.001	512.0	91.0	20.0	0.02	0.01	0.0003	25.0	5.0	2.0
Alternative C	0.76	0.24	0.02	25.0	5.0	2.0	0.22	0.07	0.003	25.0	5.0	2.0	0.08	0.02	0.001	25.0	5.0	2.0	0.18	0.04	0.003	512.0	91.0	20.0	0.03	0.01	0.0005	25.0	5.0	2.0
Alternative C - 80 % Drill Rig Mitigation	0.24	0.07	0.01	25.0	5.0	2.0	0.07	0.02	0.001	25.0	5.0	2.0	0.03	0.01	0.0005	25.0	5.0	2.0	0.06	0.01	0.001	512.0	91.0	20.0	0.02	0.01	0.0003	25.0	5.0	2.0
Alternative B - Maximum Field Production	0.10	0.03	0.002	25.0	5.0	2.0	0.03	0.01	0.001	25.0	5.0	2.0	0.01	0.004	0.0003	25.0	5.0	2.0	0.03	0.01	0.0004	512.0	91.0	20.0	0.02	0.01	0.0002	25.0	5.0	2.0

Alternative	Popo Agie Wilderness Class II						Teton Wilderness Class I						Washakie Wilderness Class I						Wind River Roadless Area Class II						Yellowstone National Park Class I					
	Direct Modeled Impact			PSD Increment			Direct Modeled Impact			PSD Increment			Direct Modeled Impact			PSD Increment			Direct Modeled Impact			PSD Increment			Direct Modeled Impact			PSD Increment		
	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual
No Action Alternative	0.08	0.02	0.003	512.0	91.0	20.0	0.02	0.01	0.0004	25.0	5.0	2.0	0.02	0.01	0.0005	25.0	5.0	2.0	0.09	0.02	0.002	512.0	91.0	20.0	0.02	0.01	0.0002	25.0	5.0	2.0
Alternative B	0.09	0.02	0.003	512.0	91.0	20.0	0.02	0.01	0.0004	25.0	5.0	2.0	0.03	0.01	0.0005	25.0	5.0	2.0	0.10	0.02	0.002	512.0	91.0	20.0	0.02	0.01	0.0003	25.0	5.0	2.0
Alternative C	0.19	0.05	0.008	512.0	91.0	20.0	0.06	0.01	0.0008	25.0	5.0	2.0	0.06	0.01	0.0010	25.0	5.0	2.0	0.19	0.06	0.006	512.0	91.0	20.0	0.06	0.01	0.0005	25.0	5.0	2.0
Alternative C - 80 % Drill Rig Mitigation	0.08	0.02	0.003	512.0	91.0	20.0	0.02	0.01	0.0003	25.0	5.0	2.0	0.02	0.01	0.0005	25.0	5.0	2.0	0.09	0.02	0.002	512.0	91.0	20.0	0.02	0.01	0.0002	25.0	5.0	2.0
Alternative B - Maximum Field Production	0.06	0.01	0.001	512.0	91.0	20.0	0.01	0.01	0.0002	25.0	5.0	2.0	0.02	0.01	0.0003	25.0	5.0	2.0	0.06	0.01	0.001	512.0	91.0	20.0	0.01	0.00	0.0002	25.0	5.0	2.0

<sup>1</sup> All NEPA analysis comparisons to the PSD increments are intended to evaluate a threshold of concern and do not represent a regulatory PSD Increment Consumption Analysis.

**Table 18.28**  
**Summary of Maximum Modeled Cumulative PM<sub>10</sub> Concentration Impacts (µg/m<sup>3</sup>) from**  
**Direct Project and Regional Sources Compared to PSD Increments<sup>1</sup>**

Alternative	Bridger Wilderness Class I				Fitzpatrick Wilderness Class I				Grand Teton National Park Class I				Gros Ventre Wilderness Class II				North Absaroka Wilderness Class I			
	Direct Modeled Impact		PSD Increment		Direct Modeled Impact		PSD Increment		Direct Modeled Impact		PSD Increment		Direct Modeled Impact		PSD Increment		Direct Modeled Impact		PSD Increment	
	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual
No Action Alternative	3.28	0.17	8.0	4.0	1.05	0.04	8.0	4.0	1.00	0.07	8.0	4.0	0.70	0.04	30.0	17.0	0.27	0.01	8.0	4.0
Alternative B	2.98	0.18	8.0	4.0	1.11	0.04	8.0	4.0	1.00	0.07	8.0	4.0	0.57	0.04	30.0	17.0	0.31	0.01	8.0	4.0
Alternative C	2.22	0.14	8.0	4.0	0.89	0.04	8.0	4.0	0.97	0.06	8.0	4.0	0.48	0.03	30.0	17.0	0.25	0.01	8.0	4.0
Alternative C - 80 % Drill Rig Mitigation	1.13	0.09	8.0	4.0	0.69	0.02	8.0	4.0	0.87	0.06	8.0	4.0	0.45	0.02	30.0	17.0	0.17	0.01	8.0	4.0
Proposed Action - Maximum Field Production	0.97	0.08	8.0	4.0	0.73	0.02	8.0	4.0	0.89	0.06	8.0	4.0	0.46	0.02	30.0	17.0	0.19	0.01	8.0	4.0

