

Environmental Assessment Horseshoe Basin 3D Seismic Survey Sweetwater County, Wyoming

October 2008

BLM

Wyoming State Office – Rock Springs Field Office



MISSION STATEMENT

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1.0 PURPOSE AND NEED

This Environmental Assessment (EA) for the Horseshoe Basin 3D Seismic Survey (Horseshoe Basin) has been prepared in compliance with the National Environmental Policy Act (NEPA) and other relevant federal and state laws and regulations. The EA complies with the Bureau of Land Management (BLM) Record of Decision and Green River Resource Management Plan (RMP) (BLM 1997), and the additional documents associated with the RMP. Prior to authorizing seismic operations on BLM-administered lands, the environmental and social effects of those actions must be evaluated on all federal and nonfederal lands within the potentially affected areas. The purpose of this EA is to disclose the direct, indirect, and cumulative effects of the Proposed Action and No Action Alternative. The findings in this EA would be used to determine whether the impacts from the Proposed Action are significant and whether an Environmental Impact Statement (EIS) would be required. If impacts are not significant, as defined in 40 Code of Federal Regulations (CFR) 1508.27, a Decision Record (DR) and Finding of No Significant Impact (FONSI) would be prepared. The DR and FONSI along with the final EA would be available to the public, and a Notice of Availability (NOA) would also be published in the Rock Springs newspaper (Daily Rocket Miner) and Green River newspaper (Green River Star). For this EA, the responsible official is:

Lance Porter, Field Manager
Bureau of Land Management
Rock Springs Field Office
280 Highway 191 North
Rock Springs, Wyoming 82901

1.1 PURPOSE AND NEED FOR PROPOSED ACTION

Exploration and development of federal mineral resources by private entities is an integral part of the Federal Government's national energy policy through the *National Energy Policy Act of 2005*, which implements policy for "dependable, affordable, and environmentally sound production and distribution of energy." BLM is authorized to lease the federal lands for oil and gas development under the authority of the *Mineral Leasing Act of 1920*, as amended; the *Mining and Minerals Policy Act of 1970*; the *Federal Land Policy and Management Act of 1976* (FLPMA); the *National Materials and Minerals Policy, Research and Development Act of 1980*; and the *Federal Onshore Oil and Gas Leasing Reform Act of 1987*. The BLM is authorized to approve geophysical surveys on BLM-administered public lands pursuant to the Mineral Leasing Act, as amended, and the 43 CFR 3150. Other relevant guidance includes the BLM Handbook H-3150 (Rel. 3-289 6/7/94).

The purpose of the Horseshoe Basin 3D Seismic EA (Proposed Project) is to authorize Devon Energy Production Company, L.P. (Devon) to conduct a 3D seismic survey in the proposed Project Area to determine the potential presence of oil and gas in the underlying stratigraphic and structurally complex subsurface strata. Geophysical exploration utilizing 3D seismic techniques is capable of locating subsurface reservoirs which potentially contain hydrocarbons. The project need is because Devon has filed a *Notice of Intent (NOI) to Conduct Oil and Gas Geophysical Exploration Operations* on federal lands managed by the BLM. Through submission of the NOI, Devon requested authorization to conduct seismic exploration operations on federal lands.

SECTION 1: PURPOSE AND NEED

1.2 CONFORMANCE WITH LAND USE PLANS

The Rock Springs Field Office (RSFO), as required by 43 CFR 1610.5, has determined that the Proposed Project conforms to the decisions, guidelines, and terms and conditions in the Record of Decision of the Green River Resource Management Plan (BLM 1997).

1.3 RELATIONSHIP TO STATUTES, REGULATIONS, OR OTHER PLANS

The BLM, as mandated by NEPA and the Council for Environmental Quality (CEQ) regulations, analyzes actions involving federal lands to determine their impact on the human environment (40 CFR 1500-1508). Prior to issuing a decision on the Proposed Action, the BLM must comply with NEPA, which requires federal agencies to use a systematic, interdisciplinary approach in planning and decision making. NEPA also directs that an environmental analysis of proposed federal actions must be completed to determine the potential effects of the federal action on the human environment. The analysis is to determine whether approval of the Proposed Action would cause “significant” impacts to the human environment.

Authority for conducting geophysical surveys on BLM-administered public lands is contained in the Mineral Leasing Act of February 25, 1920, as amended, and 43 CFR 3150. Other relevant guidance includes the BLM Handbook H-3150 (Rel. 3-289 6/7/94 BLM 2008a).

The Proposed Project has been evaluated in accordance with requirements of *Onshore Oil and Gas Operations* (43 CFR 3160), *Onshore Oil and Gas Order Nos. 1 through 7* (43 CFR 3164), NEPA and the Council on Environmental Quality (CEQ) regulations implementing NEPA (40 CFR 1500-1508), and the BLM Handbook H-1790 (Rel. 1-1710 01/30/2008).

1.4 SCOPING

The RSFO published a Notice of Intent (NOI) to prepare the Horseshoe Basin 3D Seismic EA and a scoping notice (Appendix B), with a 30-day scoping period that began on August 15, 2008, and ended on September 15, 2008. The NOI required by 43 CFR 3151 is the regulatory procedure that allows for geophysical surveys on federal lands.

During the comment period a total of 10 letters were received, which included a total of 40 individual comments on various issues.

1.5 ISSUES

Public scoping is an important component of NEPA and is used to identify the key issues related to the Proposed Action. It also serves to establish the level and scope of the analysis to comply with NEPA and the Council of Environmental Quality (CEQ) regulations.

Representatives from State and Federal agencies and the public were encouraged to participate in the scoping process to help identify the analysis needed for the proposed Horseshoe Basin 3D Seismic Survey, alternatives to the Proposed Action, mitigation measures, conditions of approval, and any other suggestions to ensure the completeness of the analysis process.

Comments to the proposed Horseshoe 3D seismic project were made by the Oregon-California Trails Association, Wyoming Department of Transportation (WYDOT), Wyoming Game and Fish Department (WGFD), Sweetwater County Conservation District, Wyoming Wildlife

Federation, Trout Unlimited, and seven private citizens concerned about impacts of project activities. A summary of the comments and responses prepared by the BLM are provided in Appendix C. A summary of the key issues of concern that were stated in the comments and at a project kickoff meeting held on July 17, 2008, between BLM, WGFD, and the project proponent are provided below.

Issue 1 – Big Game Hunting

Impacts from the proposed seismic survey to big game hunting, and impacts from helicopters and noise are of particular concern. Game hunting is a major recreational activity in this part of Wyoming for both residents and out-of-state visitors. Hunting in the Pine Mountain and Horseshoe Basin area, one of Wyoming's premier hunting areas for elk, mule deer, and pronghorn antelope (pronghorn) is considered important. The area is known to contain trophy bull elk and buck deer. Seismic surveys during the hunting season could reduce the recreational opportunity.

Issue 2 – Water Resources

The area of the proposed seismic project is an important aquifer recharge area, which plays a significant role in the groundwater found in the area. In addition, the area contains numerous springs and seeps, as well as ephemeral streams that feed into the nearby creeks supporting downstream areas. Concerns include how the proposed seismic operations would adversely affect the seeps and springs in the area, and reduce the water quality for downstream wildlife, fisheries, and grazing resources. Concern was also expressed that a 1,320-foot buffer around springs would not provide adequate protection to springs and seeps. Additional concerns were expressed about the need to protect riparian areas and area streams.

Issue 3 – Wildlife and Special Status Species

Many wildlife species breed in the area, depend on the area as crucial winter habitat, and forage and nest in the area in the spring, summer, and fall. Some of the wildlife issues raised are summarized below.

Species of Greatest Conservation Need

The proposed Project Area is suitable habitat for 45 wildlife species (28 mammals, eight birds, five reptiles, and four amphibians) identified in Wyoming's Comprehensive Wildlife Conservation Strategy as species of greatest conservation need (WGFD 2005a, WYNDD 2008). Of these, 19 species have BLM sensitive species status (see Table 3-7).

Other Special Status Species

The pygmy rabbit and greater sage-grouse occur in this area. These species are also being considered for listing under the Endangered Species Act. The need for mitigation measures to protect the pygmy rabbit and greater sage-grouse was raised as necessary to protect these and other wildlife species. The federally endangered black-footed ferret may also be present in Sweetwater County due to the presence of white-tailed prairie dog colonies in the proposed Project Area.

SECTION 1: PURPOSE AND NEED

Big Game

Much of the proposed Horseshoe Basin 3D seismic survey area is elk crucial winter range and mule deer winter range. The area is also important pronghorn spring, summer, and fall range, and the eastern one-third of the proposed Project Area is in pronghorn crucial winter range. The Wyoming Game and Fish Department (WGFD) expressed concern that these important big game winter ranges and other year-round ranges would be negatively impacted by the seismic project. The WGFD also expressed concern about the disturbance that helicopters and seismic shots will have on big game health and hunting.

Issue 4 – Pine Mountain Area

The Pine Mountain area, west of the proposed Project Area, is viewed as a unique habitat. It is an area rich in terrestrial species, and also serves as a rare depository for alpine ecosystems, which should not be disturbed. Pine Mountain is the headwaters to numerous area streams, including Vermillion Creek, which historically supported a population of the federally endangered Colorado cutthroat trout. The area is also the source of groundwater that feeds the springs and seeps that are used by area livestock and wildlife. Since the proposed Project Area is in a groundwater recharge area, there is a high level of concern that detonation of charges could fracture groundwater resources and lead to loss of surface water and groundwater.

Pine Mountain is also a popular elk and mule deer hunting area in Wyoming for both resident and non-resident hunters due to the high hunting success rate and difficulty of obtaining a limited quota license.

Issue 5 – Conformance with the Green River RMP

Several commenters felt that the proposed Horseshoe Basin 3D seismic survey project was not in conformance with the management objectives in the BLM Green River Resource Management Plan (BLM 1997). Specifically, the commenters indicated that that by allowing oil and gas development and seismic operations, the BLM is not in accordance with the commitments made in the RMP to protect other important resources.

Issue 6 – Noise from Helicopters, Shot-hole Drilling and Detonation of Charges

Noise from the helicopters, shot hole drilling, and detonation of charges was identified as a major issue resulting in impacts to wildlife and recreational activities, especially hunting, which would occur while the proposed seismic operations were underway.

The WGFD indicated that noise from helicopters will displace elk, mule deer, and pronghorn from the area and have an impact on the hunting season.

Issue 7 – Road Use

WGFD, several private individuals, and the BLM stated that the seismic survey would need to be confined to existing roads and two-track roads. WGFD and BLM expressed this concern based on experience that any vehicular traffic off roads would result in creation of an “established road,” which would be continued to be used and result in degradation of wildlife habitat and other resources. Any ruts that are caused by Devon’s use of the roads should be required to be repaired by the company. BLM staff also expressed concern that use of the area roads and two-tracks could lead to resource damage such as stream degradation at road crossings.

Issue 8 – Invasive Nonnative Species

BLM and two commenters expressed concern about the project becoming a vector for invasive weeds. BLM stated that Devon would need to ensure compliance with established requirements and procedures to adhere to invasive nonnative species prevention and control. In particular, cheatgrass is well established throughout the proposed Project Area and it is detrimental to wildlife and other resources.

2.0 PROPOSED ACTION AND ALTERNATIVES

This section describes the Proposed Action and No Action Alternative that are analyzed as part of the Horseshoe Basin 3D Seismic EA.

2.1 BACKGROUND ON SEISMIC EXPLORATION

Seismic surveys are used to map the subsurface structure of rock formations. Seismic technology is used by geologists and geophysicists who interpret the data to map structural traps that could potentially contain hydrocarbons. Seismic exploration is the primary method of exploring for hydrocarbon deposits. Although the technology of exploration activities has improved substantially in the past 20 years, the basic principles for acquiring seismic data have remained the same (Natural Gas 2008).

The general principle of seismic surveys is to send sound energy waves into the Earth, where the different layers within the Earth's crust reflect back this energy. These reflected energy waves are recorded over a predetermined time period (called the record length) by using geophones. The reflected signals are transferred to a storage medium, which is usually magnetic tape. Once the data are recorded, they are processed using specialized software which will result in a series of seismic profiles. These profiles or data sets are then interpreted for possible hydrocarbon reserves (Natural Gas 2008).

2.2 PROPOSED ACTION

Devon Energy Production Company LP (Devon) notified the Bureau of Land Management (BLM) Rock Springs Field Office (RSFO) that it plans to conduct a 3D seismic survey in T. 13 N., R. 101 W.; T. 12 N., R. 101 W.; T. 13 N., R. 102 W.; and T. 13 N., R. 102 W. in Sweetwater County, Wyoming, approximately 45 miles south of Rock Springs (Appendix A, Figure 2-1). The Proposed Action would occur in the southwestern quarter of the Vermillion Basin, which includes the northwestern corner of Colorado and southwestern Wyoming, south of the Green River Basin (Appendix A, Figure 2-1).

The boundary of the proposed survey area encompasses 24.95 square miles, of which 23.56 square miles is BLM-administered land (95 percent), 0.07 square miles is State land (0.01 percent), and 1.32 square miles is private land (5 percent) (Table 2-1; Appendix A, Figure 2-1). Permits needed to carry out seismic operations on private lands would be acquired before the proposed project begins. Total surface disturbance would be approximately 87.8 acres (see Section 2.2.2 for project details and Table 2-4). The surface disturbance is temporary in nature, with majority of the disturbance limited to minor soil compaction and vegetation trampling during shot hole drilling. Disturbance would be limited to a three-foot radius around a three- to four-inch diameter shot hole and reclaimed following the completion of seismic recording.

In order to reduce potential surface impacts, the seismic survey will be conducted using helicopter drilling methods to prepare shot holes that will be filled with a 10-lb. dynamite charge detonated 40 feet below the ground surface. Light trucks would be used, where necessary, to transport personnel and equipment to the proposed various sites within the proposed Project Area, but would only utilize existing access routes for which a cultural clearance survey has been

SECTION 2: PROPOSED ACTION AND ALTERNATIVES

Table 2-1. Project Area Surface Ownership

Surface Ownership	Sq Miles	Acres	Percentage of Program
Bureau of Land Management	23.56	15,078.4	94.71
State	0.07	44.8	0.01
Private	1.32	844.8	5.2
Total	24.95	15,968.0	100.00

conducted and approved by BLM. In addition, all terrain vehicles (ATVs), or other similar mechanized vehicles may transport personnel and equipment on the BLM-approved routes, which include existing two-track and improved roads. No mechanized vehicles would be operated during periods of saturated soil conditions, when surface ruts greater than 4 inches could occur. Field operations would be conducted from one of the proposed staging areas located in the SW $\frac{1}{4}$ of Section 5, T. 12 N., R. 102 W. and SE $\frac{1}{4}$ of Section 4, T. 12 N., R. 102 W. (Figure 2-1).

Activities at the staging area would include offloading or loading of equipment from tractor trailer units, transfer of equipment to and from light trucks and helicopter(s), temporary storage of equipment, battery charging from several light trailers, minor equipment repairs, and logistical coordination. The staging area would also be used to store fuel, lubricants, explosives, and other necessary supplies (in BLM-approved storage facilities). In addition, the staging area can be used as a muster point should it be necessary to implement the Devon Emergency Response Plan. Based on current planning, the seismic survey would begin in the southwest corner of the proposed Project Area and follow the seismic lines in a west to east pattern. The survey program would generally progress north and easterly towards the east side of the proposed Project Area.

The Horseshoe Basin 3D seismic survey could begin sometime in early October 2008 if a FONSI and Decision Record are signed by the BLM RSFO Field Manager. The project would continue until sunset on November 14, 2008, the date that big game crucial winter stipulations take effect (Table 2-2). The portion of the seismic survey not completed by sunset November 14, 2008 could be reinitiated after April 30, 2009, when restrictions on activities within crucial winter range end (Table 2-2). However, should Devon request an exemption to other wildlife stipulations in effect until July 31, 2009 (Table 2-2), the BLM would consult with the Wyoming Game and Fish Department (WGFD) before authorizing such actions.

Devon and its contractors would comply with all Federal, State, and local laws and regulations. As required by NEPA, Devon and the RSFO will agree upon Applicant-Committed Environmental Protection Measures and Conditions of Approval for the proposed project.

SECTION 2: PROPOSED ACTION AND ALTERNATIVES

Table 2-2. Land Use Restrictions and Buffers for the Horseshoe Basin 3D Seismic Survey Project Area

Affected Areas/Resources	Restriction	Restricted Area
Big Game Crucial Winter Ranges	Nov. 15 - April 30	Antelope, elk, moose, and mule deer crucial winter ranges
Greater Sage-Grouse Leks	Mar. 1 - May 15	Within one-quarter mile radius of lek
Sage-Grouse Nesting Areas	Mar. 15 - July 15	Up to 2-mile radius of nesting area
Golden Eagle Nest	Feb. 1 - July 31	Within one mile radius
Swainson's Hawk Nest	Feb. 1 - July 31	Within one-half mile radius
Ferruginous Hawk Nest	Feb. 1 - July 31	Within one mile radius
Coopers Hawk Nest	Feb. 1 - July 31	Within one-half mile radius
Burrowing Owl Nest	Feb. 1 - July 31	Within one-half mile radius
Merlin Nest	Feb. 1 - July 31	Within one-half mile radius
Other Raptors	Feb. 1 - July 31	Within one-half mile radius
Historic Trails	Year-round	Within one-quarter mile radius of trail (Exceptions allowed with site-specific analyses)

Source: Green River RMP (BLM 1997).

2.2.1 Management Objectives

Federal lands within the proposed Project Area are administered by the BLM under the Green River RMP (BLM 1997). State of Wyoming and private lands are not managed under the RMP; however, analysis of the environmental impacts to these lands is included in this EA. Regulations governing State and private lands are under the Wyoming Oil and Gas Conservation Commission (WOGCC) and other local, state, and federal regulations.

According to the RMP, the proposed Project Area is within the Pine Mountain Management Area (PMMA) and is managed as a geographic management unit; that is, the area is managed to ensure the combination of resource values in the unit are adequately maintained (BLM 1997). The PMMA is an area of hydrologic concern due to its high value as an aquifer recharge zone. Because protection of surface and groundwater quality is a high priority, the PMMA is managed as an avoidance area for rights-of-way and surface-disturbing activities. According to the Green River RMP, the management objectives for the area are to:

- 1) Improve watershed condition and enhance watershed values;
- 2) Improve riparian areas to proper functioning condition, as a minimum;
- 3) Provide opportunities for dispersed recreation uses in the area consistent with the primary watershed, riparian, and wildlife objectives;
- 4) Maintain and protect important wildlife habitat, especially raptor habitat; and
- 5) Reduce erosion.

SECTION 2: PROPOSED ACTION AND ALTERNATIVES

Restrictions on surface disturbing activities for protection of raptors, big game crucial winter range areas, and historic trails apply (Table 2-2).

The proposed Project Area is also open to mineral leasing as well as related exploration and development activities with the application of appropriate mitigation requirements to protect resource values, provided that such mineral-related activities are consistent with other resource uses and protection (BLM 1997). The PMMA is open to consideration of geophysical activities, except where off-road vehicle use or explosive charges would cause unacceptable impacts. Geophysical activities are required to conform to the off-highway vehicle (OHV) management prescriptions for the planning area (BLM 1997). Controls may be placed on the amount, sequence, timing, or level of activity or development that may occur to assure that the actions will be consistent with or help to meet the management objectives for the area. This may result in such things as limiting the number of roads and other construction or other surface-disturbing activities or deferring activities or development in some areas until other areas have been reclaimed and restored to previous uses (BLM 1997).

2.2.2 Project Operations

2.2.2.1 Overview

This project is divided into four activity segments as outlined below. Timelines are tentative at this time due to uncertainty of weather conditions. A detailed schedule will be provided as early as possible, but prior to any field activities. Table 2-3 provides an overview of operations as provided by Devon.

Table 2-3. Overview of the Horseshoe Basin 3D Seismic Survey Project Operations

Activity	Scope	Critical Steps	People Involved
Archaeological / Wildlife Surveys / Permitting	<ul style="list-style-type: none"> - Survey proceeds under Casual Use definition with consultation from BLM. - Survey source points (shot holes) with GPS. Walk only off -road. - Mark points with two-foot lathe or 2x2 hub, and flagging. - Access roads and staging areas require cultural Class III survey in undisturbed areas. - Archaeological inspection, walk only off- road. - Archaeological report to BLM. - Surface and mineral permitting of non-Federal lands. - Habitat assessment and field surveys for pygmy rabbit, white-tailed prairie dog, raptors, and sage-grouse. - Habitat assessment for sensitive plant species. 	<ul style="list-style-type: none"> - Start survey work in mid July 2008, approximately 30 days to complete. - Archaeological survey start soon after geophysical location survey. - Permitting ongoing, as required. - Biological and wildlife surveys begin prior to start of disturbance activities. 	<ul style="list-style-type: none"> - 10 survey crew members located in Rock Springs. - Approximately 4-6 archaeological personnel. - Approximately 4-5 qualified environmentally qualified personnel.

SECTION 2: PROPOSED ACTION AND ALTERNATIVES

Activity	Scope	Critical Steps	People Involved
Resurvey / Shot Hole Drilling	<ul style="list-style-type: none"> - Resurvey of source points, as needed. - Survey receiver locations. - Locate and monitor explosive magazine site. - Heli-portable drilling of all source points using heli-portable recording procedures. 	<ul style="list-style-type: none"> - Resurvey and refresh commences continuing through mid September 2008. - Access road and post plot mapping ongoing. - Explosive magazine arrives on site early October 2008. - Heli-portable drills arrives, start as soon as practical in mid September 2008. 	<ul style="list-style-type: none"> - 6 to 8-person survey crew using GPS. - Approximately 25 people working on drill crews, based in Rock Springs.
Recording	<ul style="list-style-type: none"> - Starting from west side using heli-portable recording procedures. - Place geophones, cabling and ancillary equipment necessary to record seismic data. - Detonate pre-drilled shot holes. 	<ul style="list-style-type: none"> - Start laying cable when drills are 80% complete. - Continue cable pick-up, lay out and detonation until project completed approximately in mid November 2008. 	<ul style="list-style-type: none"> - Approximately 45 people working on recording crew, based in Rock Springs.
Reclamation	<ul style="list-style-type: none"> - Travel each source and receiver line in teams of two on foot. - Pick up and dispose of all trash, survey flagging, wire and man-made debris. - Return staging areas and roads to same condition as found. 	<ul style="list-style-type: none"> - As soon as reasonably practical, after recording operations have completed segments of the survey. - Continue through recording operation. - Repairs to staging areas / roads, as needed. - This activity can be conducted in a low-impact manner with limited or no helicopter support. 	<ul style="list-style-type: none"> - Approximately 6 people assigned to reclamation / clean up.

Source: Devon Plan of Action for Seismic Exploration, Horseshoe Basin 3D Seismic Survey 2008.

Table 2-4 provides quantitative estimates of the seismic survey layout parameters and estimated potential disturbance for each parameter. Because this project would be conducted using only heli-portable procedures, potential surface disturbance for placement of source and receiver lines would be approximately 66.7 acres. A single main staging area would require about 10 acres, and an additional 10.0 acres may be required for a back-up staging area. Shot hole drilling and reclamation would disturb an approximately three-foot wide radius and drilling 1,644 shot holes would result in 1.1 acres total disturbance. Total surface disturbance would be approximately 87.8 acres. The surface disturbance would be temporary in nature, with majority of the disturbance limited to minor soil compaction and vegetation trampling.