Alternative	Popo Agie Wilderness Class II				Teton Wilderness Class I				Washakie Wilderness Class I				Wind River Roadless Area Class II				Yellowstone National Park Class I			
	Direct Modeled Impact		PSD Increment		Direct Modeled Impact		PSD Increment		Direct Modeled Impact		PSD Increment		Direct Modeled Impact		PSD Increment		Direct Modeled Impact		PSD Increment	
	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual
No Action Alternative	0.89	0.08	30.0	17.0	0.56	0.04	8.0	4.0	0.38	0.02	8.0	4.0	1.14	0.08	30.0	17.0	0.27	0.01	8.0	4.0
Alternative B	0.99	0.08	30.0	17.0	0.56	0.04	8.0	4.0	0.42	0.02	8.0	4.0	1.26	0.08	30.0	17.0	0.24	0.01	8.0	4.0
Alternative C	0.77	0.07	30.0	17.0	0.56	0.04	8.0	4.0	0.34	0.02	8.0	4.0	1.01	0.08	30.0	17.0	0.19	0.01	8.0	4.0
Alternative C - 80 % Drill Rig Mitigation	0.64	0.05	30.0	17.0	0.56	0.03	8.0	4.0	0.23	0.01	8.0	4.0	0.70	0.07	30.0	17.0	0.13	0.01	8.0	4.0
Alternative B - Maximum Field Production	0.67	0.05	30.0	17.0	0.56	0.03	8.0	4.0	0.26	0.01	8.0	4.0	0.75	0.07	30.0	17.0	0.15	0.01	8.0	4.0

<sup>1</sup> All NEPA analysis comparisons to the PSD increments are intended to evaluate a threshold of concern and do not represent a regulatory PSD Increment Consumption Analysis.

**Table 18.29**  
**Summary of Maximum Modeled Cumulative In-field Pollutant Concentrations ( $\mu\text{g}/\text{m}^3$ ) from**  
**Direct Project and Regional Sources**

Alternative	NO <sub>2</sub>				SO <sub>2</sub>											
	Direct Modeled Impact <sup>1</sup>	PSD Class II Increment <sup>2</sup>	Total Concentration <sup>3</sup>	NAAQS/WAAQS	Direct Modeled Impact <sup>1</sup>			PSD Class II Increment <sup>2</sup>			Total Concentration <sup>3</sup>			NAAQS/WAAQS		
	Annual	Annual	Annual	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual	3-hr	24-hr	Annual
No Action Alternative	53.1	25.0	61.1	100	32.8	5.3	0.8	512.0	91.0	20.0	164.8	48.3	9.8	1,300	365/260	80/60
Alternative B	60.8	25.0	68.8	100	32.6	5.4	0.8	512.0	91.0	20.0	164.6	48.4	9.8	1,300	365/260	80/60
Alternative C	37.3	25.0	45.3	100	112.6	18.2	2.3	512.0	91.0	20.0	244.6	61.2	11.3	1,300	365/260	80/60
Alternative C - 80 % Drill Rig Mitigation	10.6	25.0	18.6	100	22.6	3.8	0.5	512.0	91.0	20.0	154.6	46.8	9.5	1,300	365/260	80/60
Alternative B - Maximum Field Production	9.2	25.0	17.2	100	9.5	2.2	0.2	512.0	91.0	20.0	141.5	45.2	9.2	1,300	365/260	80/60

Alternative	PM <sub>10</sub>				PM <sub>2.5</sub>									
	Direct Modeled Impact <sup>1</sup>		PSD Class II Increment <sup>2</sup>		Total Concentration <sup>3</sup>		NAAQS/ WAAQS		Direct Modeled Impact		Total Concentration <sup>3</sup>		NAAQS/ WAAQS	
	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual
No Action Alternative	51.5	18.8	30.0	17.0	83.5	27.8	150	50 <sup>4</sup>	14.5	5.5	32.5	11.5	35 <sup>5</sup> (65) <sup>6</sup>	15
Alternative B	25.1	9.1	30.0	17.0	57.1	18.1	150	50 <sup>4</sup>	12.2	3.6	30.2	9.6	35 <sup>5</sup> (65) <sup>6</sup>	15
Alternative C	30.1	11.4	30.0	17.0	62.1	20.4	150	50 <sup>4</sup>	10.0	3.7	28.0	9.7	35 <sup>5</sup> (65) <sup>6</sup>	15
Alternative C - 80 % Drill Rig Mitigation	29.6	10.2	30.0	17.0	61.6	19.2	150	50 <sup>4</sup>	6.2	2.6	24.2	8.6	35 <sup>5</sup> (65) <sup>6</sup>	15
Alternative B - Maximum Field Production	17.9	4.9	30.0	17.0	49.9	13.9	150	50 <sup>4</sup>	4.4	1.3	22.4	7.3	35 <sup>5</sup> (65) <sup>6</sup>	15