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Table 2-4. Layout Parameters and Estimated Potential Disturbance for the Horseshoe Basin 3D Seismic Survey Project

Layout Parameters	Value	Estimated Potential Disturbance (acres)
Source Line Spacing	1,760 feet	--
Total Source Line Length	60.4 miles	22.0
Total Number Source Lines	14	--
Average Source Line width	3 feet	--
Receiver Line Spacing	1,320 feet	--
Total Receiver Line Length	123 miles	44.7
Total Number Receiver Lines	25	--
Average Receiver Line Width	3 feet	--
Shot Hole Depth	40 feet	--
Shot Hole Radius (Estimated)	3 feet	--
Source Point Interval	220 feet	--
Total Source Points	1,644	1.1
Density per Square Mile	66.4	--
Receiver Point Interval	220 feet	--
Total Receiver Points	2,483	--
Density per Square Mile	100.3	--
Explosives per hole	10 pounds	--
Staging Areas (1 Main, 1 Back-up)	20 acres	20.0
Total Potential Surface Disturbance		87.8

Source: Devon Plan of Action for Seismic Exploration, Horseshoe Basin 3D Seismic Survey 2008.

2.2.2.2 Source Point Survey

The ideal location of shot hole source points and geophone receiver points would be determined prior to the initiation of the seismic survey. An initial set of coordinates based on a seismic survey grid system and known restrictions (pre-plot coordinates) were stored in GPS units. Using the GPS unit and the stored pre-plot source point coordinates; a survey team would walk to each source point (approximately 220 feet apart). When the location of the GPS data matches the pre-plot coordinates stored in the GPS unit, the source point would be marked on the ground with a wooden hub and/or surveyor's flags. Adjustments to the source points would be made in the field and those points would then be updated on the GPS unit (post-plot coordinates).

Truck or ATV traffic would not be allowed off existing two-tracks or improved roads. In very hilly or remote terrain personnel and equipment may be shuttled with the helicopter. All personnel would carry handheld radios and, if required, survival packs in remote areas.

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The survey team would also set up temporary towers with radio transmitters at several locations throughout the proposed Project Area (usually on hilltops). These mobile, trailer-mounted towers are used to transmit GPS corrections necessary for real-time, high accuracy positioning. It may be necessary to move the source point (e.g., terrain too steep to safely land the helicopter). In these cases, source points may be moved as much as 1,000 feet to a more suitable location.

During source point layout, GPS operators would make sketches of obstacles, hazards, archaeological sites, and exclusion zones. This “hazard” map would contain the entire post-plot locations of the source and receiver points surveyed. This information would be used by the crew and forwarded to the BLM.

2.2.2.3 Resurvey

Using methods and procedures outlined in 2.2.2.2, a resurvey may be necessary to replace hubs and/or lathes and markers previously established for the archaeological field survey that are destroyed by wind, wildlife, or livestock.

The survey crew would concentrate on the resurvey of source points to enable uninterrupted progress of seismic operations. When source points are complete, layout of geophone receiver points would begin. Source and receiver points would be marked with lathe, flagging, and a one-foot diameter spray paint mark.

2.2.2.4 Shot Hole Drilling

Shot holes would be drilled using heli-portable drilling equipment (Figure 2-2). Shot holes would not be drilled in any established setback areas from critical resources (Table 2-2 and Table 2-5). A ground-based drilling coordinator, operating on foot, would locate the surveyed shot hole location. The coordinator would then direct the helicopter via VHF radio communication to set the drill on the location. Up to 10 drills could be utilized concurrently using this program. The drill is operated by a driller and drill helper. Drilling activities would take place only during daylight hours. The seismic equipment consists of a drill unit and a compressor unit, each weighing approximately 1,600 pounds. All industry safety requirements would be followed. All drill rigs are audited prior to commencement of drilling, and a daily inspection of each unit is documented. Each unit is transported from one source point to the next one by a Bell 205 “Huey”, or equivalent helicopter. The drill and compressor units are connected using “quick connect” air and hydraulic fittings. Drill cuttings from the hole are brought to the surface using compressed air.

Upon completion of the approximate 40-foot deep shot hole, 10 pounds of explosives are loaded into the hole. Approximately 40 feet of the shot hole is then back-filled with cuttings. A plastic hole plug is then installed and approximately 10 feet of bentonite clay is placed in the hole. Another plastic hole plug is placed at the surface. Figure 2-3 shows the placement of the explosives, cuttings, and bentonite in the shot hole.

Access to shot holes in sensitive areas would be evaluated by the BLM before they are drilled. Explosive storage and staging areas would be located on private or state land. If no suitable sites are found on these lands, the BLM would be contacted for possible locations on federal lands.

Prior to deployment on the proposed Project Area, equipment would be power-washed to prevent spread of noxious weeds.

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Maps and GPS coordinates of sensitive resources would be provided to the field crews. All established avoidance areas and required setback requirements would be followed (Table 2-2 and Table 2-5).

Figure 2-2. Typical helicopter portable drill rig (Devon 2008)

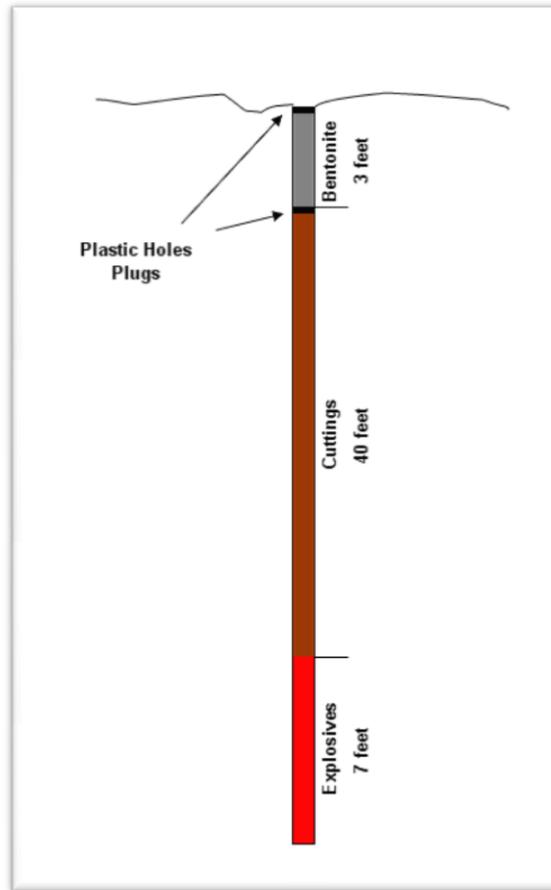


Table 2-5. Shot Hole Setback Distances for Sensitive Resources¹

Sensitive Resource	Setback Distance
Springs	1,320 feet (1/4 mile)
Riparian Areas (lentic and lotic)	500 feet
Ephemeral Channels	100 feet
Stock pipeline (<3" in diameter)	250 feet
Pygmy Rabbit Burrows	200 feet
Archeological Sites	100 feet
Slopes greater than 25%	Drilling not allowed
State and County Road ROW	100 feet

¹See Table 2-2 for other buffers and timing restrictions.

Figure 2-3. Typical shot hole cross-section (Devon 2008)



2.2.2.5 Detonation and Recording

The seismic survey would utilize helicopter and ATV support for moving recording equipment. Helicopters would utilize navigational devices, which allow for accurate deployment of recording equipment regardless of ground cover. Post-plot coordinates generated by the survey crew are uploaded into the navigation device. The accuracies are within a few square feet. The crew may utilize ATVs on pre-approved access routes to assist in troubleshooting recording equipment and move personnel. The crew would be provided with updated hazard maps showing approved drive routes and areas of avoidance. They would also receive this information at the initial meeting prior to entry into the field.

During the recording phase, a minimum of 25 lines of recording equipment would be active at any given time. The “spread” (area occupied by live recording equipment) would encompass approximately 25 square miles. The parallel receiver lines are 1,320 feet apart with 220-foot intervals between receiver points. The parallel source lines are 1,760 feet apart with 220-foot intervals between source points. Source lines run east-west while receiver lines run north-south (Appendix A, Figure 2-1). The seismic survey data would be recorded in a sequential manner.

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The design of this 3D grid has the survey starting in the southwest corner and would proceed north-easterly.

Two-man teams of “shooters” would move down the source lines detonating the charges. There may be as many as five of these teams spread out on the active spread. Actual detonation of the charges is controlled by the observer in the recording shack or vehicle. This procedure is completed prior to any detonation to ensure worker safety. Depending upon site-specific conditions, this process can take up to ten minutes between detonations or occur as frequently as every two to three minutes. Conditions which may prevent the recording crew from recording the data are lightening; strong winds; animals chewing on the recording equipment; cattle, horses, or human vandalism disrupting the geophones; or surface noise created by vehicles or other industrial equipment.

2.2.2.6 Staging Area

Two 10-acre staging areas have been designated for the seismic survey; one staging area will serve as a back-up staging area and would only be utilized, if necessary (see Section 2.2). The staging area, including a helicopter landing area, would be utilized to bag and prepare equipment to be transported by helicopter. Crew vehicles may be parked at the staging area as well as several 45-foot trailers. Mini helicopter landing zones may be utilized in some remote areas to reduce helicopter flight time and speed up the progress of the seismic program. An equipment truck may transport bagged equipment to a specific area utilizing existing two-tracks or improved roads, where the helicopter utilizing a long-line would pick up equipment and fly it to nearby receiver lines. The staging areas have been approved by the BLM Authorized Officer and have been surveyed for archaeological resources.

A crew of approximately 45 people would perform operations. Crews would operate seven days a week during the recording phase until sunset on November 14, 2008, at which time all seismic survey-related activities would be discontinued, in accordance with an agreement with the BLM and State agencies. The total field portion of the proposed project is expected to take a minimum of 45 days, and BLM may consider a short extension of the seismic survey activities beyond November 14, if favorable weather conditions allow and conflicts with big game crucial winter range can be avoided. The replacement of defective equipment would be completed by the crew on foot. The majority of crew would stay in motels in Rock Springs and would be transported by bus to the staging area in the morning following a safety and briefing meeting.

2.2.2.7 Safety

All contractors must adhere to Devon’s comprehensive Geophysical Safety Guidelines policy. The contractor’s corporate safety manual also addresses potential safety issues. Devon has a dedicated Geophysical Safety Coordinator who works closely with contractors to ensure compliance with all safety rules and regulations. Daily safety meetings are held with all contractors and documented. Devon and its contractors would have firefighting equipment on hand at various locations throughout the proposed Project Area. Helicopter “Bambi Buckets,” used to help control accidental fires, would be placed in the staging area to allow for rapid deployment. Water source areas would be identified prior to start-up of recording or drilling operations. Fire drills would be conducted on a regular basis.

Safe handling, transportation, and storage of explosives are of primary importance. These activities are strictly regulated by policies and procedures of several federal agencies.

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Explosives would be transported in industry standard portable magazines. Explosives would be handheld under the care and control of personnel possessing a federally approved explosives handling license. Storage of explosives would be in an approved magazine, temporarily established near or within the proposed Project Area. The magazine would be accessible by truck and under the care and control of licensed personnel. Explosives not loaded into a shot hole must be returned to the central magazine each night and logged. A strict inventory is maintained.

An Emergency Response Plan (ERP) would be created prior to the initiation of the seismic survey. In the unlikely event of a medical evacuation, the ERP would be implemented. The ERP would be provided prior to BLM approval and authorization of project activities.

If additional security is warranted, Devon would provide the necessary personnel to secure the proposed Project Area.

2.2.2.8 Reclamation

Project reclamation would proceed concurrently with seismic survey operations. All pin flags, flagging, stakes, and any other material associated with the project left on the surface would be collected as the seismic operations progress. Reclamation measures would be undertaken as soon as possible to restore areas as close to their original condition as possible. At the completion of the seismic survey, a final inspection would be conducted by the BLM Authorized Officer (AO). Additional reclamation would be carried out, if required by the BLM AO.

Drill cuttings would be spread over a radius of approximately three feet around the shot hole. The shot hole would not exceed a diameter of two inches and would be backfilled with soil and cuttings, and contoured to the approximate topography of the area. The shot holes are expected to recover without additional reclamation, with the goal of returning to pre-disturbance conditions within one or two growing seasons. Compacted native vegetation is expected to recover within one growing season, and would not likely require any additional reclamation.

Reclamation planned for the staging area, if necessary, would include planting certified and BLM-approved weed-free native seed. In the event that rutting of roads or two-tracks occurs, the ruts would be repaired by the crew. Damage to roads and two-tracks would be documented and reported to the BLM AO. Reclamation would, to the extent possible, restore the area to as close to its original condition as possible.

2.2.2.9 Solid Waste Management and Sanitation

Self-contained, chemical portable toilets would be provided at the staging areas for human waste disposal. The toilet holding tanks would be pumped out, as needed, and the contents disposed of in the nearest BLM-approved sewage disposal facility.

Garbage, trash, and other non-flammable waste materials would be collected and disposed of at an approved sanitary landfill. Trash would not be burned or buried on location.

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2.2.2.10 Spill Response

If spills of diesel fuel or other hazardous fluids occur during the seismic operations, Devon or their contractors would immediately begin cleanup operations and contact the BLM and other regulatory agencies (e.g., EPA National Response Center, State of Wyoming), as required. Devon would maintain on site Material Safety Data Sheets (MSDS) for all chemicals used during seismic operations, in accordance with 29 CFR 1910.1200(g).

2.2.3 Applicant-Committed Environmental Protection Measures

Applicant-Committed Environmental Protection Measures are mitigation measures that Devon has voluntarily agreed to avoid or minimize environmental impacts. These mitigation measures are provided below.

2.2.3.1 General Operations

- Devon has agreed to conduct the entire seismic survey using a helicopter instead of vibroseis trucks.
- Devon has agreed that vehicular traffic will only be allowed on existing two-track or improved roads and that a Transportation Plan will be developed. Class III cultural surveys will be conducted on the two-track and roads identified through the Transportation Plan (Appendix A, Figure 3-5).
- Seismic operations will cease at sunset on November 14, 2008, prior to the beginning of the big game wintering period, to prevent disturbing wintering large game species (i.e., elk and mule deer).
- Devon will collaborate with the BLM and Wyoming Game and Fish Department to notify the public of the seismic activity while the project is being conducted.

2.2.3.2 Water Resources

- Devon is adhering to the WOGCC regulations and the BLM Geophysical Handbook Safe Operating Distances. The State offset distance is 1,320 feet for seeps and springs. A pre-project peak particle motion study has been conducted on the proposed Project Area by independent third-party (Matheson Mining Consultants, Golden, CO) to verify that the BLM and Wyoming Safe Operating Distances are adequate.
- Devon will conduct a post-project inspection and assessment of all seeps and identified springs within the proposed Project Area and those on private land adjacent to the proposed Project Area. Inspections will, wherever possible and feasible, conduct flow tests using an independent third-party hydrologist approved by BLM and prepare a report of the results.

2.2.3.3 Air Quality

- Members of the seismic and heli-portable drilling crews will be encouraged to carpool to and from surrounding towns to minimize vehicle-related emissions. Devon plans to have 30-person buses with professional drivers to transport crew to and from the field.

2.2.3.4 Cultural/Paleontological Resources

- Devon has agreed to conduct a Class III archaeological clearance for a 100-foot corridor (50 feet from the centerline of the source point location on each side) for the length of the source lines.
- Based on the results of field surveys, all cultural and/or paleontological sites will be avoided. The survey crew will move any source points associated with identified cultural or paleontological sites to avoid these resources.
- If cultural or paleontological resources are discovered during seismic activities, all activity along the seismic line will cease, and Devon will immediately notify the BLM. The BLM and Wyoming State Historic Preservation Office representatives will then determine how to avoid impacting the site or artifact.

2.2.3.5 Hazardous and Solid Waste/Trash Disposal

- Fuel and lubricants will be temporarily stored in transportable containment trailers at staging areas, with secondary containment, to minimize potential for accidental releases/spills.
- All spills or leaks of diesel fuel, hydraulic fluid, lubricating oil, and coolant, including contaminated soil material, will be excavated and placed in an appropriate container and transported to an approved disposal site. All incidents will be reported to the appropriate regulatory agency, allowing the agency representative to monitor the reclamation of the site.
- All solid waste or trash will be transported for disposal to an approved solid waste disposal facility.
- Portable human waste receptacles will be placed in staging areas and maintained, as necessary, for the duration of the seismic program. Human waste receptacles can also be placed along access routes and established two-track roads, as needed.
- An Emergency Response Plan (ERP) will be located in each vehicle used for seismic operations to ensure rapid response to leaks and spills.

2.2.3.6 Erosion and Sedimentation Control

- No cross-country travel will be allowed and all vehicles will be restricted to designated roads and two-tracks.
- Employees and contractors will be instructed to travel at appropriate speeds to limit disturbance to soils and vegetation, and to minimize the potential for vehicle-wildlife and vehicle-vehicle collisions.
- At the end of the project, all equipment, supplies, and trash will be removed.
- Any staging areas, where vegetation may have been disturbed, will be re-contoured and reseeded, if necessary. If requested by the BLM, a representative of the agency can be flown over “cleared” lines to verify that these areas are free of trash and that no areas are disturbed from Devon’s operations.

SECTION 2: PROPOSED ACTION AND ALTERNATIVES

- Ephemeral low water stream and channel crossings will be avoided when the streams are flowing.

2.2.3.7 Vegetation Resources

- To reduce the introduction/spread of noxious and invasive weed species from vehicles and equipment to the well sites, employees and contractors will not be allowed to drive off-road.
- A noxious weed control management program will be implemented to prevent or control the spread of noxious weeds at the proposal site. All vehicles that enter the proposed Project Area will be washed prior to the beginning of the survey.
- All applicable equipment, including on-road and off-road equipment, will be cleaned to remove weed seed and soil (which may contain weed seeds), prior to commencing operations on public lands within the proposed Project Area.
- Weed infestations resulting from the seismic operations will be treated, as necessary, by an herbicide approved by the BLM AO to prevent additional weed spread. Shot holes will be refilled and plugged with soil, cuttings, and bentonite in accordance with the Wyoming Oil and Gas Conservation Commission regulations.
- Disturbed areas from shot hole drilling and helicopter staging areas will be reclaimed and restored with a BLM-approved native seed/shrub mix. Restoration will be to pre-project topographic contours and conditions and be implemented within one month of project completion. The success of the vegetative growth may be determined by BLM no sooner than during the third growing season after reclamation has been completed. Interim progress of reclamation will be monitored as appropriate by the agency and Devon. Where it has been determined that revegetation success has not been met, the BLM and the Devon will meet to decide on the best course of action necessary to meet the reclamation goal.

2.2.3.8 Wildlife Protection

- A spring raptor nesting survey will be conducted if the project continues into 2009.
- Devon has agreed to alter the helicopter flight plan, as necessary, to minimize impacts to big game species.
- Devon will comply with all BLM restrictions for the protection of wildlife.
- To reduce the potential for wildlife-vehicle collisions, Devon will require their employees and contractors to always drive at safe speeds.
- No dogs (Seeing Eye dogs excluded) or other pets will be allowed in the proposed Project Area.
- No firearms will be allowed in the proposed Project Area.

2.2.3.9 Public/Crew Safety

- Devon will take all necessary precautions for the protection and safety of the public for the duration of the seismic program. At road intersections, if approved by Devon, maps of the Project will be available for public viewing.

SECTION 2: PROPOSED ACTION AND ALTERNATIVES

- To further facilitate coordination with local emergency services, Devon will provide mapped locations of the proposed seismic exploration areas and times to the respective emergency services personnel, as applicable, in advance of any exploration activities. In addition, Devon will have cell phones, satellite phones or radios onsite, as appropriate, to provide immediate communication to emergency services.
- Emergency Response Plans (ERP) will be drafted and available at all staging areas, in all contractor and sub-contractor vehicles, as well in crew offices in Rocks Springs, BLM Rock Springs Field Office, and other applicable agency offices as necessary. The ERP will be updated and distributed regularly to reflect any changes. ERP Plans are a required document with Tesla Exploration, Inc.
- Vehicle traffic will be limited to existing roads and two-tracks. Vehicles will travel at speeds within set speed limits of main access roads and at slower speeds appropriate for conditions on more remote roads and two-tracks.
- At a minimum, all crew members will comply with the Occupational Safety and Health Administration (OSHA) rules and regulations.
- Signs warning the public of seismic survey activity will be located along SH 430 during the project and at the closest road/trail intersections on either side of the next day's planned drilling.
- During hunting season, field personnel should wear blaze orange for their personal protection.

2.2.3.10 Existing Facilities/Right of Way Protection

- Devon will be responsible for road repair and/or improvements as needed on the existing BLM access roads in accordance with BLM road standards if the damages are a result of the seismic operation.
- Devon will provide maintenance services for county roads used in the project, as requested by Sweetwater County. Services could include returning the road to original or better condition, placing erosion control features at key points along the road to prevent sediment movement into nearby streams associated with this project, and providing dust control, if needed, during the project. All services provided by Devon will be coordinated with and approved by Sweetwater County with a permit. Road maintenance services will be coordinated with Sweetwater County.
- A representative from the Sweetwater County Road Department is invited to attend the crew start-up meeting.
- Safe operating distances (based on accepted industry standards) will be maintained between shot holes and existing facilities including oil and gas wells, roads, pipelines, and electrical utility lines.
- Any facilities impacted by the proposed seismic survey will be repaired or replaced as soon as practical before the end of the project.

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2.2.3.11 Fire Protection

- Vehicles with catalytic converters will be restricted to approved roads and two-tracks. Parking or idling will not be permitted in portions of roads or two-tracks with tall vegetation.
- All brush build-up around mufflers, radiators, heater-treaters, and other engine parts will be avoided; periodic checks will be conducted to prevent this build-up.
- All personnel will be advised that smoking is only allowed in crew vehicles. All other areas are designated as non-smoking areas.
- All personnel will be advised that campfires or uncontained fires of any kind are prohibited except in an extreme emergency situation as defined in contractor safety manuals. The Emergency Response Plan (ERP) includes a fire communications protocol for contacting fire-fighting personnel. Fire boxes will be used, if required.
- Prior to start-up Devon will engage local fire prevention agencies and discuss protocols for emergency fire fighting.
- Personnel will be trained in fire fighting techniques, as needed.
- Firefighting equipment will be kept on site at all times containers painted red with “Fire Equipment” printed on the container in a highly visible manner. These containers will have the contents displayed on the exterior of the box.
- The fire containers will be constructed in such a manner that they can be simply rigged up and transported via helicopter in an expeditious manner.
- An aerial water deployment tool such as a “Bambi Bucket” will be available in a conspicuous location for rapid deployment.
- The location of emergency water supplies for fighting fires will be identified on maps. Helicopter pilots will document the locations of emergency water supplies and evaluate flight times to these water sources.
- One fire fighting tool for every person on site will be contained in the boxes.
- Fire fighting drills will be conducted at regular intervals.
- All vehicles will be equipped with fire extinguishers, shovels, and first aid kits.
- All-terrain vehicles (ATVs) will be equipped with spark arresters, fire extinguisher, and a fire fighting tool.
- Portable generators used in the proposed Project Area will be required to have spark arresters.

2.2.3.12 Noise

- All seismic operations and activities will cease at sunset on November 14, 2008, to avoid displacing large game species that congregate on crucial winter range within the proposed Project Area. BLM may consider a short extension of the seismic survey activities beyond November 14, if favorable weather conditions allow and conflicts with big game crucial winter range can be avoided.
- The helicopter will follow flight paths chosen to be efficient, while following activity-specific aviation operational safety standards for flight altitudes. Recreationists, wildlife,

SECTION 2: PROPOSED ACTION AND ALTERNATIVES

wild horses, and livestock will be avoided to the extent practical. The post-plot helicopter routes will be provided to the BLM, if requested.

2.3 NO ACTION ALTERNATIVE

In accordance with the NEPA and the CEQ regulations, a No Action Alternative is required. The No Action Alternative would be the denial by the BLM of Devon's proposal to conduct the Horseshoe Basin 3D seismic survey. It serves as a benchmark, enabling decision-makers to compare the magnitude of environmental effects resulting from the Proposed Action with a No Action Alternative. Under the No Action Alternative, there would be no new impacts to vegetation, wildlife, special status plant and animal species, soil, cultural resources, paleontological resources, recreation, surface water and groundwater, range resources, and other resources.

3.0 AFFECTED ENVIRONMENT

3.1 INTRODUCTION

Section 3 provides a description of the existing human and natural resources of the environment that could be affected by the Proposed Action and No Action Alternative in the analysis area. The analysis area is defined for each resource and is based on the nature of the resource. For some resources, the analysis area is the proposed Project Area, and for other resources the analysis area encompasses a larger area. For example, a larger area is analyzed for wildlife species, which are mobile, versus plant species, which are stationary. The existing baseline conditions in the analysis area are a result of past and present activities in the area. Aspects of the baseline condition that affect a specific resource are presented in the discussion for that resource.

The proposed Project Area is located within the western portion of the Vermillion Creek basin on the border of Wyoming and Colorado, where the geological uplift transitions into sagebrush-grassland and high, arid desert types. The topography slopes to the east from Pine Mountain in a series of upland plateaus dissected by deep canyons that flow to the east with elevations from approximately 7,200 feet on the eastern side to 8,500 feet on the western boundary. The proposed Project Area is also characterized by deep canyons including Owl, Canyon Creek, Scrivner, and Coyote canyons, which have prominent escarpments, rock outcrops, and cliffs. The upland landscape has been eroded by the creeks and gullies into flat remnant plateaus and slopes, rocky outcrops, and steep escarpments as bare cliffs and steep slopes with Horseshoe Basin in the east-central portion of the site. The majority of the land has been historically and currently used to provide forage and water for livestock and habitat for wildlife. Roads are primitive and unpaved, and used for livestock control and hunting. The escarpments in the southeastern corner of the proposed Project Area are designated in the Green River Resource Management Plan (RMP) as No Surface Occupancy to protect the unique visual character of the area (BLM 1997).

Section 3 describes the critical elements of the human environment as identified by the BLM Rock Springs Field Office staff and through the public scoping process. A summary of the critical elements of human environment, their status in the proposed Project Area, and whether or not they would potentially be affected by the proposed project are listed in Table 3-1. Elements not present within the proposed Project Area and/or minimally affected by the Proposed Action or No Action Alternative were eliminated from analysis during the preparation of this EA. Each element that would be affected or could potentially be affected by the Proposed Action is linked to a key issue (see Section 1.5) and is addressed in the sections that follow. In addition to the critical elements listed in Table 3-1; other non-critical elements that could potentially be affected by the Proposed Action or No Action Alternative are also listed. The rationale for including, or not including, these elements of the human environment are also summarized in Table 3-1. Elements appear in the general order of importance based on the issues and/or concerns presented in Section 1.5.

SECTION 3: AFFECTED ENVIRONMENT

The critical elements of concern identified by the BLM and through public scoping for the Proposed Action are discussed in the order listed below:

- Water Resources (including surface water, groundwater, and floodplains)
- Vegetation, Wetlands, and Riparian Areas
- Invasive Nonnative Plant Species
- Special Status Species (Federally listed and BLM Sensitive)
- Wildlife and Fisheries
- Cultural Resources and Native American Religious Concerns
- Paleontology
- Recreation (Dispersed, Hunting, OHV Management)
- Visual Resources
- Transportation and Access
- Wastes (Hazardous and Solid)
- Noise

Table 3-1. Critical and Noncritical Elements of the Human Environment in the Proposed Horseshoe Basin Seismic Survey Project Area

Element	Impact Status	Addressed in EA?	Rationale
Air Quality ¹	Minimally Affected	No	Sweetwater County is in attainment of the National Ambient Air Quality Standards (NAAQS) for all pollutants. Currently, air quality in and surrounding the planning area meets State Department of Environmental Quality and the Air Quality Division Standards. The pollutant emitted in the greatest quantities during the seismic survey would be PM ₁₀ from travel upon unpaved roads. Mineral aerosols from fugitive dust are generated from vehicles and equipment as well as from wind erosion of surface soils and can result in an increase in inputs of K, Mg, Ca, N and P to the ecosystem (Neff et al. 2008). Impacts from ground disturbing activities would be localized and temporary in nature and would decrease significantly with distance from the immediate activity with overall PM ₁₀ emission spread out over a large area.
Areas of Critical Environmental Concern	None Present	No	There are currently no ACECs in or within the region of influence of the proposed Project Area.
Cultural and Historic Resources ¹	Potentially Affected	Yes	Cultural and historic resources occur within the proposed Project Area and could be impacted by project activities. A review of the Wyoming SHPO files was conducted as part of the EA process to determine the presence of cultural resources for the proposed Project Area. Cultural resource surveys conducted on previously examined portions of the proposed Project Area have indicated a high density of cultural properties.
Environmental Justice ¹	Minimally Affected	No	Executive Order 12898, issued on 11 February 1994, mandates federal agencies to assess whether their actions have disproportionate environmental and human health impacts on minority and low-income populations. The intent of this order is to ensure that all communities, including minority, low-income, or federally recognized Tribes, live in a safe and healthful environment. Leasing these lands would not cause any disproportionately high and adverse human health or environmental effects on minority populations, low-income populations, or Native American Tribes. No groups of concern would be affected.

Element	Impact Status	Addressed in EA?	Rationale
Farmlands, Prime or Unique ¹	None Present	No	There are currently no prime or unique farmlands in the proposed Project Area.
Fire/Fuels Management	Minimally Affected	No	Fire and fuels management would require standard operating procedures, Applicant-Committed Environmental Protection Measures, and Conditions of Approval that would minimize the risk of inadvertent ignition. Therefore, project impacts resulting in the need for greater fire or fuels management are expected to be negligible.
Fish and Wildlife, including Threatened, Endangered, Candidate, BLM Sensitive, and Other Special Status Species ¹	Potentially Affected	Yes	The proposed Project Area contains crucial wildlife habitat and habitat for Federally listed, BLM, and State animal species of concern; therefore, potential impacts to these species are analyzed in this EA.
Floodplains ¹	Potentially Affected	Yes	The Green River RMP Waters and Floodplain map does not show floodplains within the proposed Project Area. There are no known FEMA floodplain maps covering the proposed Project Area.
Land Use	Minimally Affected	No	Rights-of-way in the proposed Project Area would not be affected because application of standard operating procedures, including the ability to move the seismic program would ensure that communication sites, water projects, power lines, etc. would be avoided, restored or replaced.
Native American Religious Concerns ¹	Potentially Affected	Yes	Some previously examined locations in the planning area have TCPs important to maintaining the cultural identity of the Northern Ute, Eastern Shoshone, Northern Arapaho, and Shoshone-Bannock tribes. Executive Order 13007, Indian Sacred Sites, and the American Indian Religious Freedom Act state that in order to protect and preserve Indian religious practices, the agency with responsibility for the management of federal lands shall, to the extent practicable, permitted by law, and not clearly inconsistent with essential agency functions, accommodate access to and ceremonial use of Indian sacred sites and sacred objects by Indian religious practitioners and avoid adversely affecting the physical integrity of such sacred sites.

Element	Impact Status	Addressed in EA?	Rationale
Noise	Potentially Affected	Yes	Noise from the helicopters, shot hole drilling and detonation of charges would likely result in impacts to wildlife and recreational activities.
Nonnative Invasive Plants ¹	Potentially Affected	Yes	The BLM coordinates with county and local governments to conduct an active program for control of nonnative invasive species. Seismic activities from vehicles and personnel could lead to an increase in nonnative invasive species.
Paleontological Resources	Potentially Affected	Yes	Paleontological resources are known to occur in the proposed Project Area. Because adequate analysis for paleontological resources is lacking, a paleontological assessment occurred and source points may be moved to reduce the impact to any sensitive paleontological resources.
Rangeland Health and Livestock Grazing ¹	Potentially Affected	Yes	Water quality, vegetation, threatened & endangered species habitat, and other components of ecological conditions are considered in Rangeland Health Standards and Guides. However, the amount of disturbance would be such that sufficient land would be unaffected; and therefore, would remain available for livestock grazing. Any range improvements such as pipelines, stock tanks and ponds, and fences that would be affected would be required to be replaced or restored, and disturbed areas would be reclaimed.
Recreation	Potentially Affected	Yes	Because project activities could have impacts on recreation (e.g., hunting), this issue is analyzed in the EA.
Socioeconomics	Minimally Affected	No	Given the low degree of long-term project activity (total surface disturbance of approximately 88 acres), socioeconomic impacts are expected to be negligible.
Soils and Geology	Minimally Affected	No	With a total surface disturbance of 88 acres and the application of applicant-committed environmental measures, it is anticipated that potential impacts on soils and geological resources would be low.
Special Management Areas	Potentially Affected	Yes	The proposed Project Area occurs within the Pine Mountain Management Area.

Element	Impact Status	Addressed in EA?	Rationale
Transportation and Access	Potentially Affected	Yes	Vehicle access could occur along roads, two-tracks, and other trails with sensitive cultural resources or resources of Native American religious concerns. A Class III cultural survey will be conducted to determine the transportation plan that will limit access to existing “BLM-approved” roads and two-tracks. Vehicle access may also impact vegetation and soil resources without adequate protection measures.
Vegetation	Minimally Affected	Yes	Proposed seismic activities would result in small amounts of vegetation removal due to shot hole drilling and a helicopter/equipment staging area.
Visual Resources	Minimally Affected	Yes	Proposed seismic activities would avoid sensitive visual areas (e.g., escarpments) which have a No Surface Occupancy restriction. Visual impacts from helicopters and project vehicles would be short term and moderate, affecting hunters and other recreationists, primarily during the 2008 hunting season.
Wastes (Hazardous or Solid) ¹	Potentially Affected	Yes	Proposed seismic activities would utilize fuels for vehicles (ATVs and trucks) and helicopters, and also include the use of explosive charges that could potentially result in spills and other hazardous conditions. The presence of field crews could potentially increase the amount and kind of solid waste generated in the proposed Project Area.
Water Quality and Quantity (Surface and Groundwater) ¹	Potentially Affected	Yes	Proposed seismic activities could have direct or indirect effects on water quality and quantity in the proposed Project Area due to the large number of seeps and springs present, and the location of the proposed Project Area within the Pine Mountain Management Area, an important aquifer recharge area.
Wetlands and Riparian Zones ¹	Potentially Affected	Yes	Proposed seismic activities would avoid wetlands and riparian zones, though few areas exist on BLM-administered lands within the proposed Project Area. The most likely effect could be indirect impacts resulting from the loss of subsurface water sources upstream.

Element	Impact Status	Addressed in EA?	Rationale
Wild and Scenic Rivers ¹	None Present	No	There are currently no Wild and Scenic Rivers in or proposed for the proposed Project Area.
Wild Horses/Burros	None Present	No	There are currently no populations of wild horses and/or burros in the proposed Project Area.
Wilderness ¹	None Present	No	There are currently no wilderness or WSAs in or proposed for the proposed Project Area.

¹Critical element of the human environment (see Appendix A, BLM Handbook H-1790-1 [BLM 2008])

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3.2 WATER RESOURCES

3.2.1 Surface Water

All the surface water drainages in the proposed Project Area start on the east side of Pine Mountain and drain to Vermillion Creek, and eventually to the Green River (Figure 3-1). There are four named drainages in the proposed Project Area and several unnamed drainages (Table 3-1). The proposed Project Area drainages are generally intermittent in character with some exceptions (seasonal flows as a response to snow melt). Many of the headwater tributaries are ephemeral in nature (stream that flows only during or immediately after periods of precipitation). However there are springs in or near the drainages where the flow is perennial for at least a short distance downstream from the spring (see Section 3.2.1.1).

Table 3-2. Streams in the Proposed Horseshoe Basin Seismic Survey Project Area

Stream Name	Approximate Length Within Project Area (mi.)	Approximate Total Stream Length (mi.)
Coyote Creek	3.5	8.5
Scrivner Canyon	3.6	3.6
Horseshoe Wash	4.7	5.4
Owl Canyon	5.1	5.5

3.2.1.1 Springs and Seeps

Springs and seeps are the most significant surface water features in the proposed Project Area (Figure 3-1). For the majority of the year, the only flowing water in the proposed Project Area comes from the 28 springs and seeps. Springs are areas where groundwater exits the ground at a relatively small point. Seeps are areas where groundwater exits the ground over a relatively large area. There are also numerous springs and seeps just outside the project area boundary. Table 3-3 lists all the springs and seeps in the proposed Project Area and an estimate of their discharge, where possible.

A field survey of the springs and seeps was carried out during the week of August 18, 2008 (TEC 2008a); some of the findings are discussed below. The springs and seeps were generally clustered in four locations, with multiple springs occurring within a few miles of each other. The springs tended to occur along canyon walls, but also were found in valley bottoms. All the springs were flowing at the time of the August 2008 survey, which is relevant because the survey was conducted at the end of a relatively dry summer. This suggests that the spring sources are relatively deep below the surface and that the spring sources are not a result of seasonal precipitation, but rather longer term geologic processes (TEC 2008a).

There were generally three types of springs found. Many of the springs emanated out of exposed sedimentary rock formations and generally had a single desirable source (spring). Another spring type found in the project area did not have a discernable source (seep) but the water surfaces in larger wetland areas, generally along a valley floor. There are two springs of a third type, which is a combination of the above spring types, with the area having both a discernable source and larger seep wetland area.

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Table 3-3. Springs and Seeps in the Proposed Horseshoe Basin Seismic Survey Project Area

ID	Feature Type	Legal Location			Approximate Flow (gpm)
		Township/Range	Section	1/4 Section	
1	Spring	T12N/R102W	10	SW	3-5
2	Spring	T12N/R102W	10	SW	3-5
d32	Spring/Seep	T12N/R102W	15	NE	-
4	Spring	T12N/R102W	14	NW	1-2
8	Seep	T12N/R102W	11	SW	-
d49	Spring	T12N/R102W	11	SE	-
d37	Spring	T12N/R102W	14	NE	-
9	Spring	T12N/R102W	11	SW	1-2
d31	Spring/Seep	T12N/R102W	11	SW	1-2
d42	Spring	T12N/R102W	10	NW	1-2
d33	Seep	T12N/R102W	13	NE	-
d48	Seep	T12N/R101W	18	NW	-
Two Bar Spring	Seep	T12N/R101W	18	NW	-
5	Spring	T12N/R101W	18	NW	3-5
d34	Spring	T12N/R101W	18	NW	3-5
d39	Spring	T12N/R101W	18	NW	7-9
10	Spring	T12N/R101W	18	NW	3-5
7	Seep	T13N/R101W	20	NW	-
6	Seep	T13N/R101W	19	SW	-
d29	Seep	T13N/R102W	24	SW	-
d26	Seep	T13N/R102W	23	SE	-
d27	Seep	T13N/R102W	23	SE	-
12	Seep	T13N/R102W	23	SW	-
Horseshoe Spring	Spring	T13N/R102W	34	SE	2-3
d15	Spring	T13N/R102W	32	SE	1-2
11	Spring	T13N/R102W	32	SE	3-5
d14	Spring	T13N/R102W	32	SE	1-2
d47	Spring	T12N/R102W	4	NW	3-5

3.2.1.2 Stock Ponds, Stock Tanks, and Water Pipelines

Four stock ponds were identified within the proposed Project Area. Of these, three were located adjacent to springs. The fourth was located on the main stem of the Horseshoe Wash (Figure 3-1). On the western end of the proposed Project Area, near the base of Pine Mountain, a series of stock tanks connected by a pipeline network have been installed (Figure 3-1). The source of the water is from several springs on the southeastern side of Pine Mountain.

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3.2.1.3 Surface Water Quality

The U.S. Geologic Survey (USGS) has collected a limited number of samples in the vicinity of the proposed Project Area. Coyote Creek was sampled once near its confluence with Vermillion Creek north of the proposed Project Area, and one spring sample from the upper reaches of Coyote Creek within the proposed Project Area. There are also samples from Vermillion Creek, including spring samples from the upper reaches of the stream. Vermillion Creek starts on Pine Mountain just to the north of Coyote Creek and has a very similar hydrologic regime. Table 3-4 includes a summary of the some of the water quality results. All the samples were collected in 1976 and 1977.

Table 3-4. Summary of Surface Water Quality Samples in the Vicinity of the Proposed Horseshoe Basin Seismic Survey Project Area

Measurement	Vermillion Ck Above Bell Spring (mid stream) ¹	Headwater Spring on Coyote Ck. ²	Alkali Springs Near the Head of Vermillion Ck ³	Coyote Ck at Confluence Vermillion Ck ⁴	Vermillion Ck Above Confluence Coyote Ck ⁵
Discharge (cfs)	0.74	0.03	3.0	0.29	.019
Temperature (C)	13	6.5	17.5	7.5	5.0
pH (standard units)	8.6	7.7	8.1	8.8	8.6
Specific Conductance (uS/cm)	350	555	1190	800	200
Alkalinity (mg/L as CaCO ₃)	196	267	405	351	350
Nitrate + Nitrite (mg/L)	0.015	0.27	0.09	0.16	0.2
Total Phosphorus (mg/L)	0.015	0.05	-	0.15	0.2
Hardness (mg/L as CaCO ₃)	165	200	45	270	780
Sulfate (mg/L)	12	23	240	68	780
Iron (mg/L)	40	<10	<10	90	80
Total Dissolved Solids (mg/L)	236	320	762	475	146
Dissolved Oxygen	10.9	-	-	12.2	11.6
Total Suspended Solids (mg/L)	8.4	-	-	202	128

1. USGS 410502108571201 VERMILLION C AB BELL SP NR HIAWATHA CO

2. USGS 410507108564801 13-102-19ccc01

3. USGS 410511109024701 13-103-19ddc01

4. USGS 410519108472101 COYOTE C AT MOUTH NR HIAWATHA CO

5. USGS 410520108472001 VERMILLION C AB COYOTE C, NR HIAWATHA, CO

3.2.2 Groundwater

3.2.2.1 Regional Ground Water Aquifers

The primary aquifers in the proposed Project Area are in the Tertiary Green River and Wasatch Formations. These units form the majority of bedrock surface exposures and are the most widely used aquifers in Sweetwater County (Mason and Miller 2004). Static water-level depths are generally less than 200 feet below ground surface and most aquifers are confined and contain water under artesian conditions. In the Wasatch-Fort Union aquifers, groundwater flows to the east and southeast towards the Little Snake River (Mason and Miller 2004).

3.2.2.2 Groundwater Quality

There are twelve water-quality samples that were collected by the USGS near the proposed Project Area (Mason and Miller 2004). Eleven of the twelve samples are from springs and a single sample is from a well located in the headwaters of Sage Creek. The samples represent water from the Green River Formation (6 samples), the Wasatch Formation (4 spring samples, 1 well sample), and the Bishop Conglomerate (1 sample). Table 3-5 provides a summary of key water quality parameters for the Wasatch and Green River Formation.

Table 3-5. Summary of Groundwater Quality in the Vicinity of the Proposed Horseshoe Basin Seismic Survey Project Area

Parameter	Wasatch Formation		Green River Formation	
	Median	Range	Median	Range
TDS (mg/L)	413	287–2380	550	246–987
Sulfate (SO ₄) (mg/L)	130	50–1400	141	30–490
Manganese (Mn) (µg/L)	<10	<10–20	<10	<10–10
Iron (Fe) (µg/L)	120	20–410	30	<10–30

3.2.2.3 Recharge/Discharge

Recharge to aquifers in Sweetwater County occurs by infiltration of precipitation on rock outcrops, infiltration of snowmelt runoff, and leakage of stream flow. The estimated groundwater recharge per year to the Tertiary aquifers in the proposed Project Area is less than 0.5 inches per year, although higher altitude areas generally have higher precipitation and greater recharge. The higher altitude areas in the proposed Project Area (primarily Pine Mountain and vicinity) receive an estimated 12–16 inches of precipitation per year; lower altitude areas typically receive around 7–8 inches per year (Mason and Miller 2004).

According to Mason and Miller (2004), the major recharge areas to aquifers in the Washakie Basin are the upturned outcrops flanking the Rock Springs Uplift, the outcrop area southwest of Rawlins and the higher area around Creston Junction. Some groundwater also flows from the Great Divide Basin across the Wamsutter Arch into the Washakie Basin.

Groundwater discharge occurs mainly as seepage to streams, discharge to springs, evaporation, and as underflow along streamways and aquifers that extend out into the Washakie Structural Basin (Mason and Miller 2004).

3.2.3. Floodplains

The Green River RMP Waters and Floodplain map does not show floodplains within the proposed Project Area. There are no known FEMA floodplain maps covering the proposed Project Area.

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3.3 VEGETATION, WETLANDS, AND RIPARIAN AREAS

Vegetation resources within the proposed Project Area are best understood in terms of plant communities and key species within those communities. Several data sources were evaluated to best understand the vegetation communities. The composition of those communities is provided below. The unpublished NRCS Sweetwater County Wyoming Soil Survey (USDA SCS 1979) provides mapping unit, soil series, and range site descriptions for the proposed Project Area. This soil information is used to interpret ecological sites and the plants found within those ecological groupings. While this particular Soil Survey was conducted in the late 1970s, it is still a draft and subject to change.

BLM Instruction Memorandum No. 2007-202 (BLM 2007) notes that “the BLM utilizes ecological sites as the method to divide rangeland into basic units for study, evaluation and management.” Ecological sites best describe plant communities and are used to understand Historic Climax Plant Communities (HCPCs). For the purposes of this EA, the NRCS-developed ecological site information for Wyoming was the primary source of information regarding plant communities (NRCS 2005).

Field inspections have taken place to verify plant communities and the results are summarized below (Bamberg 2008).

3.3.1 Proposed Project Area Description

Annual precipitation in the proposed Project Area averages approximately eight inches, classifying the area as “semi-arid.” The majority of this precipitation falls as snow or as summer rains from intense, short-duration thunderstorms with strong winds. Due to strong westerly winds, snow is blown off the ridges and summits into snow accumulation areas with better soil moisture conditions, and a mixed shrub community. Annual and seasonal temperatures vary widely due to Canadian air masses in the winter, and strong winds from frontal storms and atmospheric heating.

Soils on the site have developed on stream floodplains and valley fill terraces, coalescing alluvial fans, hill slopes, ridges, and among rock outcrop. These soils are derived from flat, underlying sedimentary rock of calcareous sandstone and shale, and are composed of weathered residuum, colluvium and alluvium. Soils vary from shallow to non-existent on ridges and slopes to deep alluvium in valleys and along drainages. Vegetation community types are closely tied to the soil properties of depth, texture, pH, salinity, water capacity, and salt and mineral content. Soil depth and types and the subsequent vegetation communities are controlled by the topographic influences of slope, drainage, snow accumulation patterns and moisture regimes. Microclimatic differences are related to aspect, water and air drainage along streams, draws and valleys, and changes brought about by the structure of the plant community. There are some minor changes in plant species composition and structure from cattle grazing, trampling, and bedding. There are grazing allotments on the project that allow grazing on the entire site, except for a few localities that are fenced for security.