<sup>1</sup> Background concentrations are not added to modeled concentrations for comparison to the PSD increment.  
<sup>2</sup> All NEPA analysis comparisons to the PSD increments are intended to evaluate a threshold of concern and do not represent a regulatory PSD Increment Consumption Analysis.  
<sup>3</sup> Total concentration includes direct modeled impact and background concentration.  
 Annual background NO<sub>2</sub> concentration value of 8  $\mu\text{g}/\text{m}^3$  from Boulder monitor.  
 Background SO<sub>2</sub> concentration values of 132  $\mu\text{g}/\text{m}^3$ , 43  $\mu\text{g}/\text{m}^3$ , and 9  $\mu\text{g}/\text{m}^3$ , from Craven Creek used for 3-hour, 24-hour, and annual averaging periods, respectively.  
 Background PM<sub>10</sub> concentration values of 32  $\mu\text{g}/\text{m}^3$  and 9  $\mu\text{g}/\text{m}^3$ , from Boulder used for 24-hour and annual averaging periods, respectively.  
 Background PM<sub>2.5</sub> concentration values of 15  $\mu\text{g}/\text{m}^3$  and 6  $\mu\text{g}/\text{m}^3$ , from Pinedale used for 24-hour and annual averaging periods, respectively.  
<sup>4</sup> Annual NAAQS for PM<sub>10</sub> was revoked by EPA effective December 18, 2006.  
<sup>5</sup> Revised NAAQS effective December 18, 2006.  
<sup>6</sup> EPA has revised the NAAQS effective December 18, 2006. The State of Wyoming will enter rulemaking to revise the WAAQS.

**Table 18.30**  
**Summary of Maximum Modeled Visibility Impacts at PSD Class I and Sensitive PSD Class II Areas**  
**from Direct Project and Regional Sources Using FLAG Background Data - (MVISBK=6)**

Alternative	Bridger Wilderness Class I		Fitzpatrick Wilderness Class I		Grand Teton National Park Class I		Gros Ventre Wilderness Class II		North Absaroka Wilderness Class I	
	Maximum Visibility Impact ( $\Delta$ dv)	Number of Days > 1.0 $\Delta$ dv (days)	Maximum Visibility Impact ( $\Delta$ dv)	Number of Days > 1.0 $\Delta$ dv (days)	Maximum Visibility Impact ( $\Delta$ dv)	Number of Days > 1.0 $\Delta$ dv (days)	Maximum Visibility Impact ( $\Delta$ dv)	Number of Days > 1.0 $\Delta$ dv (days)	Maximum Visibility Impact ( $\Delta$ dv)	Number of Days > 1.0 $\Delta$ dv (days)
No Action Alternative	8.6	75	6.0	13	2.2	4	4.6	12	1.0	1
Alternative B	9.7	77	6.7	15	2.5	5	5.1	12	1.0	1
Alternative C	7.6	56	5.2	7	1.9	2	4.0	8	0.8	0
Alternative C - 80 % Drill Rig Mitigation	4.5	25	3.1	4	1.3	1	2.6	2	0.5	0
Proposed Action - Maximum Field Production	5.1	31	3.6	4	1.6	1	3.0	3	0.6	0

Alternative	Popo Agie Wilderness Class II		Teton Wilderness Class I		Washakie Wilderness Class I		Wind River Roadless Area Class II		Yellowstone National Park Class I	
	Maximum Visibility Impact ( $\Delta$ dv)	Number of Days > 1.0 $\Delta$ dv (days)	Maximum Visibility Impact ( $\Delta$ dv)	Number of Days > 1.0 $\Delta$ dv (days)	Maximum Visibility Impact ( $\Delta$ dv)	Number of Days > 1.0 $\Delta$ dv (days)	Maximum Visibility Impact ( $\Delta$ dv)	Number of Days > 1.0 $\Delta$ dv (days)	Maximum Visibility Impact ( $\Delta$ dv)	Number of Days > 1.0 $\Delta$ dv (days)
No Action Alternative	3.9	21	1.5	2	1.7	2	5.3	12	1.2	1
Alternative B	4.1	25	1.6	2	1.8	3	5.7	19	1.2	1
Alternative C	3.4	14	1.2	1	1.4	2	4.7	10	1.0	1
Alternative C - 80 % Drill Rig Mitigation	2.5	6	0.7	0	0.9	0	3.3	6	0.7	0
Alternative B - Maximum Field Production	2.8	9	0.9	0	1.1	1	3.7	8	0.8	0

Note:  $\Delta$ dv = change in deciview.