The semi-desert climatic regime, coupled with site specific soil development, creates a fairly harsh environment for plant growth and productivity.

3.3.2 Vegetation Communities

The following is a summary of the general vegetation community types identified by BLM (2004) and examined during field inspections during August 2008.

There are two main ecological systems that determine vegetation communities present in the proposed Project Area: the inter-mountain basin semi-arid shrub steppe and the foothill riparian woodland and shrubland (NatureServe 2008a). The shrub steppe occurs throughout the Intermountain West on alluvial fans and flats. It is the most common and prevalent type on the site on shallow to deeper sandy loam soils. Narrow riparian zones occur in the lower canyon bottoms of major drainages and lower larger tributaries, and consist of wetlands and small areas of woodlands (trees and willows). This riparian type occurs throughout the Rocky Mountain basins in hydrologic regimes with periodic flooding on floodplains and terraces. In addition to the two main types of ecosystems, land cover types included cliffs and small bare areas due to natural conditions or land use practices.

The shrub steppe on the site is dominated by shrubs and subshrubs with grasses and forbs as a ground cover or growing within the shrub clumps. The principal shrub species are in the genera *Artemisia* and *Atriplex*, and the grasses are a mixture of warm and cool season grasses and sedges (Dorn 2001). There are larger shrubs and small trees associated with snow accumulation areas and around the perennial springs and seeps along the canyon walls and bottoms. Wetlands and small riparian areas are common below springs and in the canyon bottoms are fed by groundwater seeps. Invasive annual grasses (*Bromus* spp.) and forbs may be present throughout the shrub communities. Forbs are prevalent in some vegetation types, and are abundant in years of good rainfall.

The higher slopes of Pine Mountain, to the west of the proposed Project Area above 8,800 feet, have a coniferous forest of lodgepole and limber pines with some aspen groves. A few isolated limber pines occur on the Four J Rim on the southwest edge of the proposed Project Area.

BLM (2004) identified and mapped seven vegetation community types or complexes in the shrub steppe system. The vegetation communities and land cover types were field verified in August 2008, and acreages and percentage of each type were calculated (Table 3-6). All of the vegetation and land cover types are described in more detail in the field report submitted to BLM (Bamberg 2008).

Six of the community types are shrublands: 1) Wyoming big sagebrush, 2) Basin big sagebrush (includes rabbitbrush), 3) Mixed shrub, 4) Sagebrush/grassland, 5) Greasewood, and 6) Saltbush/sage. A seventh community type is an annual forb/low cushion plant type grading into bare ground on exposed ridges and slopes. The wetland communities observed were a grass/sedge wetland, and a taller riparian shrub/grass/small tree type below springs and seeps in canyons and stream bottoms. There were no community types that are common on higher mountain slopes, such as conifer/aspen forests or juniper stands, present in the proposed Project Area. Mountain sagebrush was also not identified on the site. The flora is diverse due to the different plant communities and soil types.

Large shrub species are the dominant plant cover type in the shrubland community type, with grasses and an herbaceous perennial forb cover occurring underneath and between the shrubs.

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Small areas below springs and seeps had a diverse wetland component with small trees, shrubs and a dense, tall grass/forb cover occurring on saturated soils. There were larger wetlands and small riparian areas in the stream bottoms of canyons and in alluvial valleys such as Coyote Creek in the north, and Owl Canyon along the southern boundary of the proposed Project Area.

Table 3-6. Vegetation Communities and/or Land Cover Types in the Proposed Horseshoe Basin Seismic Survey Project Area

Type	Acreage	Percent
Shrubland steppe		
1. Wyoming big sagebrush shrubland	2,580	16
2. Basin big sagebrush shrubland	340	2
3. Mixed shrubland	1,640	11
4. Sagebrush grassland	4,850	31
5. Greasewood (rabbitbrush)	1,940	12
6. Saltbush/birdsfoot sage	2,590	16
7. Annual forb/cushion plant/low shrub	1,380*	9
Riparian zone		
8. Wetland grass/sedge	190	1
9. Shrub/small tree	30	>1
Other Land Cover		
10. Bare/rock outcrops/cliffs	300*	2
Total	15,480	100

*Acreages estimated

3.3.3 Wetlands

Wetlands are subject to a variety of federal and state regulations including the Clean Water Act (CWA), Rivers and Harbors Act, Wyoming Water Quality Regulations and related Surface Water Quality Standards. In addition, Executive Order (EO) 11990 and federal statutes require federal agencies to take action to minimize the destruction, loss, or degradation of wetlands. The Corps of Engineers, through Section 404 of the CWA and Section 10 of the Rivers and Harbors Act, is the lead permitting and regulatory agency with jurisdiction over activities in waters of the United States, including wetlands.

The National Wetlands Inventory (NWI) was queried to determine the location of mapped wetlands in the proposed Horseshoe Basin Project Area. According to the NWI maps, several wetlands are located within the proposed Project Area, and are associated with springs in the canyon bottoms of the proposed Project Area (Figure 3-1). Because these springs are in an arid environment, they are of greater importance to local wildlife.

All the springs were found to have downslope or downstream wetland areas. Area wetlands were associated with either a stream channel or a wet meadow area. The extent of some of the wetlands was more than one mile, but most were a few hundred feet in length. The spring type with discernable sources generally had linear wetlands that followed small channels flowing downhill from the spring. The wetlands associated with the seep-like springs that flooded

broader wet meadow areas did not have a channel running through them, although they often drained to a stream channel. The well developed nature of wetland areas associated with springs indicates that all the springs in the proposed Project Area have been flowing for long periods of time.

Wetlands that occur as narrow strips along small streams below springs in the canyon bottoms, and along the alluvial valley bottoms of the larger creeks, were typically found along Coyote and Canyon Creeks. Narrow wetlands in the canyons (Scrivner Canyon) are from a few feet to 30 feet wide and extend some distances until the moisture seeps into the alluvium. Wetlands in the alluvial valley bottoms along Coyote and Canyon Creeks are broader and extensive due to abundant springs, seeps and shallow groundwater. The principal species in the wetter zones are sedges (*Carex* spp.) three square rush (*Schoenoplectus americanus*) and Baltic rush (*Juncus balticus*). Vegetation below springs on slopes below cliffs is a dense tall mix of shrubs, grasses and sedges, and perennial forbs. Several water birch (*Betula occidentalis*) were observed on slopes below the cliffs where springs emerged.

3.3.4 Riparian Areas

Riparian areas in the proposed Project Area are generally characterized by willow or cottonwood and woody vegetation, as well as herbaceous species found in wetter areas. These areas are important wildlife habitat for many of the species present in the area. Very limited amounts of riparian area were located within the proposed Project Area. The riparian zone is confined to the immediate floodplain and low terraces along the lower creeks. The principal species in the nonwetland riparian areas are cottonwoods (*Populus* spp), willows (*Salix* spp), along with clumps of small trees (chokecherry, maple) and shrubs (serviceberry, currant, and ocean spray).

Riparian areas are located along perennial parts of Coyote Creek, but occur only sporadically along the ephemeral and the other seasonal creeks running west to the east, and into the Vermillion Creek drainage north and east of the proposed Project Area.

3.4 NOXIOUS WEEDS AND NONNATIVE INVASIVE PLANT SPECIES

Noxious weeds and nonnative invasive plants inhabit about 1.3 million acres in Wyoming. They pose a significant threat to Wyoming croplands, rangelands, and natural areas. Wyoming has long recognized the importance of managing noxious weeds, with its first noxious weed law legislated in 1913 (Wyoming Weed Management Strategic Plan 2003). Noxious weeds, as defined by the Wyoming Weed and Pest Control Act of 1973, are weeds, seeds, or other plant parts that are considered detrimental, destructive, injurious or poisonous, either by virtue of their direct effect, or as carriers of diseases or parasites that exist within the state. The Sweetwater County Weed and Pest Control District has identified four noxious weeds of concern for the county, including black henbane, foxtail barley, lady's bedstraw, and mountain thermopsis.

There has been no formal noxious weed mapping in the proposed Project Area. However, cheatgrass, halogeton, and henbane are probably present (J. Glennon, BLM RSFO Botanist. Personal Communication with S. Bamberg, August 25, 2008).

Other noxious weed and nonnative invasive species in Sweetwater County that may occur in the proposed Project Area include Canada thistle (*Cirsium arvense*), whitetop (*Cardaria draba*)

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Russian knapweed (*Centaurea repens*), musk thistle (*Carduus nutans*), perennial pepperweed (*Lepidium latifolium*), dalmatian toadflax (*Linaria dalmatica*), spotted knapweed (*Centaurea maculosa*), diffuse knapweed (*Centaurea diffusa*), saltcedar (*Tamarix spp.*), and common tansy (*Tanacetum vulgare*).

Species observed on the site included whitetop, spotted knapweed, and Canada thistle. The most common invasive species present in the proposed Project Area, cheatgrass and kochia, are not listed as noxious, but were recorded in some plant communities during vegetation surveys conducted in August 2008 (Bamberg 2008). Cheatgrass was common in the shrub and grass communities; the second most common weed was kochia, which was common in lower draws and near stock tanks. Both of these weeds can replace and outcompete native plants, especially grasses and native forbs.

3.5 SPECIAL STATUS SPECIES

The BLM is required to protect and manage federally threatened, endangered, proposed, candidate, and BLM sensitive species on lands administered by the agency. BLM also provides protection and manages for sensitive species jointly with the Wyoming Game and Fish Department and the U.S. Fish and Wildlife Service (USFWS). Table 3-7 lists the federally listed threatened and endangered species, and BLM-listed sensitive species that could potentially occur in the proposed Project Area.

3.5.1 Federally Listed and Proposed Species

The Endangered Species Act of 1973 (ESA), as amended, requires that Federal agencies protect those species listed under the Act. The endangered or threatened species listed by the U.S. Fish and Wildlife Service that are potentially present in the proposed Project Area include the black-footed ferret, Canada lynx, and Gray wolf. Four species that may occupy habitat in the area are currently being petitioned for federal listing: the pygmy rabbit, white-tailed prairie dog, greater sage-grouse, and Wyoming pocket gopher. The pygmy rabbit, white-tailed prairie dog, and greater sage-grouse have been documented as occurring in the proposed Project Area (TEC 2008b; WYNDD 2008). The yellow-billed cuckoo is a candidate species for listing under the ESA and may occur in Sweetwater County (USFWS 2008).

3.5.1.1 Black-footed Ferret

The black-footed ferret (*Mustela nigripes*) historically inhabited white-tailed prairie dog colonies in southwestern Wyoming. The diet of the black-footed ferret consists almost entirely of prairie dogs. Black-footed ferret survey guidelines suggest that 1,000 or more acres of white-tailed or black-tailed prairie dog habitat should be evaluated as possible sites for future black-footed ferret reintroduction (Biggins et al. 1993). Intermediate areas having 200 to 1,000 acres of white-tailed prairie dog towns may have importance for black-footed ferret recovery (USFWS 1989). Currently, there are three large prairie dog complexes in the vicinity of the Rock Springs resource area: Kinney Rim, Flaming Gorge, and Baxter Basin, and portions of Sweetwater, Continental Divide, and Desolation Flats (BLM 2005a). The Baxter Basin is a large white-tailed prairie dog complex, which is located 40 miles north and northeast of the proposed Project Area and includes a 23,000-acre complex (of which 8,000 acres are very densely populated) in the

North Baxter Basin. The Six-Mile Rim area (south of Point of Rocks) contains a 25,000- to 30,000-acre complex (BLM 2005a). The closest large white-tailed prairie dog complex is Kinney Rim, located along State Highway 430. The complex once occupied about 18,000 acres, but plague has caused a major decline (Center for Native Ecosystems et al. 2002).

Twenty-six towns, less than 10 acres in size, were observed in the Horseshoe Basin area during the August 2008 wildlife survey (TEC 2008b). Of these complexes, only four had active burrows, and no more than four prairie dogs were observed at any one time. BLM had previously identified 18 other towns in the proposed Project Area; these towns are currently abandoned and many are decadent, showing no recent evidence of activity.

The Vermillion Basin is included in the Little Snake Management Area that spans Colorado and Wyoming (BLM 2005a). This area is currently a reintroduction site, but plague has postponed this effort. Ferrets released in Colorado as part of ferret reintroduction efforts have been designated an experimental non-essential population, as defined by USFWS, and have less stringent protection guidelines than wild ferrets. If the ferrets do well with the reintroduction, they may expand across the border into Wyoming (BLM 2005a). Since 2001, 189 black-footed ferrets were released in the Wolf Creek area near Rangely, Colorado, and south of Vernal, Utah. Wild-born ferret kits were first found there in 2005; however, only 16 ferrets were confirmed to be present in the reintroduction area at the end of 2007.

3.5.1.2 Gray Wolf

While gray wolves (*Canis lupus*) may exist in the vicinity of the proposed Project Area, there are no known den sites in the area (N. Kaczor, BLM Wildlife Biologist, personal communication with D. Kane, TEC, Inc., July 17, 2008). Wolves in Wyoming have been known to move south from their reintroduction area in Yellowstone National Park into Utah and across the Red Desert to Colorado. The gray wolf was delisted by the USFWS on March 28, 2008. A recent federal court injunction on July 18, 2008 reinstated the Endangered Species Act protection for the gray wolf, in Idaho, Montana and Wyoming.

3.5.1.3 Canada Lynx

The Canada lynx (*Lynx canadensis*) inhabits coniferous forests near rocky areas, bogs, and swamps in parts of Wyoming, Colorado, Idaho, Montana, Oregon and Washington. Approximately 75% of the diet of the Canada lynx consists of the snowshoe hare. It also feeds on birds, meadow voles, carrion, and larger animals, such as deer (NatureServe 2008b). Although coniferous forests are present in parts of the project area, the USFWS does not identify the Canada lynx as a species that may occur in Sweetwater County (USFWS 2008).

3.5.1.4 Pygmy Rabbit

The pygmy rabbit is being considered for listing under the ESA and is a BLM sensitive species, occurring in swales of taller, denser sagebrush in a setting of hillsides with thinly distributed, shorter sage (Ulmschneider et al. 2004). Use areas also have significantly greater vertical shrub structure (over 10 cm from the ground), while non-use areas have denser ground cover of forbs and low shrubs (Keinath and McGee 2004). Pygmy rabbits are found in alluvial fans, large flat valleys, at the foot of mountains, along creek and drainage bottoms, in basins in the mountains or other landscape features where soil may have accumulated to greater depths. The species is

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generally found on level ground and sometimes on moderate slopes, but not on steep slopes (Ulmschneider et al. 2004).

The pygmy rabbit excavates its own burrow, but may also use burrows from other animals (e.g., badgers and marmots) when available (Keinath and McGee 2004). Burrow entrances range from 4-10 inches across and usually are fairly round but may be slightly wider than tall (Ulmschneider et al. 2004). Areas with relatively deep, stable soils are necessary for burrow construction. The pygmy rabbit depends on burrow for protection from predators and severe weather, and as a secure location for raising young (Keinath and McGee 2004). Burrows are most often placed at the base of a sagebrush plant, or occasionally another shrub species (Ulmschneider et al. 2004). Burrows extend several meters in length with an entrance at each end (Keinath and McGee 2004).

Field surveys were conducted in August 2008 to locate pygmy rabbit burrows. The presence of pygmy rabbits was documented on two occasions during the survey in the Project Area (TEC, Inc. 2008b).

3.5.1.5 White-tailed Prairie Dog

The white-tailed prairie dog (*Cynomys leucurus*), the primary prey species of the black-footed ferret, occurs within the proposed Project Area. Federal listing for the white-tailed prairie dog was initially denied in 2004, but the species is currently being reconsidered for listing under the ESA. The white-tailed prairie dog is also a BLM sensitive species. As noted in the discussion on the black-footed ferret (Section 3.5.1.1), a total of 26 prairie dog towns occur in the proposed Project Area (18 previously identified by BLM), and four small towns (< 10 acres) were observed during the August 2008 wildlife survey (TEC Inc. 2008b). However, only few individuals were observed in each town. White-tailed prairie dog colonies that may support the black-footed ferret are typically in excess of 200 acres.

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Table 3-7. Sensitive Animal and Plant¹ Species Potentially Occurring in the Proposed Horseshoe Basin Seismic Survey Project Area

Common Name (<i>Scientific Name</i>)	Family	Federal Status	BLM Status
Animal Species			
Black-footed ferret (<i>Mustela nigripes</i>)	Mustelidae	USFWS Endangered	Endangered
Canada lynx (<i>Lynx canadensis</i>)	Felidae	USFWS Threatened	Threatened
Pygmy rabbit (<i>Brachylagus idahoensis</i>)	Leporidae	USFWS petitioned for ESA listing	Sensitive
Wyoming pocket gopher (<i>Thomomys clusius</i>)	Geomyidae	USFWS ESA petitioned for listing, USFS R2 Sensitive	Sensitive
White-tailed prairie dog (<i>Cynomys leucurus</i>)	Sciuridae	USFWS ESA petitioned for listing, USFS R2 Sensitive	Sensitive
Gray wolf (<i>Canis lupus</i>)	Canidae	USFWS Endangered – Nonessential Experimental Population	Sensitive
Townsend’s big-eared bat (<i>Corynorhinus townsendii</i>)	Vespertilionidae	USFS R2 Sensitive, USFS R4 Sensitive	Sensitive
Spotted bat (<i>Euderma maculatum</i>)	Vespertilionidae	USFS R2 Sensitive, USFS R4 Sensitive	Sensitive
American Peregrine falcon (<i>Falco peregrinus anatum</i>)	Falconidae	USFWS delisted, USFS R2 Sensitive	Sensitive
Ferruginous hawk (<i>Buteo regalis</i>)	Accipitridae	USFS R2 Sensitive	Sensitive
Burrowing owl (<i>Athene cunicularia</i>)	Strigidae	USFS R2 Sensitive	Sensitive
Western Yellow-billed cuckoo (<i>Coccyzus americanus</i>)	Cuculidae	USFWS ESA Candidate, USFS R2 Sensitive	Sensitive
Greater sage-grouse (<i>Centrocercus urophasianus</i>)	Phasianidae	USFWS ESA petitioned for listing, USFS R2 Sensitive	Sensitive
Sage sparrow (<i>Amphispiza belli</i>)	Emberizidae	USFS R2 Sensitive	Sensitive
Brewer’s sparrow (<i>Spizella breweri</i>)	Emberizidae	USFS R2 Sensitive	Sensitive
Loggerhead shrike (<i>Lanius ludovicianus</i>)	Laniidae	USFS R2 Sensitive	Sensitive
Sage thrasher (<i>Oreoscoptes montanus</i>)	Mimidae	N/A	Sensitive
Midget faded rattlesnake (<i>Crotalus viridis concolor</i>)	Viperidae	WGFD NSS2	Sensitive
Great Basin spadefoot toad (<i>Scaphiopus intermontanus</i>)	Pelobatidae	WGFD NSS4	Sensitive
Northern leopard frog (<i>Rana pipiens</i>)	Ranidae	WGFD NSS4	Sensitive

¹No Sensitive Plants are known to occur in the proposed Project Area (J. Glennon, BLM RSFO Botanist, personal communication with S. Bamberg, August 25, 2008).

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²**Heritage Rank:** WYNDD uses a standardized ranking system originally developed by The Nature Conservancy and its network of natural heritage programs (now coordinated by Nature Serve [Arlington, Virginia]) to indicate the probability of extinction, at both the global and state scales, of each plant and animal taxon. The following letters denote the spatial scale at which a taxon's status is scored: G = Global rank: refers to the range-wide probability of extinction for a species; S = State rank: refers to probability of extinction from WY for a given species. These letters are each followed by a numeric, 1-5 score: 1 = Critically imperiled because of extreme rarity (often <5 extant occurrences) or because some factor makes it highly vulnerable to extinction; 2 = Imperiled because of rarity (often 6-20 extant occurrences) or because of factors making it vulnerable to extinction; 3 = Rare or local throughout its range or found locally in a restricted range (often 21-100 known occurrences); 4 = Apparently secure, although it may be quite rare in parts of its range, especially at the periphery; 5 = Demonstrably secure, although it may be rare in parts of its range, especially at the periphery.

Sources: Wyoming Natural Diversity Database <http://uwadmnweb.uwyo.edu/wyndd/>

BLM Wyoming Sensitive Species List (BLM 2002)

Wyoming Game and Fish Comprehensive Wildlife Conservation Strategy (WGFD 2005a)

3.5.1.6 Greater Sage-Grouse

A status review process by the USFWS is currently underway for the greater sage-grouse (*Centrocercus urophasianus*) to determine if it warrants listing under the ESA. The sage-grouse is also a BLM sensitive species. The species is dependent upon sagebrush-steppe habitat and relies on sagebrush not only for forage but also for cover from predators, brood-rearing, and shelter from the elements year-round (Schroeder et al. 2004; Aldridge and Boyce 2007). The sage-grouse also requires open areas with high visibility for courtship and mating. Courtship areas are referred to as “leks” (Connelly et al. 2000).

The greater sage-grouse has been extirpated from approximately half of its pre-settlement range (Schroeder et al. 2004). Threats include conversion of grasslands and sagebrush-steppe habitat to dry-land farming as well as invasion of weedy species, such as cheatgrass. Most recently, outbreaks of West Nile virus have been major contributors to the sage-grouse decline (Naugle et al. 2005; Schroeder et al. 2004, Holloran 2005, Naugle et al. 2006, and Walker et al. 2007). In recent studies to determine how sage-grouse respond to gas field and coal bed methane development (considering multiple variables, including male lek attendance, nesting success, egg-laying success, juvenile survival, and overall population vigor), Holloran (2005) and Naugle et al. (2006) concluded that sage-grouse populations are highly likely to decline from extensive energy field development, when there is extensive surface occupancy. Naugle et al. (2006) concluded that when drilling was conducted near active leks and nesting areas, declines could be expected at least two miles from the drilling site during the breeding, nesting, and brood-rearing periods.

The northwestern quadrant of the proposed Project Area is within a Sage-Grouse Core Population Area and the South Rock Springs Core Breeding Area (WGFD 2008). The State of Wyoming considers sage-grouse core population and core breeding areas key components of the state’s conservation efforts to avoid federal listing of the sage-grouse. On August 1, 2008, the Governor of Wyoming issued Executive Order No. 2008-02(1) instructing state agencies to work collaboratively with other state, federal, and local agencies in the conservation of sage-grouse and their core population areas.

Three leks were identified within the proposed Project Area. One lek was originally located during a research study conducted by the University of Idaho in 2006 (B. Walker, Colorado Division of Wildlife, personal communication with D. Kane, TEC, Inc., August 22, 2008). The lek was field-verified in August 2008 (TEC, Inc. 2008). The two other leks were located in close proximity to the lek located by the University of Idaho (TEC 2008b). All leks demonstrated evidence (e.g., high density of fecal pellets) of recent use. These sites appear to be in good ecological condition when viewed from the perspective of sage-grouse habitat needs (TEC 2008b). During the August 2008 wildlife survey, more than 40 juvenile and adult sage-grouse were also flushed from sagebrush swales in the proposed Project Area, primarily on the top of the Four J Rim. A sage-grouse nest with four hatched eggs was observed below the rim of Scrivner Canyon.

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3.5.1.7 Wyoming Pocket Gopher

The Wyoming pocket gopher (*Thomomys clusius*) is being considered for listing under the ESA and is a BLM sensitive species, occurring in southeastern Sweetwater County and southwestern Carbon County (WGFD 2005a). Little appears to be known about this species. The only references in which it is addressed merely state that it uses upland drier ridge tops, gravelly loose soils and greasewood habitats (Clark and Stromberg 1987, Cerovski et al. 2004 in WGFD 2005a, Keinath and Beauvais 2006). According to the WGFD (2005a), conservation of the species is complicated by the lack of information regarding life history and habitat needs of this species, although in general, its habits are probably similar to other species of intermountain pocket gophers. Additionally, protection is complicated because pocket gophers are considered pests by many, and they have no protection under Wyoming State law.

3.5.1.8 Western Yellow-billed Cuckoo

The Yellow-billed Cuckoo (*Coccyzus americanus*), western subspecies, is a neotropical migrant, which winters in South America and breeds in the western United States. It is a candidate species for listing under the ESA and a BLM sensitive species. The preferred habitat is open woodlands near streams, shrublands, and dense thickets (Animal Diversity Web 2008). Breeding occurs from mid- to late-May and clutches are typically one to five eggs. Within one month after hatching, the fledglings leave the nest and forage on their own. Juvenile and adult birds feed primarily on insects, frogs, and some fruits and seeds (Animal Diversity Web 2008). The Yellow-billed cuckoo may occur in Sweetwater County (USFWS 2008), but no records document their occurrence in the Project Area (WYNDD 2008).

3.5.2 BLM Sensitive Species

The BLM sensitive species that may be present in the Project Area are discussed below and include mammals, birds, reptiles, amphibians and fish.

3.5.2.1 Mammals

BLM sensitive mammal species that potentially occur in the proposed Project Area include the pygmy rabbit, white-tailed prairie dog, Wyoming pocket gopher, Townsend's big-eared bat (*Corynorhinus townsendii*), and spotted bat (*Euderma maculatum*). The pygmy rabbit, white-tailed prairie dog, and Wyoming pocket gopher were discussed in sections 3.5.4, 3.5.5, and 3.5.7.

Townsend's Big-eared Bat

The Townsend's big-eared bat is a BLM sensitive species and is dependent upon caves or mine entrances for shelter (Sherwin et al. 2000). There is some evidence they may utilize trees as temporary day roosts (Miller et al. 2003). There are few trees in the proposed seismic exploration area, and most trees are cottonwoods associated with riparian areas are located in canyon bottoms occurring on private lands.

Spotted Bat

The spotted bat is a BLM sensitive species known to occur in a wide variety of habitats from desert scrub to coniferous forest, although it most often observed in low deserts and basins and

juniper woodlands (WGFD 2005a). It generally roosts in cracks and crevices on cliffs and canyons (Wai-Ping and Fenton 1989; WGFD 2005a). The spotted bat also may occasionally roost in buildings, caves, or abandoned mines, although cliffs are the only roosting habitat in which reproductive females have been documented (WGFD 2005a). Its distribution in Wyoming is still unknown, although it may be expected to occur throughout western Wyoming and perhaps statewide in suitable habitat (WGFD 2005a). The escarpments along Canyon Creek and Owl Canyon and the scattered rock outcroppings in the proposed Project Area may provide some, albeit marginal, habitat.

3.5.2.2 Raptors

The BLM has mapped raptor nest sites occurring in the Green River planning area. A number of active and inactive nests are known to occur throughout the proposed Project Area. No focused nest surveys were conducted in August 2008 because seismic activities would occur outside the breeding and nesting season.

Peregrine Falcon

The Peregrine Falcon (*Falco peregrinus*) is a BLM sensitive species and occurs in the BLM Rock Springs Field Office planning area. The falcon is protected by the Migratory Bird Treaty Act of 1918. The peregrine falcon's breeding and nesting habitat is found on cliffs, rocky outcrops, ledges, and holes overlooking open areas. Potential nesting sites occur along the steep escarpments within Owl Canyon in the southeastern corner of the proposed Project Area, and along Four J Rim on the southern boundary of the proposed Project Area. No individuals were observed during the August 2008 wildlife survey (TEC 2008b).

Ferruginous Hawk

The ferruginous hawk (*Buteo regalis*) is a BLM sensitive species and occurs in the Rock Spring Field Office planning area. The ferruginous hawk is protected by the Migratory Bird Treaty Act of 1918. The ferruginous hawk's breeding and nesting habitat is found in the prairie shrublands, plains in the foothill grasslands, riparian areas and rocky outcrops. No ferruginous hawks were observed during the August 2008 wildlife field survey (TEC 2008b).

Burrowing Owl

The burrowing owl (*Athene cunicularia*) is a BLM sensitive species and a Wyoming Species of Special Concern (WGFD 2005b, WYNDD 2008). It nests primarily in the underground burrow systems of various rodents, including prairie dogs (Zarn 1974). This species has been studied in black-tailed prairie dog (*Cynomys ludovicianus*) colonies (Butts 1973, Koford 1958, Olendorff 1973), but little is known about their occurrence in white-tailed prairie dog colonies (*C. leucurus*). The burrowing owl is considered uncommon in the Wyoming and may be declining in numbers (WGFD 2005a). Habitat destruction and rodent control are believed responsible for reducing owl numbers in the state (WGFD 2005a). These data seem to substantiate casual observations that burrowing owls are less numerous on white-tailed prairie dog colonies than on black-tailed prairie dog colonies. Reasons for these differences may be found in the variation of colony characteristics between black-tailed and white-tailed prairie dogs.

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Factors identified as essential for good burrowing owl habitat include openness, short vegetation, and burrow availability (WGFD 1977). White-tailed prairie dog colonies may contain fewer burrowing owls because they are generally less open and contain taller vegetation (Hoogland 1981) than black-tailed prairie dog colonies. Martin (1983) observed burrowing owls in white-tailed prairie dog colonies in Sweetwater County. Twenty-six small, isolated white-tailed prairie dog towns were mapped during a wildlife field survey conducted in August 2008 (TEC 2008b). Of these colonies, only four small towns (< 10 acres) had active white-tailed prairie dogs. Another 18 colonies mapped by BLM occur in the proposed Project Area are abandoned. Active colonies appeared in general decline (e.g., collapsed and debris-filled burrows), and only a few individuals were observed. No evidence of burrowing owl nesting or burrow use (e.g., fecal or cough pellets) were observed during the August 2008 field survey (TEC 2008b).

3.5.2.3 Migratory Birds

Sensitive migratory birds that may occur in the proposed Project Area include the loggerhead shrike, sage thrasher, sage sparrow, and Brewer's sparrow. These species typically utilize the sagebrush steppe shrub communities found throughout the proposed Project Area.

Loggerhead Shrike

The loggerhead shrike (*Lanius ludovicianus*), a BLM Sensitive Species and a Wyoming Species of Special Concern (WGFD 2005b, WYNDD 2008), is a migratory songbird that is widely distributed across North America. It is irregularly found in Wyoming, although it can occasionally be found near the Flaming Gorge area (Keinath and Schneider 2005). The loggerhead shrike is found in prairie and scrub areas in Wyoming, and inhabits edge habitat. It uses open areas with scattered shrubs and trees for foraging, adjacent to dense shrubs or trees used for nesting. Scattered trees and shrubs are also used as perches for hunting. The loggerhead shrike typically nests on the edge of scrub or forest lands, although it will nest in other types of habitat, such as mature sagebrush, if the preferred habitat is not available. Because this species has shown a marked decline in abundance throughout its range (Keinath and Schneider 2005), habitat preservation and restoration is a primary conservation goal in Wyoming. The loggerhead shrike was not observed during the wildlife survey conducted in August 2008 (TEC 2008b).

Sage Thrasher

The sage thrasher (*Oreoscoptes montanus*), a BLM sensitive species and a Wyoming Species of Special Concern (WGFD 2005b, WYNDD 2008), is a common summer inhabitant in western Wyoming. The thrasher is considered a sagebrush obligate species, and occupies shrubland where sagebrush is present and prefers areas with tall sagebrush and low grass cover (WGFD 2005a). The sage thrasher migrates in late winter/early spring and early fall between breeding areas and wintering areas. It is designated by Wyoming as a species of special concern because of declining habitat and increasing habitat vulnerability. State conservation goals include monitoring and maintaining large tracts of unfragmented sagebrush habitat (WGFD 2005a). The sage thrasher was observed during the August 2008 wildlife survey (TEC 2008).

Sage Sparrow

The sage sparrow (*Amphispiza belli*) is a BLM sensitive species and a Wyoming Species of Special Concern (WGFD 2005b, WYNDD 2008). The WGFD classifies it as a species of special concern because populations are declining, and because its habitat is vulnerable. The sage sparrow is a common summer resident in Wyoming. It is a sagebrush obligate species that inhabits prairie and foothills shrubland habitat where sagebrush is present and prefers shrublands with tall shrubs and low grass cover. It also requires large blocks of unfragmented habitat to successfully breed and survive (WGFD 2005a). The sage sparrow was observed during the August 2008 wildlife survey (TEC 2008).

Brewer's Sparrow

The Brewer's sparrow (*Spizella breweri*) is a sagebrush obligate and is a BLM sensitive species that occurs in the RSFO planning area. Brewer's sparrow is found throughout Wyoming and is a common summer resident. Brewer's sparrow is also found in other shrublands, such a mountain mahogany. It prefers areas with abundant scattered shrubs and short grass (WGFD 2005a). Brewer's sparrow is listed as a Wyoming Species of Special Concern because of declining breeding populations and nesting habitat vulnerability (WGFD 2005b). This species was observed in the Project Area during the 2008 wildlife survey (TEC 2008b).

Mountain Plover

The mountain plover (*Charadrius montanus*) is a BLM sensitive species and a Wyoming Species of Special Concern (WGFD 2005b, WYNDD 2008). The mountain plover is considered a common summer resident in Wyoming, with a statewide population of approximately 3,400 (range 2,270 to 4,430). Mountain plover populations have been declining for many years. As a result, the species was proposed for listing under the Endangered Species Act. The proposal was later withdrawn by the USFWS in 2003, because the agency determined that the species was more common than previously believed (Cornell Lab of Ornithology 2008).

The mountain plover has a narrow range of habitat requirements combined with a high degree of site fidelity, which increases its vulnerability to impacts at traditional breeding sites (Dinsmore 2003). Disturbance, like fire or grazing, seems necessary to meet the specific habitat requirements of the plover, and may provide secondary benefits such as increased food resources (Dinsmore 2003). The mountain plovers in Utah and western Wyoming nest in the sagebrush steppe with taller vegetation. Throughout their range, mountain plovers selectively nest on active prairie dog colonies, especially those of black-tailed prairie dogs (Knowles et al. 1982, Olsen-Edge and Edge 1987, Dinsmore 2001), but also occasionally those of the white-tailed prairie dog (Ellison-Manning and White 2001). Soil type is not known to be a factor in nest-site selection (Dinsmore 2003).

3.5.2.4 Reptiles and Amphibians

Midget faded Rattlesnake

The midget faded rattlesnake (*Crotalus viridis concolor*) is a rare species that is common within its range. It is a BLM sensitive species and occurs in the Rock Springs Field Office planning area. Its range in Wyoming is limited to the lower Green River valley from Green River and

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Rock Springs to the Utah-Wyoming border (Travsky and Beauvais 2004). Elsewhere it occurs in northeastern Utah and northwestern Colorado (WGFD 2005a). This species is typically found at elevations below 7,000 feet in areas with steep, rocky canyon slopes with cover from outcroppings along the canyon walls. The preferred habitat of the midget faded rattlesnake is in outcrop areas where sagebrush is abundant (Houston 2005). The midget faded rattlesnake hibernates in dens much of the year. In early May, the snakes begin to emerge to breed and feed. If the female is gravid, she will typically not venture more than 60 feet from the den. The proposed Project Area is located outside the known geographic range and elevation of the midget faded rattlesnake in Wyoming.

Northern Leopard Frog

The northern leopard frog (*Rana pipiens*) is a BLM sensitive species and occurs in the Rock Springs Field Office planning area. The northern leopard frog was once one of the most common and widespread amphibians in the United States. However, populations are declining throughout its range. Northern leopard frogs are commonly found around beaver ponds in Wyoming, and winter in ponds, buried in the mud (WGFD 2005a).

The northern leopard frog breeds from mid-March through July, emerging when daytime high temperatures reach 59 degrees F (NatureServe 2008c). Females lay round clusters of eggs in shallow, nonflowing areas of permanent waters or seasonally flooded areas near permanent pools (NatureServe 2008c). The feeding habits of juveniles and adults differ, with juveniles feeding on algae and adults on insects. The northern leopard frog hibernates during the winter (Biological Diversity 2001). In many cases, they use a deep pond during aestivation (a state of inactivity and reduced metabolic activity, similar to hibernation that occurs during dry or hot seasons) and a shallower one for breeding (WGFD 2005a).

Great Basin Spadefoot Toad

The great basin spadefoot toad (*Spea intermontana*) is a BLM sensitive species and occurs in the Rock Springs Field Office planning area (BLM 2002). It inhabits areas with spring seeps and permanent and temporary waters. Although the spadefoot toad appears to prefer sagebrush communities below 6,000 feet in elevation, it has been found at elevations to 9,200 feet (Baxter and Stone 1980, WGFD 2005a, Buseck et al. 2005). The spadefoot toad requires loose soil to burrow below the surface and escape the adverse environmental conditions (e.g., drought, winter) to avoid desiccation (Buseck et al. 2005). In Wyoming, this species is most abundant west of the Continental Divide in the Wyoming Basin and the Green River Valley (Baxter and Stone 1980). This species has been reported as much as 15 feet below ground (WGFD 2005a), though Buseck et al. (2005) cited studies that suggested that burrows excavated by rodents and small mammals to about 3-4 feet were more typically used.

Breeding occurs between May and July, usually in temporary water formed after heavy rains. Little is known about the activity and movements of spadefoots outside the breeding season (Buseck et al. 2005).

Different types of habitat are required for Great Basin spadefoot survival: overwintering burrow sites, temporary breeding ponds and foraging areas (WGFD 2005a). They may travel long distances between foraging, breeding, and hibernation sites, but little is known about their

movement patterns (WGFD 2005a). Tanner (1939) reported that breeding adults in Utah occupying desert habitats are associated with springs and may move 20 to 50 miles. Buseck et al. (2005) cited studies that suggested movements were up to about three miles. These studies suggest that the Great Basin spadefoot occupies a tenuous niche, likely giving it stringent habitat requirements and a need for safe passages between habitats utilized seasonally (WGFD 2005a).

3.5.2.5 Fish Species

Colorado River Cutthroat Trout

The Colorado River Cutthroat Trout (CRCT) (*Oncorhynchus clarki pleuriticus*) is a BLM-listed Sensitive Species and a State Species of Special Concern (WYNDD 2008). No CRCT are known in creeks within the proposed Project Area; however, the CRCT is of primary management concern in the Vermillion Creek watershed, located north and east of the proposed Project Area. The CRCT is the only trout native to the Green and Little Snake river drainages in Wyoming. The CRCT now occupies less than 1% of its historic range (CDOW 2006). The CRCT is currently being evaluated by the U.S. Fish and Wildlife Service (USFWS) for listing under the Endangered Species Act (ESA).

According to the Green River RMP, all resource and land uses are to be managed in support of watershed stability and CRCT habitat management objectives because watershed function has been degraded in many headwater stream habitats by a variety of anthropogenic activities and fire suppression resulting in the decline or loss of aspen and beaver (BLM 1997 and WGFD 2005a). CRCT begin spawning on the declining side of high flows in the late spring and continue through early July at higher elevations (WGFD 2005a).

3.5.2.6 Sensitive Plant Species

There are no known sensitive plant species in the proposed project (J. Glennon, BLM RSFO Botanist. Personal communication with S. Bamberg, August 25, 2008).

3.5.3 Other Species of Concern

Golden Eagle

The golden eagle (*Aquila chrysaetos*) is found in Sweetwater County, Wyoming. The eagle is protected by the Bald and Golden Eagle Protection Act of 1962. The golden eagle's breeding and nesting habitat occurs in open areas near trees or cliffs. Potential nesting sites occur along the steep escarpments within Owl Canyon in the southeastern corner of the proposed Project Area, and along Four J Rim on the southern boundary of the proposed Project Area (TEC 2008b). Three golden eagles were observed in the proposed Project Area during the wildlife survey conducted in August 2008 (TEC 2008b).

Prairie Falcon

The prairie falcon (*Falco mexicanus*) occurs in Sweetwater County, Wyoming. The falcon is protected by the Migratory Bird Treaty Act of 1918. The falcon's breeding and nesting habitat is found on cliffs, rocky outcrops, ledges and holes overlooking open areas. Potential nesting sites occur along the steep escarpments within Owl Canyon in the southeastern corner of the proposed

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Project Area, and along Four J Rim on the southern boundary of the proposed Project Area(TEC 2008b). One individual was observed south of Scrivner Butte, which is located on the northern edge of the proposed Project Area (TEC 2008b).

Northern Harrier

The northern harrier (*Circus cyaneus*) is found in Sweetwater County, Wyoming. The harrier is protected by the Migratory Bird Treaty Act of 1918. The northern harrier's breeding and nesting habitat can be found in the prairie or the foothills and often occurs in grasslands and marshlands. Six observations of northern harriers were made during the wildlife survey conducted in August 2008 (TEC 2008b).

Red-tailed Hawk

The red-tailed hawk (*Buteo jamaicensis*) is found in Sweetwater County, Wyoming. The hawk is protected by the Migratory Bird Treaty Act of 1918. The red-tailed hawk breeding and nesting habitat occurs below 9,000 feet and is associated with open foraging areas with nearby trees or cliffs. More than 10 red-tailed hawks were observed during the wildlife survey in August 2008 (TEC 2008b).

Other Migratory Birds

Migratory bird species that are likely to nest in the proposed Project Area include horned lark (*Eremophila alpestris*), lark bunting (*Calamospiza melanocorys*), and grasshopper sparrow (*Ammodramus savannarum*). These species are protectd under the Migratory Bird Treaty Act of 1918. Only the horned lark was observed during the August 2008 field surveys (TEC 2008b).

3.6 WILDLIFE AND FISHERIES

3.6.1 Big Game Species

The term big game includes those large mammals that are typically hunted for recreational purposes and, in the proposed Project Area, include mule deer, pronghorn, elk, and moose. Habitat for these species is typically defined by the ranges that are used seasonally, i.e., winter range, spring range, or summer/fall range.

3.6.1.1 Big Game Migration Corridors

Big game migrate seasonally to find suitable foraging and thermal conditions, i.e., warmer, low elevations in winter, and cooler, high elevations in summer. Forage availability, ambient temperatures that minimize stress, avoiding impediments to movement (i.e., deep snow), suitability of parturition areas, and avoidance of predation are all factors influencing seasonal habitat selection (Marcum 1975). Migration corridors are routes between seasonal ranges. In the Pine Mountain area, elk groups consisting of bulls, and groups consisting of cows, yearlings, and calves converge as they migrate west and east to lower elevations during late summer and fall (M. Zornes, WGF D Green River Wildlife Management Coordinator. Personal communication with D. Kane, TEC, Inc. July 17, 2008). The groups separate again returning to the higher elevations in late spring and early summer as snows recede and preferred forage becomes more available.

3.6.1.2 Pronghorn Antelope

Pronghorn antelope (*Antilocapra americana*) occur in the proposed Project Area. The WGFD has designated three ranges utilized by pronghorn antelope in the vicinity of the area: spring/summer/fall pronghorn range, winter/yearlong pronghorn range, and crucial winter/yearlong pronghorn range. About one-third of the proposed Project Area contains pronghorn spring- summer-fall range (Appendix A, Figure 3-2).

The pronghorn population in the proposed Project Area is designated by WGFD as the South Rock Springs Herd (Herd Unit #412, Hunt Area #112), and may also include animals from the Bitter Creek Herd Unit (Unit #414, Hunt Area #58). The population size of the South Rock Springs herd was estimated to be 5,900 individuals in 2006, 9 percent below the WGFD objective of 6,500 individuals. The population size of the Bitter Creek herd was estimated to be 13,700 individuals in 2006, which is 42 percent below the WGFD objective of 25,000 individuals, which occurred in the 1990s. While current numbers are below the long-term population objective, the number of individuals is slowly trending upward. According to the WGFD (2007a), the number of individuals is unlikely to reach the previous population level, due to accelerated natural gas production combined with long-term drought.

3.6.1.3 Elk

Elk (*Cervus canadensis*) are common throughout the proposed Project Area and are part of the South Rock Springs Herd. The WGFD considers this herd as an interstate herd, with groups moving between Wyoming, Utah and Colorado (M. Zornes, WGFD Green River Wildlife Management Coordinator, personal communication with D. Kane, TEC, Inc. on July 17, 2008). The population size of the herd was approximately 1,500 animals in 2006, above the WGFD objective of 1,000 animals. Accurate population estimates and management in this area are problematic because the herd ranges into Colorado and Utah. Aggressive management through hunting has been utilized, with targeted harvests of 200 bulls, 235 cows, and 40 calves during the 2007 hunting season. Average age of bulls harvested in 2006 was 4.2 years, down slightly from the 2005 average of 4.4. The proposed Project Area is located within Hunt Unit 32 (Appendix A, Figure 3-3).

The WGFD has designated two elk ranges in the proposed Project Area: Yearlong elk range occurs in two-thirds of the area; some crucial winter/yearlong elk range occurs in the western end of the proposed Project Area (Appendix A, Figure 3-3).

3.6.1.4 Mule Deer

Mule deer (*Odocoileus hemionus*) are common inhabitants of the proposed Project Area. The proposed Project Area is within crucial winter/yearlong mule deer range (Appendix A, Figure 3-4). The mule deer population in the proposed Project Area is designated by WGFD as the South Rock Springs Herd (Unit # 424 and Hunt Unit 102; Appendix A, Figure 3-4). This herd size is below the WGFD objective of 11,750 individuals, with an estimated population of 6,600 individuals in 2006 (WGFD 2007a). The population is slowly increasing due to natural fires and BLM prescribed burns (WGFD 2007a). However, the recent drought has decreased fawn survival and mature buck recruitment. Average age of sampled bucks has decreased by almost one year from 4.7 in 2005 to 3.9 in 2006.

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3.6.1.5 Moose

Moose (*Alces alces*) are part of the Uinta herd (Hunt Area #44) and are periodic inhabitants, though local individuals primarily reside in the Vermillion Creek drainage near Pine Mountain, west and north of the proposed Project Area. The Uinta moose herd is shared and managed cooperatively with Utah. The herd unit objective is 900 moose (WGFD 2007a). Due to the interstate nature of this herd, no working model exists and estimates are of low reliability. A significant portion of the occupied moose habitat is on private land, so landowner tolerance is also an issue when it comes to moose numbers (WGFD 2007a).

During the 2006 season Hunt Area 44 was added to the herd unit. There have been increasing numbers of moose that have pioneered into this area. This has created some concern to habitat managers since these moose are impacting the ability to bring back riparian shrubs in this dry area. The objective of these licenses is to decrease moose numbers and keep them from establishing in this area. During the 2006 season, hunters harvested three moose on the five tags that were issued (WGFD 2007a). During the 2007 season, hunters harvested three moose on four tags (WGFD 2008).