**Table 18.31**  
**Summary of Maximum Modeled Visibility Impacts at Wyoming Regional Community Locations**  
**from Direct Project and Regional Sources Using Boulder Background Data**

Alternative	Boulder		Cora		Pinedale	
	Maximum Visibility Impact ( $\Delta dv$ ) <sup>1</sup>	Number of Days > 1.0 $\Delta dv$ <sup>1</sup> (days)	Maximum Visibility Impact ( $\Delta dv$ ) <sup>1</sup>	Number of Days > 1.0 $\Delta dv$ <sup>1</sup> (days)	Maximum Visibility Impact ( $\Delta dv$ ) <sup>1</sup>	Number of Days > 1.0 $\Delta dv$ <sup>1</sup> (days)
No Action Alternative	13.7	141	11.5	65	12.8	94
Alternative B	15.8	153	13.0	68	13.2	96
Alternative C	12.8	118	10.2	60	10.8	79
Alternative C - 80 % Drill Rig Mitigation	7.6	69	5.2	25	6.7	45
Alternative B - Maximum Field Production	7.8	74	5.6	27	7.3	43

<sup>1</sup>  $\Delta dv$  = change in deciview.

**Table 18.32**  
**Summary of Maximum Modeled Total Nitrogen (N) Deposition Impacts (kg/ha-yr) at PSD Class I**  
**and Sensitive PSD Class II Areas from Direct Project and Regional Sources<sup>1</sup>**

Alternative	Bridger Wilderness Class I		Fitzpatrick Wilderness Class I		Grand Teton National Park Class I		Gros Ventre Wilderness Class II		North Absaroka Wilderness Class I	
	Modeled Impact	Total Impact <sup>2</sup>	Modeled Impact	Total Impact <sup>2</sup>	Modeled Impact	Total Impact <sup>3</sup>	Modeled Impact	Total Impact <sup>2</sup>	Modeled Impact	Total Impact <sup>3</sup>
No Action Alternative	0.108	1.528	0.015	1.435	0.031	1.321	0.020	1.440	0.006	1.296
Alternative B	0.101	1.521	0.014	1.434	0.030	1.320	0.018	1.438	0.006	1.296
Alternative C	0.068	1.488	0.010	1.430	0.029	1.319	0.013	1.433	0.005	1.295
Alternative C - 80 % Drill Rig Mitigation	0.033	1.453	0.006	1.426	0.027	1.317	0.008	1.428	0.003	1.293
Alternative B - Maximum Field Production	0.042	1.462	0.007	1.427	0.027	1.317	0.009	1.429	0.003	1.293

Alternative	Popo Agie Wilderness Class II		Teton Wilderness Class I		Washakie Wilderness Class I		Wind River Roadless Area Class II		Yellowstone National Park Class I	
	Modeled Impact	Total Impact <sup>2</sup>	Modeled Impact	Total Impact <sup>3</sup>	Modeled Impact	Total Impact <sup>3</sup>	Modeled Impact	Total Impact <sup>2</sup>	Modeled Impact	Total Impact <sup>3</sup>
No Action Alternative	0.044	1.464	0.007	1.297	0.007	1.297	0.028	1.448	0.005	1.295
Alternative B	0.039	1.459	0.006	1.296	0.007	1.297	0.026	1.446	0.005	1.295
Alternative C	0.028	1.448	0.005	1.295	0.005	1.295	0.019	1.439	0.004	1.294
Alternative C - 80 % Drill Rig Mitigation	0.016	1.436	0.003	1.293	0.003	1.293	0.011	1.431	0.003	1.293
Alternative B - Maximum Field Production	0.019	1.439	0.004	1.294	0.004	1.294	0.013	1.433	0.003	1.293

<sup>1</sup> Nitrogen deposition analysis level of concern for total impacts - 3.00 kg/ha-yr.

<sup>2</sup> Includes N deposition value of 1.42 kg/ha-yr measured at the CASTNET/NADP site near Pinedale for the year 2004.

<sup>3</sup> Includes N deposition value of 1.29 kg/ha-yr measured at the CASTNET/NADP site at Yellowstone National Park for the year 2005.

**Table 18.33  
Summary of Maximum Modeled Total Sulfur (S) Deposition Impacts (kg/ha-yr) at PSD Class I  
and Sensitive PSD Class II Areas from Direct Project and Regional Sources<sup>1</sup>**

Alternative	Bridger Wilderness Class I		Fitzpatrick Wilderness Class I		Grand Teton National Park Class I		Gros Ventre Wilderness Class II		North Absaroka Wilderness Class I	
	Modeled Impact	Total Impact <sup>2</sup>	Modeled Impact	Total Impact <sup>2</sup>	Modeled Impact	Total Impact <sup>3</sup>	Modeled Impact	Total Impact <sup>2</sup>	Modeled Impact	Total Impact <sup>3</sup>
No Action Alternative	0.0037	0.744	0.0007	0.741	0.0004	0.680	0.0008	0.741	0.0003	0.680
Alternative B	0.0039	0.744	0.0008	0.741	0.0004	0.680	0.0008	0.741	0.0003	0.680
Alternative C	0.0101	0.750	0.0017	0.742	0.0008	0.681	0.0016	0.742	0.0006	0.681
Alternative C - 80 % Drill Rig Mitigation	0.0030	0.743	0.0006	0.741	0.0004	0.680	0.0007	0.741	0.0003	0.680
Alternative B - Maximum Field Production	0.0010	0.741	0.0003	0.740	0.0002	0.680	0.0004	0.740	0.0002	0.680