Moose fecal pellets were observed in the canyon bottom of Coyote Creek during the August 2008 field surveys conducted in the vicinity of the proposed Project Area. It is believed that these animals were utilizing the small, isolated patches of riparian willow associated with Coyote Creek and associated springs (TEC, Inc. 2008b).

3.6.2 Fisheries

There are no known fisheries on BLM-administered public lands within the proposed Project Area.

3.7 CULTURAL RESOURCES AND NATIVE AMERICAN RELIGIOUS CONCERNS

Cultural resources are the products of human history in the form of material items produced by human workmanship or use and elements of the natural environment that were altered by human activities. Within the region containing the Horseshoe Basin 3D seismic project, examples of cultural resources include historic artifacts, buildings, mines, trails and roads, and a telephone line dating from the last two centuries, and archeological sites with stone tools and flaked debris from their production, remnants of animals and plants produced by food processing, the remains of fires, rock art, and other evidence of ancient human activity. Physical manifestations of human activity must normally be more than 50 years old to be considered cultural resources, but sites, structures or objects related to exceptional historical events within the past 50 years may also be considered to be cultural resources.

Cultural resources may also include Traditional Cultural Properties (TCPs), which are sites and objects critical to a living community's beliefs, customs, and practices. TCPs may include religious or ceremonial sites, other locations important in the belief systems of the community, and areas used by the community for gathering or otherwise producing materials used for traditional ceremonial, spiritual, medicinal, or subsistence purposes. TCPs may be topographical features; stone alignments, rock art, or other physical artifacts; sources of plants or other materials; or areas without obvious physical manifestation of the site's cultural significance.

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The cultural context of the general Wyoming Basin, including the Horseshoe Basin 3D seismic study area, includes prehistoric Native American occupation and use from at least 11,500 years to about 500 years before present (BP), proto-historic Native American occupation and use from roughly 500 to 150 years BP, and the historic period in the past 150 years. The Wyoming Basin has been considered by archaeologists to be part of the Northwestern Plains culture area (Frison 1978, 1991), but research beginning in the late 1970s also indicates that prehistoric cultures in the study region had much in common with cultures from the Great Basin cultural area to the west and southwest. A cultural chronology for the Wyoming Basin developed by Metcalf (1987) and revised by Thompson and Pastor (1995) addressed the influences of the Great Basin cultures in western Wyoming, and that chronology is applicable to the Horseshoe Basin 3D seismic study area: generally, Paleoindian Period (11,500 to 7,500 B.P.), Archaic Period (7,500 to 1,500 B.P.), and Late Prehistoric Period (1,500 to 500 B.P.). Numerous archaeological sites from all of these prehistoric culture periods have been found in the Wyoming Basin, and sites dating from the Late Prehistoric Period are especially common.

The Protohistoric Period is considered to be the period after technology introduced by Europeans began to affect the lifeways of the Native Americans, but before actual European contact with Native Americans in this region. The introduction of the horse probably elicited the most profound impact on the Native American groups of the region, allowing more efficient hunting of bison and other large plains animals and greater mobility for groups in general.

Wyoming's historic period may have begun in A.D. 1742-1743, when French Canadian fur traders may have travelled from Indian villages on the Missouri River to as far southwest as the Bighorn Mountains. Other fur trappers and traders definitely penetrated the state in the first decade of the 19th century, and in 1812 one such party travelled a route that would become a portion of the Oregon-California-Utah Trail. The first non-fur trade related passage over the trail was in 1834, and substantial overland emigration along the trail began in 1840. Multiple variations of the Oregon-California-Utah Trail developed, especially in southwestern Wyoming. The discovery of gold in California in 1848 spurred overland emigration, including along two new routes, the Overland Trail and the Cherokee Trail. All of the Overland Trail routes were substantially to the north of the current study area.

Sweetwater County was organized in 1867, slightly in advance of the completion of the Union Pacific Railroad westward from Cheyenne. Rock Springs became an important railroad center because of the presence of coal and water, and the town also became a regional trade center, with wagon and stage roads extending to small mining and agricultural settlements. One such route was the Rock Springs to Browns Park Wagon Road, which ran southwestward from Rock Springs to rural communities and settlements in Browns Park in Colorado and Utah, and which also served isolated ranches in southern Sweetwater County, Wyoming. Stagecoach and mail service was established along the route, but formal freight service was apparently never established because of the sparseness of population. In 1926, significant discovery of oil and gas was made at Hiawatha Dome, about eight miles east of the Horseshoe Basin 3D project area. As a result, much of the Rock Springs to Browns Park Wagon Road was crowned-and-ditched to become a major thoroughfare, and some portions were ultimately paved to become State Highway 430. The portion of the road south of the divergence to Hiawatha Camp was not altered, and this portion is within the current study area. More than 40 years after establishment

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of the road, a telephone line was installed generally along the road route prevailing at the time. The telephone line operated from roughly 1914 to 1930 (Johnson 1999: 23-24).

The entire Horseshoe Basin 3D project area is about 6 miles by 5 miles and encompasses about 14,400 acres, but the actual proposed maximum disturbance area is only about 88 acres. Wyoming SHPO Cultural Resources Records Office (WYCRO) files were consulted on July 7, 2008, for full sections containing any location of activities for the proposed project. WYCRO records indicated that 26 cultural resource sites had been recorded within the file search area. Of the previously recorded sites, half (13) are prehistoric and half are historic in nature. Eight of the prehistoric sites are lithic scatters, and four are open camp sites; two sites of each type also contain groundstone, and one of the open camp sites is also notable for the presence of bison bone. One site is a prehistoric cairn. Lithic scatters are composed primarily of debris from the production of flaked stone tools at various stages. In the vicinity of the current project, lithic scatters are typically sparse in content and do not contain tools that are particularly diagnostic of temporal period or cultural affiliation. Prehistoric cairns may be associated with lithic scatters, but are also found alone. Cairn sites may represent a number of prehistoric behaviors including burials, and in general are considered eligible for nomination to the NRHP. The diverse artifact assemblages from camp/habitation sites imply they were occupied over an extended period, and camp/habitation sites may also include architectural features such as tipi rings or the remnants of house pit structures.

Of the 13 historic sites on record, 5 are ranches or ranching homesteads (containing structures, corrals, etc.), 2 are stockherding camps, 1 is an historic trash dump containing a hearth/fire-cracked rock, 1 site consists of unknown historic graves (cemetery), and 1 site consists of ranch related wagon parts. The remaining three historic sites are linear in nature and include the Rock Springs to Browns Park Wagon Road, an associated telephone line, and the Cherokee Trail.

The Graham Ranch (48SW3873) and the Canyon Creek Ranch (48SW3874) are each occupied ranches located entirely on privately owned land along the southern margin of the project area. The Canyon Creek Ranch is outside the project boundary. The Graham Ranch lies approximately 15 miles northwest of the Canyon Creek Ranch and within the proposed project boundary. The Schofield Ranch (48SW3890) lies on the northern perimeter of the project and consists of abandoned buildings located on a private parcel. A fourth unnamed ranchstead, site 48SW3872, consists of an abandoned house and the ruins of a corral in the southeastern portion of the project area. Site 48SW2800 consists of the remnants of three hand hewn log structures (including a ruined cabin), a dugout cellar, a trash midden, and scattered stoneware and earthenware sherds and glass fragments. The site is presumed to date to the late 19th century and is located outside the current project boundary. None of these ranch or homestead sites had been formally evaluated for National Register eligibility by July 2008, and only site 48SW2800 had actually been formally recorded.

Previously recorded portions of the Cherokee Trail are within land sections included in the files search, but the historic trail is well to the north of the proposed Project Area and is not expected to be directly or indirectly affected. Five miles of the previously recorded linear site 48SW3865 (Rock Springs to Browns Park Wagon Road) pass through the eastern portion of the project, and the recording of this length of the road was updated as part of the Class III Inventory (see below). Similarly, remnants of the Rock Springs to Browns Park Telephone Line (48SW15703)

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were previously indicated to exist adjacent to the Wagon Road, and some remnants were recorded during the Class III inventory for the current project.

WYCRO records include 14 reports of cultural resources investigations within the files search area up to July 2008. WYCRO data indicate that relatively few Class III block and combination block/linear surveys have been conducted within the project area in the past, and most of these were small scale efforts ranging from 1 to 30 acres completed for the purposes of range improvements (reservoirs), pipelines, and well pads. The small sample of previously inventoried acreage in the project vicinity does not provide sufficient basis for estimation of site density for the area as a whole. WYCRO records also show that a number of linear cultural resource inventories have been conducted within the Horseshoe Basin 3D files search area. A comparable 3D seismic project, the PGS Onshore Canyon Creek 3D, was conducted nearby in 2004, covering approximately 2,742 linear acres of federal surface. This undertaking resulted in the identification and recordation of 9 cultural resource sites, yielding a site density rate of 1 site per 304 linear acres, a relatively low rate of site occurrence. However, linear survey of this kind may not be a dependable index of site density because of selective placement of survey transects, including intentional BLM offsets from known cultural resources.

A Class III intensive level cultural resources survey was conducted for all activity areas proposed for the current Horseshoe Basin 3D project in July, August, and September 2008 (Jones and Fassler 2008). Prior to the survey, receiver points were pin-flagged at 220-foot intervals, with parallel receiver lines spaced 1,320 feet apart. Source points were also staked at 220-foot intervals, with parallel source lines 1,760 feet apart. The surveyed diameter surrounding each heli-portable drill point was 100 feet. A total of 1,497 heli-portable shot holes and the 100-foot wide corridor between these points were surveyed, cumulatively totaling 848 acres of inventory. A 100-foot wide travel corridor following all existing two-track roads was also inspected for cultural resources, totaling 40.5 linear miles or 491 acres. Also inventoried on BLM-administered land were three project survey base stations totaling 2 acres, four 6-acre helicopter landing zones (LZs) totaling 24 acres, and two 'test hole sites' that total 1 acre.

Two previously recorded cultural resources and seven additional cultural resource sites were recorded during the Class III inventory for this project. The two previously recorded properties are the Rock Springs to Browns Park Wagon Road (48SW3865) and the Rock Springs to Browns Park Telephone Line (48SW15703). Newly recorded prehistoric sites are five lithic scatters (48SW17145, 48SW17146, 48SW17147, 48SW17149, and 48SW17151), and one cairn (48SW17148). Also recorded were one historic artifact scatter apparently related to stockherding (48SW17150) and five isolate finds or isolated resources.

Initially proposed project activity areas contain only one property that has officially been determined eligible for the NRHP, the Rock Springs to Browns Park Wagon Road (48SW3865). The Rock Springs to Browns Park Telephone Line (48SW15703) has been recommended by a consultant to be eligible for nomination to the NRHP, but SHPO has not concurred in its eligibility. An historic artifact scatter (48SW17150) has been recommended by a consultant to be not eligible for the NRHP. Five other lithic scatters or camp sites (48SW17145, 48SW17146, 48SW17147, 48SW17149, and 48SW17151) have been recommended to be unevaluated pending archaeological testing. An isolated stone cairn (48SW17148) is unevaluated and will be avoided by ¼ mile.

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3.8 PALEONTOLOGY

Rocks of early to middle Eocene age exposed as bedrock in the Horseshoe Basin include the Tipton and Wilkins Peak members of the Green River Formation and the Niland Tongue and Cathedral Bluffs Member of the Wasatch Formation (Bradley 1964; Roehler 1973).

3.8.1 Green River Formation

3.8.1.1 Tipton Shale Member

The Tipton Shale Member crops out in the eastern part of the proposed Project Area, between Scrivner Butte to the north and Four J Rim to the south. The Tipton Shale consists of gray to brown oil shale, interbedded with gray brown oolitic limestone, gray-brown siltstone and shale, tan to brown algal limestone, and gray, fine-grained mollusk-bearing sandstone (Winterfeld 2008).

Vertebrate fossils, including fish remains and the teeth and bones of mammals, have also been reported from deltaic sandstone deposits in the Tipton Shale member in southeastern part of the Washakie Basin (Roehler et al. 1988). It is unknown if similar deposits could be found in the proposed Project Area (Winterfeld 2008).

3.8.1.2 Wilkins Peak Member

The Wilkins Peak Member crops out above the Tipton Shale along the sides of Scrivner Butte and Four J Rim. Two distinct lithologies of the member occur in the area (Winterfeld 2008). To the north the member consists chiefly of interbedded brown oil shale, gray and brown mudstone, gray claystone, tan and gray-brown limestone, gray oolitic limestone, tan siltstone, and gray, very fine grained sandstone. To the southeast along the lower reaches of Four J Rim, the member consists chiefly of conglomerate composed of rounded cobbles and pebbles of gray, tan and red quartzite, chert, and gray limestone, which is interbedded with varicolored tuffaceous mudstone, siltstone, sandstone, and minor amounts of tan algal limestone (Winterfeld 2008).

3.8.2 Wasatch Formation

In the proposed Project Area, the Wasatch Formation consists of the Niland Tongue and Cathedral Bluffs Member. Both members are well known to produce fossils of scientific importance (Winterfeld 2008).

3.8.2.1 Niland Tongue

The Niland Tongue crops out below the Tipton Shale in several small patches in the eastern part of the proposed Project Area (Winterfeld 2008). Rocks of the tongue consist of drab-colored sandstone, mudstone, shale, oil shale, and coal that accumulated chiefly in smaller lakes, ponds, bogs, swamps, and floodplains following restriction of the lake in which the Luman Tongue of the Green River accumulated (Winterfeld 2008). The Niland Tongue is recognized only in the same areas that the Luman Tongue is recognized. Where the Luman is absent, the Niland Tongue overlies the main body of the Wasatch, and the two are indistinguishable (Winterfeld 2008).

Fossils of plants, invertebrates, and vertebrates and their tracks and traces are known from the Niland Tongue (Roehler 1987c). Plant fossils, including the imprints of leaves and stems and carbonized wood, are common. Pollen and spores are present throughout organic-rich sediments in the unit, representing at least 25 genera of land plants. Invertebrate fossils are fairly abundant, with ostracods being pervasive in oil shale and limestone and often found in association with molluscs. Fossil molluscs comprise two distinctive molluscan assemblages including a *Goniabasis*, *Viviparus* and *Plesielliptio* assemblage and a *Biomphalaria*, *Omalodiscus*, and *Gyraulus* assemblage. The assemblages are important environmental indicators, with the *Goniabasis*, *Viviparus*, and *Plesielliptio* assemblage diagnostic of onshore and offshore lake environments and the *Biomphalaria*, *Omalodiscus*, *Gyraulus* assemblage diagnostic of pond and marsh environments (Hanley 1976). Some shale layers preserve coquina layers that are composed of chiefly of the turreted prosobranch *Goniabasis*.

Fossil specimens of mammals and reptiles occur as isolated bones or teeth and rarely as articulated skeletal parts in sediments of the Niland Tongue that accumulated in floodplain and pond environments. Mammals described from the member include the remains of at least 15 different genera of insectivore, primate, rodent, carnivore, condylarth (a Paleocene placental mammal), artiodactyl (even-toed mammals; e.g., deer family, pigs, goats, camels), and perissodactyl (odd-toed mammals; e.g., rhinos, horses). Fish fossils, including the scales and bones of teleost (boney) fish, the holostean gar-pike *Leposteus*, and the freshwater ray *Myliobatis*, occur in sediments that accumulated in lake environments. Fish scales and ray teeth are common in ant hills developed on shales of the unit in the proposed Project Area. Fish, turtle, and lizard remains have been reported from the Vermillion Creek coal bed, specifically from cores taken from two wells. One core preserved fish bones and fragments of turtle shell. The other included scales, bones, and teeth of fish. Scale and jaws of the heavily scaled lizard *Placosaurus* (*Glyptosaurus*) are also known from the coals (Robbins 1987).

3.8.2.2 Cathedral Bluffs Member

The Cathedral Bluffs Member is exposed as bedrock along the top of Four J Rim, but exposures are generally poor (Winterfeld 2008). The member is composed chiefly of varicolored (chiefly red) sediments that accumulated in fluvial and upland environments surrounding ancient Lake Gosiute. The member interfingers with and is replaced laterally toward the basin center by sediments of the Wilkins Peak Member of the Green River Formation that accumulated in lake environments.

Fossils of plants (wood), vertebrates, and trace fossils have been reported from the Cathedral Bluffs Member throughout southern and central Wyoming (Morris 1954; Honey 1992; Roehler 1991a, 1991b, 1992a, 1992b, 1992c, 1993). Fossil mammals from the member include the teeth and bones of at least 19 genera including marsupials, insectivores, tillodonts (ancient herbivorous mammals with claws and chisel-like teeth), primates, rodents, carnivores, condylarths, dinocerates (herbivorous mammals), perissodactyls, and artiodactyls.

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3.9 RECREATION

3.9.1 Dispersed Recreation

The Green River RMP provides Management Objectives and Actions for each applicable resource. The RMP objectives for recreation management are to:

- Ensure the continued availability of outdoor recreational opportunities sought by the public, while protecting other resources;
- Meet legal requirements for the health and safety of visitors; and
- Mitigate conflicts between recreation and other types of resource uses.

The proposed Project Area encompasses a portion of the Pine Mountain Recreation Use Area. The area is managed to assure its continuing value for recreational opportunities.

The Cherokee Historic Trail passes north of the proposed Project Area. The Browns Park to Rock Springs Stage Road runs through the east side of the proposed Project Area, traversing from the south to north.

There are no numeric data available regarding recreation use in the proposed Project Area. The “BLM Wyoming 2005 Recreation Statistics” indicates there were 1,890,126 recreation visitor-days on BLM-administered lands in Wyoming in 2005. There are no Areas of Critical Environmental Concern (ACEC) occur within or adjacent to the proposed Project Area.

3.9.2 Hunting

The area in the vicinity of the proposed Project Area is popular for hunting, especially for trophy elk and mule deer, and to a lesser extent pronghorn and moose. According to the WGFD, demand for big game permits, especially elk and mule deer, in the area is extremely high (D. Hays, WGFD Game Warden, personal communication with D. Kane, TEC, Inc., July 17, 2008). The adjoining Pine Mountain area is well known for its trophy bull elk and buck mule deer. Upland game birds, primarily sage-grouse, are also hunted in this area.

The proposed Project Area occurs within the following herd units and hunt areas: South Rock Springs Antelope Herd Unit 412 and Hunt Area 112 (Figure 3-2, Appendix A); South Rock Springs Elk Herd Unit 424 and Elk Hunt Area 32 (Figure 3-3, Appendix A); South Rock Springs Mule Deer Herd Unit 424 and Hunt Area 102 (Figure 3-4, Appendix A); Uinta Moose Herd Unit and Hunt Area 44; and Upland Game Hunt Unit 6 (Flaming Gorge).

Elk Hunt Area 32 is relatively small, extending north from the Wyoming-Colorado state line to Sweetwater County Roads 34, 71, 27, and 32. The western boundary of the hunt area is U.S. Highway 191 and eastern boundary is State Highway 430 (SH 430). Mule deer Hunt Area 102 is much larger than Elk Hunt Area 32. The hunt area extends north from the Wyoming-Colorado state line to Interstate 80, and is bound on the west by the Flaming Gorge Reservoir/Green River and on the east by SH 430. The extent of Pronghorn Hunt Area 112 is similar to Mule Deer Hunt Area 102. Hunting season information, number of licenses, hunter success, and recreational days for each of the hunt areas are shown in Table 3-8. The popularity of hunting for pronghorn, elk, and mule deer in these hunt units is largely due to the high hunter success.

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The WGFD provides annual post-harvest information depicting the drawing odds and draw results by hunt area and game species (WGFD 2008). A general summary of 2008 data indicates a nonresident had less than a 0.68 percent chance of drawing an Any Elk license for Elk Hunt Area 32 (313 applicants for two licenses), and a 12.5 percent chance of drawing an Antlerless Elk license (eight applicants for one license). A resident had about a 7.4 percent chance in Area 32 for an Any Elk license (1,136 applicants for 85 licenses) and 39.6 percent chance for an Antlerless Elk license (235 applicants for 93 licenses). A nonresident had a 0.40 percent chance of drawing an Antlered Deer License in Mule Deer Hunt Area 102 (2,162 applicants for 10 licenses) and a resident had only a 8.2 percent chance (3,598 applicants for 298 licenses). Nonresident antelope chances were 1.0 percent (396 applicants for four licenses) and resident odds were 26.1 percent for an Any Antelope License (511 applicants for 135 licenses). Although 14 nonresidents applied for a moose license in Hunt Area 44, WGFD did not issue any licenses to nonresidents; residents had a 1.4 percent chance (172 applicants for one license).

A total of 746 hunters spent 3,934 hunter-days, averaging about 5.3 hunter-days for all species hunted. Overall, these data indicate the high demand for big game hunting permits in the vicinity of the proposed seismic exploration.

The proposed Project Area is part of the Uinta Sage-Grouse Management Unit (Area 5) where the hunting season generally begins in late September and continues for 11 days before ending no later than early October. Three hundred hunters harvested 599 birds (1.9 birds/hunter) in 2007 spending about 645 hunters-days (WGFD 2008); 367 hunters harvested 808 birds (2.2 birds/hunter) in 2006 spending 829 hunter-days (WGFD 2007b).

Table 3-8. 2007 Harvest Data for Elk and Mule Deer in the Proposed Horseshoe Basin Seismic Survey Project Area

Species/Hunt Area	Season Dates	Licenses Sold/ Hunters	Hunter Success (%)	Days/Harvest	Hunter-Days
Hunt Area					
Pronghorn 112	Sept. 20 – Oct. 14	177/161 (limited quota – any antelope)	92.0	3.3	488
		76/61 (doe/fawn)	83.6	4.4	224
Elk 32	Oct. 1 – Oct. 31	99/95 (limited quota – any elk)	48.4	15.9	732
	Oct. 6 – Nov. 30	55/51 (limited quota – antlerless elk only)	41.2	19.4	408
Mule Deer 102	Oct. 15 – Oct. 31	402/374 (limited quota – bucks only)	79.1	6.9	2,039
Moose 44	Oct. 1 – Nov. 30	5/4 (limited quota – any moose, except cow with calf)	75.0	14.3	43

Source: WGFD 2008 (<http://gf.state.wy.us/downloads/pdf/HarvestRpt/2007%20Pronghorn%20Antelope.pdf>
<http://gf.state.wy.us/downloads/pdf/HarvestRpt/2007%20Elk.pdf>
<http://gf.state.wy.us/downloads/pdf/HarvestRpt/2007%20Deer.pdf>
<http://gf.state.wy.us/downloads/pdf/HarvestRpt/2007%20Moose.pdf>

3.9.3 Off-Highway Vehicle (OHV) Management

The Green River RMP (BLM 1997) management objective for OHV management is “to provide opportunity for off-road vehicle use in conformance with other resource management

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objectives.” OHV travel within the proposed Project Area is limited to designated roads and trails by the Green River RMP [see RMP Table 13 (BLM 1997)]. Designated roads and trails are those that are depicted on the current BLM land status map for the area. This limitation applies to all activities involving motorized vehicles. Most OHV use in the area occurs in late summer and throughout the fall during hunting season.

There are no seasonal OHV use restrictions in the area. Generally, over-the-snow vehicle use is subject to the restrictions above unless a site specific analysis determines that exceptions can be allowed. Snowmobile use is very sporadic due to limited snow cover. The winter of 2007/2008 was one of the first where snowmobiling has been possible over an extended time period. However, road access was limited or restricted, due to very limited snowplowing. No BLM transportation planning has been done for the area.

3.10 VISUAL RESOURCES

Visual resource management (VRM) is a system for minimizing the visual impacts of surface-disturbing activities and maintaining scenic values for the future. VRM classes along with the corresponding VRM objectives were established with the Green River RMP (BLM 1997). Visual values were identified through an inventory conducted by BLM personnel. VRM objectives corresponding to the various management classes provide standards for analyzing and evaluating proposed projects.

The VRM Class established for the entire proposed Project Area is Class III. The objective for Class III areas is to design proposed alterations so as to partially retain the existing character of the landscape. Contrasts to the basic elements of form, line, color, and texture caused by management activity may be evident and may begin to attract attention in the characteristic landscape. However, the changes should remain subordinate to the existing characteristic landscape.

The landscape overall is made up of steep slopes formed by deeply eroded drainages between long ridges. Strong horizontal lines in the characteristic landscape are created by long deep ravines and changes in vegetation associated with them. Colors in the characteristic landscape range from tan to brown where soil is exposed. Vegetation colors range from dark green and gray in the background to pale green, medium green and grey in the foreground-middleground. The texture of the landforms is mostly smooth with the exception of scattered rock outcrops. The texture of the vegetation is coarse to medium at the middle to background distances.

The proposed Project Area currently has some natural gas development activity mostly in the Fisher Creek unit. The six existing facilities consist of access roads, wells, and production facilities. They are noticeable and attract attention but are few in number, and not a dominant visual element in the area.

3.11 TRANSPORTATION AND ACCESS

Wyoming State Highway 430 (SH 430) serves as the primary access to the proposed Project Area from Rock Springs. SH 430 can be accessed from Interstate Highway 80, via exit 99, and receives, on average, less than 250 vehicles per day (WYDOT 2008). The stretch of SH 430 from Interstate 80 to the Colorado state line is subject to recurrent winter weather closures from

October to May. The highway is a secondary rural route that may not be cleared until after a winter storm and after other higher priority area roads, closing the road for days.

From 2004-2007, WYDOT (2008) estimated that the 55-mile section of SH 430 from I-80 to the Colorado state line had an accident rate (average = 1.65) equivalent to other Class 7 roads (major rural collector) in Wyoming (average = 1.66). On average, there were 16 accidents per year along SH 430. A majority of the automobile accidents involved wildlife or livestock, and most accidents occurred between dawn and dusk, which is about twice the rate of nighttime accidents (WYDOT 2008). Accidents from all causes resulted in one fatality.

The existing access roads in the proposed Project Area range from improved dirt roads to two-tracks. There are very limited improved roads, most of the main transportation corridors are semi-improved, with two-tracks leading from them. Under the Proposed Action, no new roads would be constructed or upgraded.

Helicopters would be used extensively during the project, which would transport most of the equipment throughout the proposed Project Area. The helicopter would be used throughout the work day for the duration of the project, landing mainly in the proposed staging area, and would be used to carry field crews to source and receiver line sites, as necessary. Large trucks would mobilize and demobilize the equipment and supplies to the project staging area, and would periodically transport additional supplies throughout the proposed Project Area during project operations.

While helicopters would carry equipment most of the time, light trucks would also be used to haul equipment and supplies where nearby road access exists. Daily traffic would generally involve less than 10 light trucks and ATVs traveling in the proposed Project Area. Devon would use a bus to carry workers from Rock Springs to the proposed Project Area. All unimproved roads and two-tracks that are proposed for use have had a Class III archeological clearance performed (Section 3.7), and the clearance was used as the basis for developing a BLM-approved transportation map (Figure 3-5).

3.12 RANGE RESOURCES

The proposed Project Area is encompassed by one grazing allotment that is administered by BLM. This grazing allotment is managed under the direction of the following documents:

- Green River Resource Management Plan (BLM 1997),
- Standards for Healthy Rangelands and Guidelines for Livestock Grazing Management for the Public Lands Administered by the BLM in the State of Wyoming (BLM 2008c),
- Allotment Management Plan.

3.12.1 Pine Mountain Allotment

The Pine Mountain Allotment consists of 74,177 acres and includes 64,160 acres of BLM-administered land, 7,255 acres State of Wyoming land, and 2,762 acres private land. The Proposed Action would occur on 22 percent (15,968 acres) of the allotment. Currently, three permittees are authorized to graze the allotment. One permittee is authorized for cattle grazing year-round (March 1 – February 28) with a maximum of 6,325 AUMs permitted. Another

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permittee is authorized for cattle grazing from May 1 – February 28 with a maximum of 210 AUMs permitted. A third permittee is authorized for sheep grazing from May 1 to October 10 with a maximum of 1,228 AUMs.

The Pine Mountain Pipeline is the only pipeline for livestock water within the proposed Project Area boundary.

3.13 WASTES, HAZARDOUS AND SOLID

BLM defines hazardous materials as any substance, pollutant, or contaminant that is listed as hazardous under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended, 42 USC 9601 et seq., and its regulations. Under CERCLA, the definition of hazardous substances includes any hazardous waste as defined in the Resource Conservation and Recovery Act (RCRA) of 1976, as amended, 42 USC 9601 et seq., and its regulations. The definition does not include petroleum, including crude oil or any fraction thereof that is not otherwise specifically listed or designated as a hazardous substance under CERCLA Section 101(14), 42 USC 9601 (14). It also does not include oil and gas. The Emergency Planning and Community Right-to-Know Act (EPCRA) was passed by Congress in 1986. EPCRA was included as Title III of the Superfund Amendments and Reauthorization Act (SARA) and is sometimes referred to as SARA Title III. EPCRA provides for the collection of information regarding the use, storage, production, and release of hazardous chemicals, thereby helping to increase emergency planners, responders, and the public's knowledge and access to this information. States and communities, working with facilities, can use the information to improve emergency planning, chemical safety and protect public health and the environment.

The Environmental Protection Agency (EPA) has exempted certain waste materials generated in oil and gas exploration and production from regulation as hazardous wastes (EPA 1988). These materials must be intrinsic or uniquely associated with the production of oil and gas to classify as exempt waste. Examples of exempt wastes include drilling fluids and drill cuttings. Although not regulated as hazardous wastes, these materials are considered to be solid wastes and must be disposed in ways that protect human health and the environment.

3.14 NOISE

The Proposed Action would be located in a rural, unpopulated area with few potential noise sources. Noise levels from human activity are mostly associated with vehicular traffic and aircraft.

Noise levels experienced by a receptor depend on the distance between the receptor and the equipment, the topography, vegetation, and meteorological conditions (e.g., wind speed and direction, temperature, humidity). Ambient sound levels within the vicinity of the proposed Project Area are likely to be slightly elevated above the typical levels for rural recreational areas. Loud noise may reduce a person's opportunity to enjoy solitude. Noise disturbance can annoy people to differing degrees, depending on their expectations, attitudes towards development activities, magnitude and duration of the noise, the activity they are pursuing, and the time of day. Sensitive noise receptors include wildlife and recreationists and hunters visiting the area for

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solitude and a sense of remoteness. Overall, the wide expanse of the area and rolling topography would tend to disperse noise generated by seismic survey activities.

4.0 ENVIRONMENTAL CONSEQUENCES

4.1 INTRODUCTION

Chapter 4 provides comparative analyses of the direct and indirect consequences on the affected environment (Chapter 3) resulting from implementation of the Proposed Action and the No Action Alternative.

A variety of laws, regulations, and policy directives mandate the evaluation of the effects of a proposed action and alternative(s) on certain critical environmental elements. Not all of the critical elements that require inclusion in this EA are present or, if they are present, they may not be affected by the Proposed Action and No Action alternative. The critical elements that were identified as present (Table 3-1) are described and analyzed in Chapter 4.

The analysis area is defined for each resource and is based on the nature of the resource. For some resources, the analysis area is the proposed Project Area, and for other resources the analysis area encompasses a larger area. For example, a larger area is analyzed for wildlife species, which are mobile, versus plant species, which are stationary. The effect of a particular project activity may have short-term or long-term effects depending on the specific natural resource addressed; therefore, in the Environmental Consequences sections of this document the duration of impacts are evaluated on a resource basis and defined below:

- Long-term impacts result from seismic activities that would extend beyond the life of the project. The life of the proposed project is estimated to extend up to one year.
- Short-term impacts include temporary disturbances occurring during the life of the project including staging areas, and other impacts that would be limited to the shot hole drilling and seismic survey activities. Generally, implementation of the short-term project activities would last from 45 days to one year.

The impact analyses take into account the Applicant-Committed Environmental Protection, Conditions of Approval (COAs), best management practices (BMPs), and any additional recommended mitigation measures for the Proposed Action and, if applicable, the No Action Alternative.

4.2 WATER RESOURCES

4.2.1 Proposed Action

4.2.1.1 Surface Water

Potential direct impacts to surface water resources from the Proposed Action would include accidental spills of fluids and/or fuel from equipment, dust from vehicles and helicopters, soil run-off from shot hole drilling, and damage to developed water sources. For this project, the required best management practices and mitigation measures that would be implemented to protect surface waters are covered in a number of documents and regulations. These include but are not limited to:

- Onshore Oil and Gas Orders,
- Green River RMP,

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- Surface Operation Standards and Guidelines for Oil Exploration and Development (Gold Book),
- Wyoming Water Quality Regulations and the Clean Water Act, and
- Applicant-Committed Environmental Protection Measures.

There is a potential for contamination of water resources from spills or discharges of fuels or other chemicals used for drilling the shot holes. The risk of uncontrolled spills reaching surface water exists throughout the implementation of the proposal. An emergency response plan (ERP) would be in place that covers non-petroleum product spills, such as hazardous materials (Section 2.2.2.10). Other steps that Devon would take to reduce risk are included in the Applicant-Committed Environmental Protection Measures (Section 2.2.3) and COAs. While adherence to the ERP, Applicant-Committed Measures, COAs, and regulatory requirements reduces the possibility of a spill, there would still be a small risk of surface waters becoming contaminated as the result of an accidental release. Devon would be required to immediately report any accidental releases to BLM, EPA, and the State of Wyoming. Devon would also be responsible for the clean-up and restoration of any surface water and associated riparian, wetland, and upland areas, if the BLM and other regulatory authority determine that damage from such a release occurs.

Potential direct impacts are possible if seismic shots are detonated in close proximity to developed water resources, such as stock ponds, or natural water features, such as springs. These could include structural damage to stock pond dams, damaging riparian vegetation near streams, or disruption of stream flow.

Each shot hole would directly disturb a maximum of 28 square feet, and the total surface disturbance from drilling 1,644 shot holes in the proposed Project Area would be 1.1 acres. Other surface disturbing activity would result from foot traffic walking within a three-foot wide area along the source and receiver lines (66.7 acres), and the two staging areas (20 acres). Vegetation removal and the deposition of topsoil and subsoil on the ground surface from drilling the shot holes and foot traffic on loose or erosive soils could potentially contribute to increased sediment loads affecting streams and seeps, ephemeral channels, wetlands, and riparian zones if surface run-off occurs. The risk of impacting these perennial and ephemeral water resources due to surface run-off would be low because soil and subsoil exposure would be temporary and short-term. Once detonated, shot holes will be immediately plugged and the topsoil restored to original contours; further reclamation will be concurrent with seismic survey operation as it progresses from west to east.

Increased use of unimproved roads could lead to minor increases in erosion and sedimentation to area streams, wetlands, and riparian zones. Dust from project vehicles would be the greatest contributor. The use of helicopters, carpooling, and buses to transport crews would reduce impacts to the unimproved roads, but many of these two-tracks and unimproved roads would still experience an increase in use. The increased sedimentation in local streams and areas that convey water seasonally and perennially would, however, be short-term and minimal. Devon will also be required to implement dust control measures, and avoid the use of approved roads and two-tracks if travel ruts four inches or greater occur. Devon will be required to be repair ruts in the roads.

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In order to further protect these critical water resources during project implementation, the BLM is requiring a series of setbacks around critical water resources from seismic activities. Table 4-1 includes setbacks for resources in the proposed Project Area; other setbacks may also apply.

Table 4-1. Setback Distances of Seismic Activities from Critical Water Resources

Water Resource	Setback Distance
Streams & Ephemeral Channels	100 feet
Riparian Areas	500 feet
Springs and Seeps	¼ mile
Pipelines <6" in diameter	250 feet
Stock Ponds	800 feet

A 500-foot set-back from riparian areas would ensure that riparian resources remain intact by reducing the potential for direct disturbance from crews and equipment and indirect impacts from surface run-off. A 100-foot buffer will also be imposed on ephemeral channels within the proposed Project Area. Similarly, a 250-foot setback from water pipelines (< 6 inches diameter) and an 800-foot setback for stock ponds would protect existing developed water sources.

4.2.1.2 Groundwater

Groundwater resources of greatest concern are the springs and seeps located within the proposed Project Area. According to Mason and Miller (2004; Figure 14), aquifer rocks are not exposed at the surface and the recharge potential in the proposed Project Area is considered to be low. Nevertheless, the minimum distance at which the detonation of shot holes could change or damage the flow of springs and seeps locally important to livestock grazing and wildlife was determined. An August 2008 field study evaluated the potential effect of ground motion on area springs and seeps resulting from the detonation of 10-pound explosive charges, a weight comparable to the Proposed Action. The study concluded that a 200-foot to 400-foot buffer around these groundwater resources would provide adequate protection of flows (Matheson Mining Consultants 2008). The WOGCC requires implementation of ¼-mile buffer zones to reduce the likelihood that project activities would result in negative impacts to local seeps and springs (Table 4-1). The BLM requires an 800-foot buffer from springs; however, the more conservative ¼ mile buffer zone will be used in the proposed Project Area.

4.2.2 No Action Alternative

Under the No Action Alternative, the proposed seismic survey would not be conducted; therefore, no change to current conditions would result and no additional impacts to surface and groundwater resources would occur. Ephemeral channels would remain in their current condition, unless changes in the intensity of the use of existing roads and two-tracks occur in the proposed Project Area.

4.2.3 Additional Mitigation

Based on the regulatory requirements, Applicant-Committed Environmental Protection Measures (Ch. 2, Section 2.2.3), and COAs (Appendix D) that would be incorporated into the Proposed

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Action, potential impacts to water resources would be minor, and no additional mitigation measures would be necessary.

4.3 VEGETATION, WETLANDS, AND RIPARIAN AREAS

4.3.1 Proposed Action

Project activities using heli-portable equipment would result in a total short-term surface disturbance of 87.8 acres. This represents about 0.7 percent of the total vegetation cover for all plant communities within the proposed 24.75-square mile Project Area. The overall long-term effect on vegetation would, therefore, be negligible.

Assuming soil and vegetation disturbance would occur in three-foot radius, shot hole drilling would potentially result in the short-term loss of about 1.1 acres of native vegetation. Excess cuttings and soil that are not returned to the shot hole and recompacted following explosive detonation would be spread over the general area, and though effects could be long-term (up to two years), recontouring and reclamation would ensure that the overall effects would be negligible. Disturbed areas would be expected to return to pre-project conditions and health.

Foot traffic from seismic crews would trample vegetation during surveying, drilling, laying of source and receiver points and lines, and data collection along receiver lines. Perennial grasses and herbaceous species would be flattened, but because most species are resilient the effect would be short term. Woody species, such as sagebrush, could be damaged if older, more brittle stems are broken off. The impact would be minimal and short-term as most crews would walk around shrubs. Any disturbed vegetation would likely recover in one to two growing seasons. Linear receiver lines would affect about a three-foot wide area and be removed following completion of the seismic data collection program. Though some vegetation may be trampled, recovery would be expected in no more than one to two growing seasons.

Impacts from ATVs and other service vehicles would not occur because travel would be restricted to BLM-approved roads included in the travel management plan (Appendix A, Figure 3-5). Use of the staging area to prepare, service, and store equipment to support field operations would result in the short-term disturbance of 20 acres (two staging areas). No blading or grading would occur on the site; however, vegetation would be trampled and some soil compaction would occur. Site selection criteria included level sites with little or sparse vegetation. Reclamation of the site would occur immediately following completion of the seismic survey minimizing the potential for long-term effects manifested as soil erosion and compaction, invasion by nonnative plant species, and loss of vegetative cover and productivity to occur. Recovery would be expected in no more than two to three growing seasons.

No wetland and riparian areas would be directly impacted by the Proposed Action because those areas will be off limits to drilling and seismic shots. While riparian and wetland areas will be open to foot traffic and the placement of seismic geophone lines and associated equipment, this impact is limited to very minor vegetation trampling. BLM requires that all seismic exploration activities (including vehicle use, helicopter use, and drilling) implement a 500-foot buffer from either side of the streambank to avoid wetland and riparian areas. A 100-foot buffer would further reduce potential impacts to ephemeral channels.

Onsite surveys indicated that no impacts to wetland and riparian vegetation would result from equipment and vehicles because a 500-foot buffer will be implemented. Potential negative impacts would result from dust and other particulate matter that could drift and cover vegetation. Dust settling on wetland and riparian vegetation could contribute indirectly to existing sediment loads of Project Area streams. Dust and other particulate matter could also increase the potential for sediment transport downstream of the proposed Project Area. Given the 45-day duration of the Proposed Action, impacts to wetland and riparian vegetation would be short-term and minor. Implementation of dust control measures, and restricting vehicle access to existing BLM-approved roads and two-tracks, would further reduce potential impacts to these vegetation community types.

4.3.2 No Action Alternative

Under the No Action Alternative, the proposed seismic survey would not occur and impacts to the vegetation community types in the proposed Project Area would remain the same as existing conditions. The proposed ephemeral channel crossings and adjacent wetland or riparian zones would not be impacted either directly or indirectly by additional vehicles and seismic crews using existing roads and two-tracks.

4.3.3 Additional Mitigation

Applicant-Committed Environmental Protection Measures and COAs (Appendix D) would be incorporated into the Proposed Action, so that potential impacts to vegetation resources, wetlands, and riparian habitats would be minimal. Areas disturbed would be restored and reclaimed to pre-project conditions. Therefore, no additional mitigation measures will be necessary.

4.4 NOXIOUS WEEDS AND INVASIVE NONNATIVE PLANT SPECIES

4.4.1 Proposed Action

Ground-disturbing activities associated with the construction and detonation of seismic shot holes would expose approximately 1.1 surface acres to potential noxious and invasive nonnative plant infestations, which would have a negligible indirect effect in contributing to any potential nonnative species invasions. The effect of personnel and equipment mobilization at the 10-acre helicopter staging areas would indirectly contribute to the spread of noxious and invasive nonnative plant species, if seeds attach to clothing and equipment, and are transported to other areas within the proposed Project Area. Similarly, vehicles used to mobilize equipment and personnel on existing roads and approved two-tracks could indirectly contribute to the transport of invasive nonnative plant species from one area of the proposed Project Area to another. Human activities associated with the Proposed Action could act as vectors for noxious weeds and invasive nonnative plant species, which would have potentially long-term, negative effects on the proposed Project Area. However, the potential for these impacts would be minor.

4.4.2 No Action Alternative

Under the No Action Alternative, the Proposed Action would not be approved. The proposed Project Area would remain in its current condition and there would be no new impacts that could

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result in the transport and spread of and noxious and invasive nonnative plant species. Because the No Action alternative would not disturb any area, there would be no disturbance to soil and plant communities, wetlands or riparian areas, which would otherwise expose the area to further infestation by noxious and invasive nonnative plant species.

4.4.3 Additional Mitigation

All equipment should be thoroughly cleaned prior to being brought on-site. Service vehicles should be kept clean, especially if they are used at multiple sites where noxious and invasive nonnative plant seeds may have adhered to the undercarriage of the vehicle. Applicant-Committed Environmental Protection Measures (Section 2.2.3), and COAs (Appendix D) would be incorporated into the Proposed Action, so that potential impacts would be minimized to the extent possible. Areas disturbed would be restored and reclaimed immediately following completion of seismic data collection activities further reducing the potential for invasions. Development of the applicant-committed invasive nonnative plant and weed management plan would also reduce the potential for additional invasions in the proposed Project Area during the seismic survey.

4.5 SPECIAL STATUS SPECIES

4.5.1 Proposed Action

The Proposed Action may result in direct and indirect, short- and long-term effects. Effects are addressed at both the local and landscape scales, depending on the home range and distribution of individual species.

4.5.1.1 Federally Listed Species

Black-footed Ferret

Because the black-footed ferret is not present in the proposed Project Area, the Proposed Action would have no effect on the black-footed ferret. Current white-tailed prairie dog colonies do not meet the 200-acre complex size necessary to support black-footed ferrets. The small number of individual prairie dogs observed onsite would also be a limiting factor. Potential future colonization by white-tailed prairie dogs, the principal prey species for ferrets, would not be impacted due to the short-term nature of seismic activities associated with the Proposed Action.

Gray Wolf

As noted in section 3.5.1.2, wolves may exist in the vicinity of the proposed Project Area, but there are no known den sites (N. Kaczor, BLM Wildlife Biologist. Personal communication with D. Kane, TEC, Inc, July 17, 2008). Any wolves present in the proposed Project Area would avoid project activities and related human disturbance. The short-term duration of the Proposed Action would not result in impacts to the wolves and their prey base. Therefore, the Proposed Action would have no effect on the gray wolf or their habitats.

Canada Lynx

The analysis area does not provide quality habitats for Canada lynx or snowshoe hares, the lynx's primary prey species. In addition, the proposed Project Area is outside the designated lynx analysis units and outside any boreal areas where lynx are known to occur. Therefore, the proposed action would have no effect on Canada lynx or their habitats.

4.5.1.2 Species Petitioned for Listing

Pygmy Rabbit

Because suitable pygmy rabbit habitat exists in the proposed Project Area (TEC 2008b), a survey was conducted in August 2008 on nearly 60 percent of the proposed Project Area with a medium to high probability for supporting pygmy rabbit. The survey located burrows and resulted in two observations of the species. Where pygmy rabbits are present in the area, direct impacts could include vehicle-related mortality. Another direct effect is the short-term loss of 1.1 acres of vegetation due to shot hole construction and the detonation of the seismic charges. No surface disturbance would occur in habitat suitable for pygmy rabbits at the proposed helicopter staging area.

A potential impact would be the disturbance of rabbits from their burrows during shot hole drilling and detonation, which could result in negative physiological stresses and increase the potential for predation. Pygmy rabbits may also disperse from or abandon burrows prior to shot hole drilling and detonation as a result of increased human activity. To avoid direct impacts to burrows, a 200-foot buffer on all burrows located during the August 2008 field survey (TEC 2008) would be implemented in suitable habitat, regardless of burrow condition (e.g., collapsed, unused). Project activities would also, to the extent possible, avoid dense shrub areas and vegetation removal. Overall, the project may indirectly impact individuals, but would not likely contribute to federal listing.

White-tailed Prairie Dog

The white-tailed prairie dog is being considered for listing under the ESA. Twenty-six small towns, each less than ten acres in size were observed during the August 2008 survey in the Horseshoe Basin Project Area, and only a few individuals were observed in each colony (TEC 2008b). No activity was observed on 18 additional white-tailed prairie dog towns mapped by BLM.

The proposed seismic operations could potentially impact the white-tailed prairie dog colonies by damaging the burrows from vehicles and human activities. The noise from detonation of the dynamite could result in destruction of the burrows, potentially result in loss of hearing and other physiological effects from the sound waves, and potentially cause the prairie dogs to desert the burrow. Individuals outside the burrows would be more susceptible to predation by raptors and other species. However, a 200-foot buffer would be placed around the active prairie dog towns, which would reduce the direct impact to the white-tailed prairie dogs. In addition, disturbed areas within abandoned prairie dog towns would be restored and reclaimed to pre-project conditions following seismic surveying. Therefore, the seismic project would result in a short-term impact to the prairie dogs, but would not contribute to federal listing.