Alternative	Popo Agie Wilderness Class II		Teton Wilderness Class I		Washakie Wilderness Class I		Wind River Roadless Area Class II		Yellowstone National Park Class I	
	Modeled Impact	Total Impact <sup>2</sup>	Modeled Impact	Total Impact <sup>3</sup>	Modeled Impact	Total Impact <sup>3</sup>	Modeled Impact	Total Impact <sup>2</sup>	Modeled Impact	Total Impact <sup>3</sup>
No Action Alternative	0.0021	0.742	0.0004	0.680	0.0004	0.680	0.0013	0.741	0.0003	0.680
Alternative B	0.0022	0.742	0.0004	0.680	0.0004	0.680	0.0013	0.741	0.0003	0.680
Alternative C	0.0050	0.745	0.0007	0.681	0.0008	0.681	0.0030	0.743	0.0005	0.681
Alternative C - 80 % Drill Rig Mitigation	0.0018	0.742	0.0003	0.680	0.0004	0.680	0.0011	0.741	0.0003	0.680
Alternative B - Maximum Field Production	0.0008	0.741	0.0002	0.680	0.0003	0.680	0.0005	0.740	0.0002	0.680

<sup>1</sup> Sulfur deposition analysis level of concern for total impacts = 5.0 kg/ha-yr.

<sup>2</sup> Includes S deposition value of 0.74 kg/ha-yr measured at the CASTNET/NADP site near Pinedale for the year 2004.

<sup>3</sup> Includes S deposition value of 0.68 kg/ha-yr measured at the CASTNET/NADP site at Yellowstone National Park for the year 2005.

**Table 18.34**  
**Summary of Maximum Modeled Change in ANC ( $\mu\text{eq/L}$ ) at Acid Sensitive Lakes from Direct Project and Regional Sources**

Alternative	Black Joe Lake		Deep Lake		Hobbs Lake		Lazy Boy Lake		Lower Saddlebag		Ross Lake		Upper Frozen	
	Bridger Wilderness Class I		Bridger Wilderness Class I		Bridger Wilderness Class I		Bridger Wilderness Class I		Popo Agie Wilderness Class II		Fitzpatrick Wilderness Class I		Bridger Wilderness Class I	
	ANC Change ( $\mu\text{eq/L}$ )	ANC Change (%)	ANC Change ( $\mu\text{eq/L}$ )	ANC Change (%)	ANC Change ( $\mu\text{eq/L}$ )	ANC Change (%)	ANC Change ( $\mu\text{eq/L}$ )	ANC Change (%)	ANC Change ( $\mu\text{eq/L}$ )	ANC Change (%)	ANC Change ( $\mu\text{eq/L}$ )	ANC Change (%)	ANC Change ( $\mu\text{eq/L}$ )	ANC Change (%)
Level of Acceptable Change( $\mu\text{eq/L}$ )	6.71	10%	5.97	10%	6.99	10%	1.00	--	5.52	10%	5.37	10%	1.00	--
Background	67.1	--	59.7	--	69.9	--	10.8	--	55.2	--	53.7	--	6.0	--
No Action Alternative	0.33	0.50%	0.37	0.62%	0.18	0.25%	0.11	--	0.37	0.67%	0.10	0.19%	0.40	--
Alternative B	0.30	0.45%	0.33	0.56%	0.17	0.25%	0.11	--	0.33	0.60%	0.10	0.18%	0.37	--
Alternative C	0.23	0.35%	0.26	0.43%	0.13	0.19%	0.09	--	0.26	0.47%	0.08	0.14%	0.28	--
Alternative C - 80 % Drill Rig Mitigation	0.12	0.18%	0.13	0.22%	0.07	0.10%	0.05	--	0.14	0.25%	0.04	0.08%	0.14	--
Alternative B - Maximum Field Production	0.14	0.20%	0.15	0.25%	0.08	0.11%	0.06	--	0.16	0.29%	0.05	0.09%	0.17	--

<sup>1</sup> USFS Level of Acceptable Change; 10% change in ANC for lakes with ANC background values greater than 25  $\mu\text{eq/L}$ ,  
<sub>1</sub>  $\mu\text{eq/L}$  for lakes with ANC values less than or equal to 25  $\mu\text{eq/L}$ .

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- Environmental Protection Agency. 1993. Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure. Preliminary Review Draft.
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- Environmental Protection Agency. 2007b. Air Toxics Database, Table 1, Prioritized Chronic Dose-Response Values (6/12/2007). Office of Air Quality Planning and Standards. September.

## **APPENDIX 19**

### **Models of Potential Impacts to Groundwater**

## Models of Potential Impacts to Groundwater

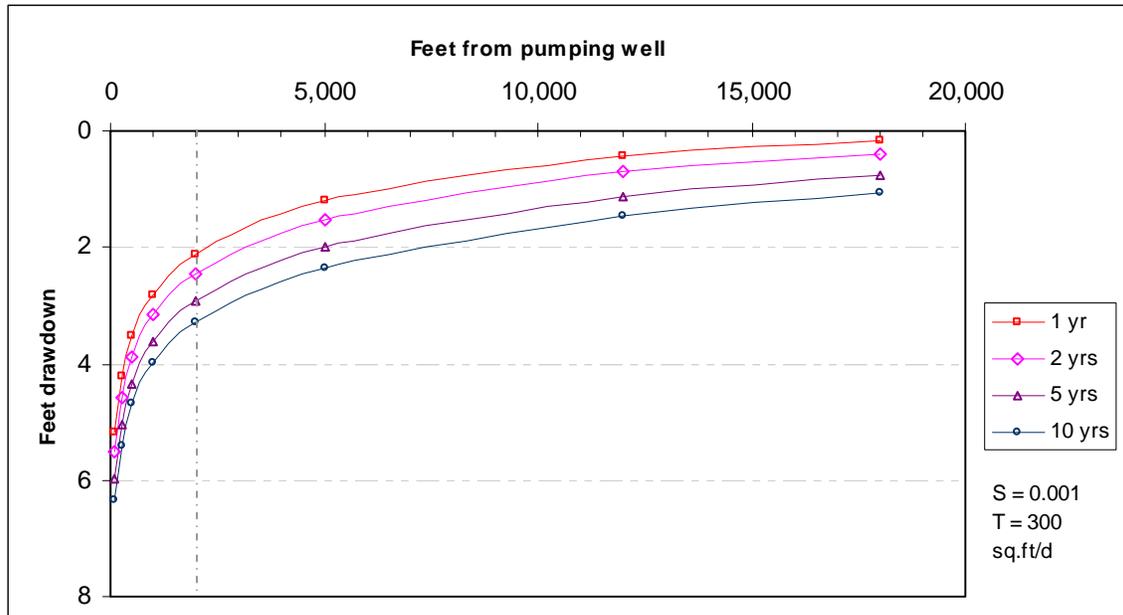
### Prediction of Drawdown

Drawdown impacts in the Wasatch Formation aquifer in the PAPA due to drilling water extractions are modeled for a relatively dense drilling pattern, using very conservative assumptions about aquifer parameters. There is little hydraulic information available for the Wasatch Formation in the PAPA, and drilling locations, extraction rates and such variables are not closely specified, but some bounds may be placed on the extent and amount of drawdown using a semi-analytical method. This consists of developing a theoretical drawdown cone for a single pumping well, summing a number of cones in a section, and sketching the drawdown about a cluster of contiguous sections with active drilling at one time. The particular array of drilling rigs (or water supply usage) is based on a concentrated group of drilling rigs and serves as a representation of a possible concentration of groundwater use.

Sandstones of the Wasatch Formation were laid down by meandering rivers, and represent channel and oxbow fill deposits with some overbank flood sheets. These features are typically narrower than drill hole spacing, and cannot be individually correlated between holes, so that a geological model is statistical rather than precise. This assumes an extensive, uniform aquifer with average hydraulic properties is the most practical approach to predicting drawdown responses to groundwater extractions from the Wasatch Formation, until such times as more intensive data is available and a there is a need for greater local precision. This model may be simplistic but any more sophisticated model would have to be supported by additional data, real or assumed.

The drawdown cone in time for a single Wasatch Formation pumping well (half of it, in cross-section) is shown in Figure 1, with assumed hydraulic parameters noted on the plot. Each curve shows the drawdown in head after steady pumping for a certain time. The basis for the cone is the Theis equation for drawdown at time  $t$  and distance  $r$  due to pumping an extensive, approximately homogeneous aquifer with transmissivity  $T$  and storage coefficient  $S$ . The equation would be mathematically exact if the assumptions held. The Wasatch Formation is believed to have  $T$  between 300 and 2,000 sq.feet/day, and storage coefficient ("storativity") is likely to be between 0.001 and 0.0001. Figure 1 is based on  $T = 300$  and  $S = 0.001$ . Pumping rate is taken to be the higher Proponent estimates of usage, as if steady, namely 10 gallons per minute.

At a radius of 2,000 feet (almost half a section width) from a model pumping well, the drawdown ( $T = 300$ ,  $S = 0.001$ ) is about 2 feet after a year of pumping at 10 gpm, and about 3 feet in 5 years. Adding the effects of more wells scattered in a section multiplies these values by the number of wells; for instance, five wells close together would give an average of 10 feet drawdown at the section boundaries after 1 year, and 15 feet in 5 years; spreading the wells apart spreads the drawdown (flatter and wider cone). Moving the pumping points with gas drilling (that is, pumping new water supply wells at each new well pad) gives periods of respite in which water levels recover somewhat, but if the moves are short in time and distance the averaging approach is approximately valid for a cluster of active sections.



**Figure 1 Analytical model of drawdown in the Wasatch due to pumping a single well**

As an example, a cluster of actively drilling gas pads in one earlier scenario had the number of drilling rigs active by section (~ square mile) as:

4	6	3	2
		1	1

If each of these natural gas rigs steadily used Wasatch Formation groundwater from supply wells located in the same section at 10 gpm per natural gas rig, and stayed within these sections for 5 years, the average drawdown at that time at the section perimeters (in feet), due to just the pumping within the particular section, would be:

12	18	9	6
		3	3

Drawdown at any point can be estimated by summing all the contributions of each pumping well. For instance, the drawdown in the lower left section (0 wells pumping) equals the impacts of pumping of four wells at 1 mile (upper left), six wells at 1.4 miles, three wells at 2.2 miles, 8 wells at 3.2 miles, 4 wells at 2 miles, and 4 wells at 3 miles. Adding all the components of drawdown in each section due to pumping in that section *plus* all the effects of the other wells gives a matrix as below (the six sections with active pumping are outlined in the middle).

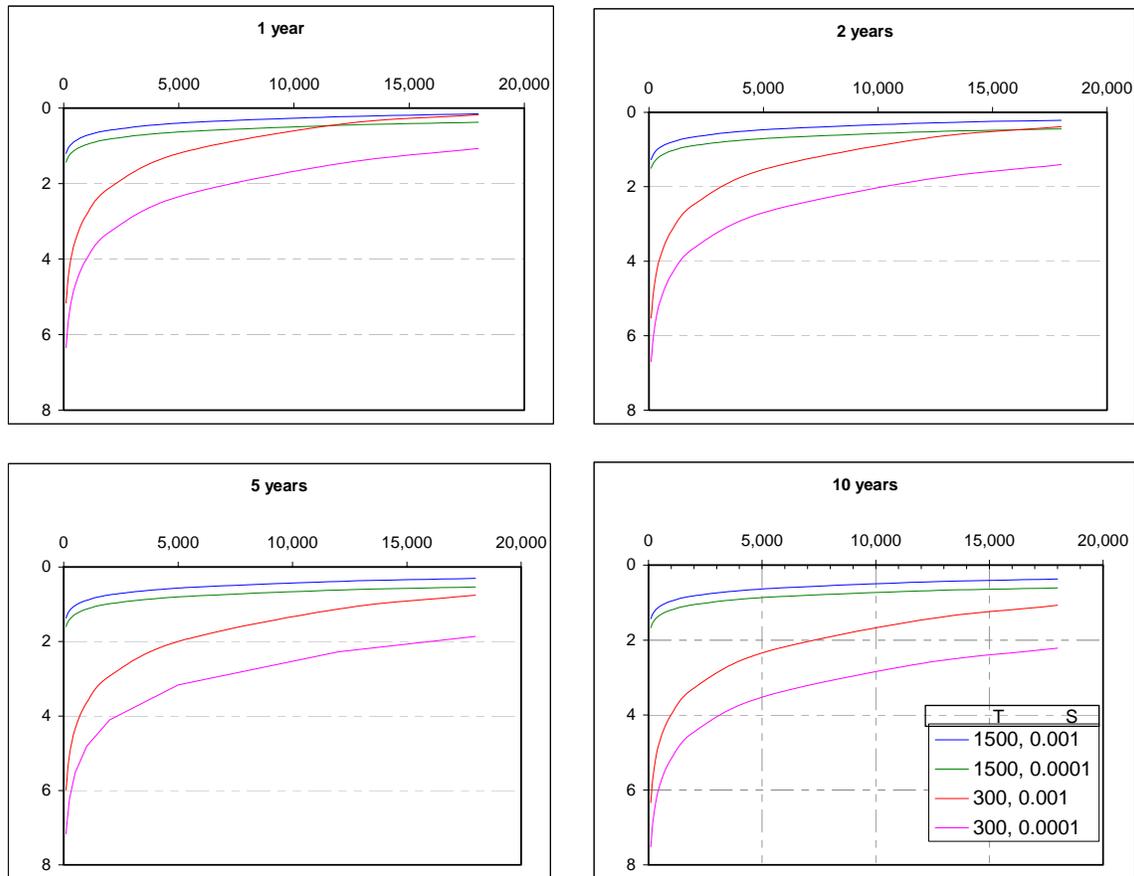
2	2	3	3	4	5	5	5	5	5	4	4	3	2	2	1
2	3	3	4	5	6	7	7	7	7	6	5	4	3	2	2
2	3	4	6	7	8	9	10	10	9	8	7	5	4	3	2
3	4	5	7	9	11	13	14	14	13	11	8	6	5	4	3
3	4	6	8	11	14	18	19	19	17	14	10	8	6	4	3
3	5	7	9	13	18	24	27	26	28	17	12	9	6	4	3
4	5	7	10	14	20	41	52	40	24	17	12	9	6	4	3
3	5	7	9	13	18	24	28	30	25	16	12	8	6	4	3
3	4	6	8	11	15	18	20	19	17	13	10	8	6	4	3
3	4	5	7	9	11	13	14	14	13	11	8	6	5	4	3
2	3	4	6	7	8	10	10	10	9	8	7	5	4	3	2
2	3	3	4	5	6	7	7	7	7	6	5	4	3	2	2
2	2	3	3	4	5	5	5	5	5	4	4	3	2	2	1
1	2	2	2	3	3	4	4	4	3	3	3	2	2	1	1

**Figure 2 Drawdown in Wasatch Formation aquifer after 5 years pumping with 17 natural gas rigs in eight central sections (T 300 sq.feet/d, S 0.001)**  
**Value in square (1-mile section) is the average drawdown (feet) over the section**

The sensitivity of the model to the hydraulic assumptions can be gauged by comparing drawdown cone profiles at different times with ranges of T and S parameters. In Figure 3, profiles are shown for transmissivity 300 and 1,500 sq.feet/day, and storativity 0.001 and 0.0001. Note the drawdown cones in Figure 3 for T 300, S 0.001, which are the basis of the Figure 2 model, are approximately in the middle of the range indicated for the possible parameter values. That is, the Figure 2 model drawdown is about what might be actually expected given reasonable parameter assumptions.

The Fort Union and Wasatch Formation strata are said to achieve a local maximum thickness in the PAPA area (Glover et al., 1996), and to be near 7,000 feet. No estimate of local sand percentages or transmissivities in the Wasatch Formation are available, but a 1,000 feet thickness of sands with hydraulic conductivity 0.3 feet/day would give the 300 sq.feet/day transmissivity assumed in Figure 2. If the Wasatch Formation sands were in fact thicker, coarser grained and more permeable, then transmissivity would be higher and the aquifer would yield more water with less drawdown.

It should be emphasized that this model represents an ideal, extensively continuous aquifer, which the Wasatch Formation aquifer is not. Because sand lenses in the Wasatch Formation are variably linked, sinuous channel deposits, the modeled drawdown is unlikely to be valid more than a mile from a pumped well or cluster of wells (it may be more and it may be less).



**Figure 3 Comparison of drawdown at 1, 2, 5 and 10 years  
for range of transmissivity, storativity**

(as in Figure 1, drawdown is in feet on left axis, and distance from well on the top axis)

This model assumes zero recharge during the period of pumping. If 1 percent of assumed surface infiltration (that is, 0.001 feet/yr) passes through the alluvial cover and reaches the Wasatch Formation, this would yield about 5 acre-feet/yr per section, or 10 bbl/day. This would shrink the drawdown surface in Figure 2 inward, so that the 10-foot contour would be 2 rather than 3 miles from the cluster.

Based on this analysis of potential drawdown impacts:

- up to 3 feet of drawdown may be observed within a distance of a mile of a single water supply well that has been steadily active for 5 years;
- Up to 30 feet drawdown may be observed within a mile of a dense cluster of active gas drilling pads (here, 17 wells in six sections). Greater drawdown may occur within dense pumping well clusters;
- Measurable drawdown (more than 2 feet) around a dense cluster of drilling activity and groundwater extraction could extend approximately 6 miles from the perimeter of the cluster after 5 years of pumping (though the spread of drawdown is limited by imperfect connection between sand lenses);
- Drawdown continues to deepen and spread as long as pumping continues in one place, but pumping points will follow drilling rig movement, and water level recovery begins immediately pumping desists;
- Recovery is expected to be rapid overall, although there will be variability where aquifer sandstones are locally poorly connected. Leakage from shale aquitards

(a completely unknown potential) would hasten recovery. In the analytical model (without leakage), drawdown doubles from 1 to 5 years in active pumping; if pumping ceases at 5 years, recovery is similarly half complete 1 year later, and  $\frac{3}{4}$  complete 5 years after ceasing pumping.

It is emphasized that these predictions of drawdown assume no vertical recharge, and even very small infiltration would substantially reduce these impacts and the recovery time.

Drilling out production zones with produced water reduces the demands on Wasatch Formation water as much as 15 percent overall, which has not been taken into account in this model. The drawdown is a linear function of pumping withdrawals, so that a drawdown predicted at any location with re-use would be potentially 85 percent of that without re-use.

The total water use for drilling by all of the Operators is a small percentage of the water stored in the Wasatch Formation aquifer just beneath the PAPA. Annual usage by Operators is on the order of 100 acre-feet; Wasatch Formation aquifer storage must be in excess of 10,000 acre-feet under the PAPA (200,000 acre area,  $S > 0.0001$ , and initial head  $> 500$  feet above base of aquifer makes storage  $> 10,000$  acre-feet).

A better model of probable hydrologic consequences in the Wasatch Formation aquifer might be constructed in the future, when the formation and its hydraulic properties are better known. BLM may acquire such data in the form of well logs, pumping tests, or overall drawdown observations. BLM will develop the monitoring plan to include acquisition of such data both for purposes of detection and mitigation of potential impacts and for a groundwater model basis. A refined model could allow more accurate prediction of aquifer responses over the life of the project, and assist determination of any necessary mitigation measures through an Adaptive Management approach supporting the SEIS record of decision (ROD) and regulatory constraints.

## Reference

Glover, K., D. Naftz, and L. Martin. 1998. Geohydrology of Tertiary Rocks in the Upper Colorado River Basin in Colorado, Utah, and Wyoming Excluding the San Juan Basin. Water-Resources Investigations Report 96-4105.