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Greater Sage-Grouse

The Proposed Action would not occur during sage-grouse breeding season (March 1– May 15) and nesting and early brood rearing period (March 15–July 15). Potential disturbance to the sage-grouse may not be completely avoided during the fall, in areas where the birds utilize sagebrush as cover; however, the disturbance would be short term and limited to about a 45-day period in 2008. Human presence and shot hole detonation would likely cause the sage-grouse to disperse to adjacent areas, which could result in increased predation or mortality from vehicles.

No activities would occur near the three leks identified in the proposed Project Area because the Proposed Action would avoid seismic activities within 400 feet of a lek. Noise from helicopter activity and human presence could temporarily cause birds to flush. The noise could also result in physiological impacts to the sage-grouse that could make birds more susceptible to predation. The 500-foot buffer for riparian areas and 100-foot buffer on drainages would reduce the impact to sage-grouse habitats in these areas. Many of the ephemeral drainages in the Project Area are sagebrush swales where sage-grouse concentrate. No project activities would occur during the critical wintering period (December 1 – March 1) or within any designated winter concentration area.

Overall, potential disturbance to sage-grouse from project activities associated with Proposed Action is expected to be short term and minor. The greatest potential for disturbance would occur in those sagebrush swales located throughout the proposed Project Area where potential fair to excellent cover occurs in association with riparian areas and moist drainages.

Wyoming Pocket Gopher

Because Wyoming pocket gophers are confined to upland drier ridge tops with gravelly loose soils and greasewood habitats, there is some potential for occurrence in the proposed Project Area and potential for disturbance from the Proposed Action. Direct impacts may include a temporary loss of few acres of marginal habitat from shot hole construction and charge detonation. A potential indirect impact would be habitat fragmentation. However, the habitat loss is minor at the landscape scale and would be short term. Disturbed areas would be restored and reclaimed to pre-project conditions following seismic surveying. Some mortality could occur if vehicles run over animals on approved roads.

There is a low potential risk that shot hole detonation could disturb burrowing pocket gophers and result in hearing loss that could make individuals more susceptible to predation. The risk of mortality to pocket gophers in burrows resulting from burrow collapse or direct impact from seismic waves would also be low as shot holes would be drilled below the depth that pocket gophers burrows occur. There is a moderate potential risk that shot hole detonation could result in physiological stress on individual pocket gophers in burrows, or potentially result in mortality. Although the Proposed Action would impact individuals and different individuals may be affected more severely than others, seismic activities would not contribute to the federal listing of the species.

4.5.1.3 Candidate Species

Western Yellow-Billed Cuckoo

The Proposed Action would avoid seismic activities within 500 feet of riparian areas and within 100 feet of drainages where suitable, mature cottonwood habitat for the yellow-billed cuckoo could occur. Therefore, the Proposed Action would have no effect on the western yellow-billed cuckoo or their habitats should they occur in the area.

4.5.1.4 BLM Sensitive Animal Species

Townsend's Big-Eared Bat

Because the Townsend's big-eared bat's prey base is limited to airborne insects, the direct, temporary loss of 87.8 acres of native vegetation would not measurably affect this species. Day roosting on rock outcrops or in trees would not be expected to be affected by the Proposed Action. Shot holes and geophone lines would not be located adjacent to rock outcrops, which occur primarily on steep, inaccessible escarpments. For these reasons, the Proposed Action may result in short-term impacts to individuals, but would not contribute to federal listing.

Spotted Bat

Because the spotted bat's prey base is limited to airborne insects, the direct, temporary loss of 87.8 acres of native vegetation probably would not measurably affect the insect prey base. Day roosting opportunities would not be affected by shot holes and detonation of charges, which may otherwise cause bats to flush from roost sites. Few trees exist in the proposed Project Area, and are primarily located along drainage bottoms on private land adjacent to the proposed Project Area. No trees would be removed, and bats flushed from roost sites would likely return following the completion of daily project activities. For these reasons, the Proposed Action may impact individuals over the short term, but not contribute to federal listing.

Raptors

Potential new and existing nest sites for raptors are known to occur throughout the proposed Project Area (J. Caldwell, personal communication with David Kane, TEC, Inc, on July 17, 2008). If project activities extend into 2009, aerial nesting surveys would be conducted during March - early June 2009 to locate nest sites prior to initiation of seismic activities. In addition, BLM stipulations are in place to protect the raptors during the breeding period of each species.

Depending on the species, BLM requires that project activities avoid active nest sites within a ½- to one-mile radius of active nests during raptor nesting season from February 1 – July 31 for most species of raptors, and April 1 – September 10 for the burrowing owl (Table 2-2). Project activities occurring in 2009 within a one-mile radius of active golden eagle nests would be avoided if they occur prior to the conclusion of the nesting season. Inactive nests would not be removed or destroyed. If seismic activities continue in 2009 and young birds are present, no shot holes will be drilled within the identified species specific buffer area. In addition, no helicopter flights would occur over any nests with young birds. Any dead young birds found in nests known to be occupied will be considered a "taking." Given these protection measures, the Proposed Action would not contribute to conditions that would warrant raptor species' federal

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listing, and impacts to nesting raptors would be minor and short term. In addition, because the seismic survey would occur after fall migration, the proposed project is not likely to impact raptors.

Migratory Passerine Birds

The Migratory Bird Treaty Act of 1918 requires treaty participants (USA, Canada, and Mexico) to protect birds that migrate between the three countries. Nesting loggerhead shrike, sage thrasher, sage sparrow, Brewer's sparrow, and other migratory bird species would likely occur throughout the proposed Project Area. However, project activities associated with the Proposed Action would occur in 2008 after the nesting season. Seismic activities that may occur in 2009 could conflict with nesting, if these activities occur during the nesting period from mid-March/early April - July 15. Impacts from the short-term loss of vegetation important to ground- and shrub-nesting birds would be negligible if seismic activities have no shrub removal and herbaceous species are only trampled. Shot hole drilling and the staging area would result in the short-term loss of about 87.8 acres over the life of the project. Because project activities would, to the extent possible, avoid dense shrub areas and vegetation removal, impacts from source and geophone receiver lines would be minimal. Impacts from project activities would, therefore, have short-term, negligible effects on nesting migratory birds or their habitats, and there would be no readily observable long-term effects resulting from the Proposed Action, that would result in either the decline of local subpopulations or populations as a whole.

Seismic activities that may occur in 2009 would conflict with nesting if these activities occur during the nesting period from mid-March/early April to July 15, February 1 to July 31 for raptors, and April 1 to September 10 for burrowing owls. However, the BLM timing stipulations for sage-grouse and raptor nesting and the Migratory Bird Treaty Act would provide additional protection to nesting migratory birds.

Because there would be no long-term effects on migratory passerine birds and their habitats, the Proposed Action would not contribute to conditions that would warrant federal listing.

Mountain Plover

Because the Proposed Action would occur after the breeding season, no impacts to the mountain plover would occur. In addition, there is limited suitable habitat for this species in the Project Area. Reclamation and restoration of disturbed areas (87.8 acres) within the proposed Project Area would occur prior to the breeding season. If seismic operations occur in the spring, BLM stipulations would apply and presence/absence surveys would be required in suitable habitat areas. Therefore the Proposed Action is not likely to impact the mountain plover or contribute to federal listing.

Reptiles and Amphibians

The greatest potential impact to reptiles and amphibians would be disturbance from the detonation of explosive charges during hibernation. Reptiles and amphibians are less mobile than other species in the proposed Project Area, and would be more susceptible to the physiological stress that could result from the detonation of charges below ground. Impacts to hibernating northern leopard frogs would be reduced because seismic activities would not occur within a 500-foot buffer of riparian areas and wetlands. The Great Basin spadefoot toad is associated with

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springs and seeps in desert habitats; therefore, the risk of mortality for this species during hibernation would be reduced because a ¼ mile buffer would be required around these water sources. Detonation of charges would not be expected to collapse northern leopard frog and Great Basin spadefoot burrows because shot holes would be drilled to a depth (40 feet) below where these species are known to hibernate. The risk of mortality due to vehicles would be low because these less mobile species would have begun hibernating before the Proposed Action begins. Impacts from the detonation of charges would be similar to those described for the Wyoming pocket gopher. Although impacts to some individuals of these species would occur, the long-term viability of these amphibian populations would not be affected and not contribute to federal listing.

The midget faded rattlesnake would not be affected by the Proposed Action because the proposed Project Area would occur outside the range of this species.

Colorado River Cutthroat Trout

The Colorado River cutthroat trout populations were historically found in the headwaters of Vermillion Creek, north of the proposed Project Area. Applicant-Committed Environmental Protection Measures, including setbacks from ephemeral and perennial drainages, would reduce the potential for contaminants, spills, and sedimentation. Implementation of 500-foot buffers on riparian areas and 100-foot buffers on drainages would protect Colorado River cutthroat trout and the cooperative efforts (WGFD, BLM, and Trout Unlimited) to restore CRCT habitat and watersheds.

4.5.1.5 BLM Sensitive Plant Species

Because no known sensitive plant species are known to occur in the proposed Project Area, no impacts would occur.

4.5.2 No Action Alternative

Under the No Action Alternative, the Proposed Action would not be selected, and no shot hole drilling or detonation operations would occur. Therefore, there would be no change to existing conditions, and no new impacts to federally listed, proposed or candidate species and no impacts to BLM sensitive species.

4.5.3 Additional Mitigation

Breeding bird and raptor nesting surveys should be considered within one mile of proposed ground-disturbing activities during the spring nesting season (February 1 – July 31), if the Proposed Action were to continue in 2009. Applicant-Committed Environmental Protection Measures (Chapter 2, Section 2.2.3), and COAs (Appendix D) that would be incorporated into the Proposed Action would reduce impacts or completely avoid vegetation removal. Areas disturbed would be restored and reclaimed to provide long-term protection for special status species. No additional mitigation measures will be necessary.

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4.6 WILDLIFE AND FISHERIES

4.6.1 Proposed Action

4.6.1.1 Big Game

The sensitivity of big game to noise from helicopter activity and light vehicles would potentially have the greatest impact on these animals in the proposed Project Area. A more detailed discussion on the impacts of noise is in section 4.14.

Based on telemetry and heart monitor studies, the noise from helicopters appears to have a major physiological effect on big game species (Larkin 1996) and results in avoidance and displacement behaviors (Gunn 1983, Krausman et al. 1986, McKechnie and Gladwin 1994). Such avoidance and displacement also reduces foraging efficiency (Stockwell et al. 1991). Studies have demonstrated that the distance that big game have fled from human disturbances related to aircraft is variable, and often dependent on the type, size, intensity and duration of the disturbance as well as the sex, age, season, and experience of the animal, and terrain, topography, and wind (Luz and Smith 1976, Fancy 1982, Bleich et al. 1990, Harrington and Veitch 1992). Physiological adaptations to helicopters appear to be unlikely because exposure to this stressor is for a short time period (Larkin 1996). Individuals and small groups of pronghorn, elk, and mule deer would be expected to be disturbed and temporarily displaced during seismic operations, but sufficient suitable habitat is available throughout and adjacent to the proposed Project Area. The effects on big game would, therefore, be short term and minor. Big game disturbed by helicopter and increased human activity would be expected to return to the area following the completion of the proposed seismic survey.

The eastern one-third of the proposed Project Area is within WGFD-designated big game crucial winter/year-round range for pronghorn (Appendix A, Figure 3-2), western one-third is crucial winter range for elk (Appendix A, Figure 3-3) and the entire proposed Project Area is in winter/year-round range for mule deer (Appendix A, Figure 3-4). Spring, summer, and fall seasonal ranges are generally considered less limiting to big game populations, but researchers have suggested that having access to productive summer forage results in animals being in better condition for the winter, and increases their chances for over-winter survival (Marcum 1975; Grover and Thompson 1986; Edge et al. 1990). The Proposed Action would likely disturb and disperse pronghorn, mule deer, elk, and moose from the area. However, loss of forage would be short term and negligible. No direct impacts to wintering pronghorn, elk, and mule deer on crucial winter range would occur because seasonal restrictions on project activities would be implemented from sunset November 14 through April 30.

Shot hole drilling would have a short-term and negligible effect on available forage in crucial winter range because shot holes would be reclaimed. The two 10-acre helicopter staging areas would occur in pronghorn crucial winter range and mule deer winter range. Project activities associated with the use of the staging areas would trample vegetation. However, the loss would be short term and negligible. Because no blading or grading of the staging area would occur, and the area would be reclaimed immediately following the completion of the seismic survey, direct impacts to forage from project activities would be minimal. Removal of vegetation, especially those shrubs preferred by game species (e.g., mountain mahogany, antelope bitterbrush, and Wyoming big sagebrush) and herbaceous material with a high nutritional value would be

avoided, as much as possible, by equipment and crews. The limited effect of seismic activities on vegetation is discussed in sections 4.3.

Impacts to Migration Corridors

The impact on migration routes from the Proposed Action would be short term and minor. However, increased traffic throughout the proposed Project Area may disturb migrating animals where migration routes cross roads or two-tracks. The use of light vehicles on existing roads and two-tracks would also increase the risk of human-wildlife collisions. The risk of human-wildlife collisions would remain low where vehicles obey the appropriate speed limits and minimize travel during pre-dawn and post-sunset periods when big game animals are more active.

4.6.1.2 Fisheries

There are no fisheries in the proposed Project Area, and no fisheries in the vicinity of the proposed Project Area that would be directly or indirectly affected by project activities. Implementation of 500-foot buffers on riparian areas and 100-foot buffers on drainages would reduce the potential impact to water quality of streams further downstream, where important sport and game fish species are present.

4.6.2 No Action Alternative

Under the No Action Alternative the project would be denied and no new impacts would occur to wildlife and fisheries resources within the proposed Project Area.

4.6.3 Additional Mitigation

No additional mitigation measures will be necessary.

4.7 CULTURAL RESOURCES AND NATIVE AMERICAN RELIGIOUS CONCERNS

4.7.1 Proposed Action

4.7.1.1 Cultural Resources

All activity areas proposed for the Horseshoe Basin 3D seismic exploration project have been surveyed for cultural resources. Nine cultural resources are known to exist within the surveyed areas: five prehistoric lithic scatters/camp sites, one rock cairn of unknown but possibly prehistoric origin, one historic period artifact scatter, portions of the Rock Springs to Browns Park Wagon Road, and remnants of the Rock Springs to Browns Park Telephone Line. Also recorded were two isolated finds and three isolated resources within the surveyed areas. Ground surface visibility and other conditions were good at the time of the survey, and the potential for existence of as-yet undiscovered cultural resources is low. The Rock Springs to Browns Park Wagon Road has been determined to be eligible for nomination to the National Register of Historic Places (NRHP), but none of the other recorded cultural resources within the surveyed areas has been formally evaluated by BLM and SHPO for eligibility for nomination to the NRHP.

The Horseshoe Basin 3D seismic project was designed and specifically adjusted to avoid potential impacts to cultural resources. On BLM surface, project activity areas were located, at a

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minimum, the following distances from the specified site types: (1) ½ mile from known prehistoric burial sites, (2) ¼ mile from known rock art sites, (3) ¼ mile from known medicine wheels, standing cairns, or other apparent Native American ceremonial sites, (4) ¼ mile or viewshed distance (whichever is less) from extant segments of a significant or unevaluated historic trail but no closer than 300 feet, (5) ¼ mile or viewshed distance (whichever is less) from significant or unevaluated standing structures or other sites potentially NRHP eligible under criterion A, (6) ¼ mile from known sites containing prehistoric cairns, habitational stone circles, or simple rock alignments, (7) 300 feet from known rock shelter sites, and (8) 100 feet from any other known eligible or unevaluated site.

In compliance with stipulations (6) and (8), project activity areas were relocated or eliminated from the project following the discovery of cultural resources during the survey. With regard to the historic Rock Springs to Browns Park Wagon Road (48SW3865), prior to project staking, all of the source points for the Horseshoe Basin 3D seismic project were planned to avoid the historic route by 300 feet. Within the overall project area, incidental road traffic by light vehicles (pickups and ATVs) is planned to facilitate personnel deployment and allow access to the staging areas. However, no project vehicles would travel the historic road itself, except at the three designated crossings of the historic road by upgraded roads: the BLM Pine Mountain Road on the north, the Canyon Creek County Road on the south, and the recently upgraded unnamed road along the north side of Horseshoe Wash that runs to a currently drilling rig. Geophones and cables may be placed by pedestrians within the 300-foot wide buffer zones on each side of the historic road.

The proposed 3D project involves only heli-portable drilled shot holes, and no off-road vehicle traffic is proposed. Helicopters would move the drilling equipment from source point to source point as drill crews walk from one shot hole to the next. Surface disturbance along shot hole lines would consist of drilling 4-inch diameter holes and the incidental disturbance caused by workers manning the drills. Recording equipment would be laid out by the pedestrian cable crew, working from equipment caches placed by the helicopter. Surface disturbance can be expected to be somewhat more intense in staging areas, but no cultural resources have been found in those areas, and the potential is low for undiscovered cultural resources in those areas.

This project would have no foreseeable impacts on cultural resources, and the project would have a very low level of surface disturbance that might impact as-yet unidentified cultural resources. In the event of an inadvertent discovery during any construction, excavation, or shot hole activities, the operator would discontinue activities in the immediate area of the discovery, and notify the BLM Rock Springs Field Office Archaeologist of the discovery. The Archaeologist would then evaluate and determine the appropriate action, and project activities would not resume in the immediate vicinity of the inadvertent discovery until authorized by the BLM Archaeologist.

4.7.1.2 Native American Religious Concerns

Prehistoric stone circle sites, rock alignment or rock imagery sites have not been recorded by past inventories in the land sections in which project activities would occur, and SHPO and BLM records do not indicate the presence of sites in the proposed Project Area considered potentially eligible for nomination to the NRHP as Traditional Cultural Properties. Indian Sacred Sites, as defined and protected by EO 13007, are not known to be located in the proposed Project Area.

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Indian Sacred Sites, as defined and protected by EO 13007, may suffer adverse affects to their integrity of setting, feeling, and/or association or by interference with their ceremonial use. One prehistoric cairn was found during the course of the cultural resource inventory. As an isolated cairn on a residual surface with no associated artifacts nor functionally diagnostic tools and a general lack of complexity and poor temporal clarity. It is recommended to be unevaluated for the NRHP. This prehistoric cairn locality could be considered a Native American sensitive or sacred site, as defined and protected by EO 13007. Native American consultation is necessary to determine the site's status in this regard. In conformance with established guidelines for geophysical projects in the area, all vehicle traffic and shot hole drilling activities will be kept ¼ mile from this site. Direct impacts from this project are not foreseen, and any indirect impact (particularly interference with ceremonial use) would not occur.

4.7.2 No Action Alternative

Under the No Action Alternative, the project would be denied and no project impacts would occur to cultural resources and Native American religious concerns.

4.7.3 Additional Mitigation

All cultural resources will be avoided. Inadvertent discovery of cultural resources would be addressed as described in the Proposed Action.

4.8 PALEONTOLOGY

4.8.1 Proposed Action

The Niland Tongue and Cathedral Bluffs Member of the Wasatch Formation and the Wilkins Peak and Tipton Members of Green River Formations constitute the bedrock underlying the proposed Project Area. These geologic units are rated by the BLM as having a high sensitivity for containing fossils of scientific significance with Probable Fossil Yield Class (PFYC) of 4 (if not well exposed) or 5 (if well exposed).

Ground disturbance could result in the possible destruction of fossil resources of scientific significance as a result of shot hole drilling and detonation. Ground disturbance could also result in beneficial effects if new fossils of scientific significance were discovered. Such fossils would need to be properly recovered, catalogued into the collections of a museum repository, and made available for study and scientific evaluation. An additional benefit would be the increased knowledge gained from the recovery of new field specimens by professional, permitted paleontologists and geologists for the purpose of making scientifically significant discoveries.

A field survey conducted in September 2008 documented that good bedrock exposures are, for the most part, conspicuously absent in the proposed Project Area (Winterfeld 2008). Most areas have a surficial cover of recent alluvium or colluviums, or are deeply weathered. In addition, despite the high PFYC ranking, the Wasatch and Green River Formations do not yield fossils everywhere. The September 2008 field work also documented that, in general, there are far more unfossiliferous outcrops than there are fossiliferous ones (Winterfeld 2008).

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The only fossils discovered during field survey were shells of invertebrates (freshwater clams) and wood fragments found in the Niland Tongue (Winterfeld 2008). Based on the survey, it is unlikely that the Proposed Action will impact any significant fossil resources (Winterfeld 2008). If, however, fossils are discovered during seismic operations, activities will need to be suspended immediately and the BLM notified so the discovery can be evaluated.

4.8.2 No Action Alternative

Under the No Action Alternative, the BLM would not select the Proposed Action and no seismic activities would occur. Because there would be no change from current conditions, no positive or negative impacts on paleontological resources from the No Action Alternative would occur.

4.8.3 Additional Mitigation

No additional mitigation measures will be necessary.

4.9 RECREATION

4.9.1 Proposed Action

4.9.1.1 Dispersed Recreation

The analysis area for recreation includes the proposed Project Area and also the Pine Mountain and Four J Basin areas. The Proposed Action will have minor direct effects on the wide array of dispersed motorized and non-motorized recreation opportunities offered and available in the Horseshoe Basin, Four J Basin, and Pine Mountain areas. The minor impacts that may occur would be short term due to the short duration (45 days) needed to conduct the seismic exploration activities. The potential effects from the Proposed Action on most recreation activities will consist mainly of lost or diminished recreation opportunities or experiences in the proposed Project Area due to the drilling, detonation of shot holes, and placement of geophones.

The visual impact and/or noise from these activities would affect recreation experiences in the immediate area where they are visible and/or audible. Recreation experiences for persons in the Horseshoe Basin, Four J Basin, and Pine Mountain area may also be diminished by the sights or sounds of the seismic exploration activities from helicopter flights and detonation of charges, especially for those individuals seeking quiet, solitude, and unchanged natural landscapes.

Traffic associated with access roads in the proposed Project Area would be minimal, and limited to existing roads and two-tracks. The potential impact on traffic on State Highway 430 is provided in Section 4.14. Because the Proposed Action would be limited to about 45 days in 2008, impacts would be short-term and temporary.

4.9.1.2 Hunting

The analysis area for hunting includes the respective designated WGFD Hunt Areas for elk, mule deer, pronghorn antelope, and moose in which the proposed Project Area is located (Figures 3-2, 3-3, and 3-4). Hunting for these four species in the area occurs for about two months, with archery opening approximately on September 1 and lasting for a month, and rifle season opening on about October 1 and lasting for about 30 days.

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The Proposed Action would have a short-term and temporary negative impact on hunting in 2008 in the proposed Project Area. Because of the very high demand for and very limited number of licenses available in the respective hunt areas, licenses only rarely go un-issued, and successful license lottery recipients are unlikely to forego the opportunity to hunt in the affected hunt areas. In 2007, 746 licenses were issued for all big game species, and only nine percent went unused (WGFD 2008).

Because the Proposed Action would occur during the rifle season, direct effects would include displacement of big game animals from the immediate vicinity of Horseshoe Basin and areas west to Pine Mountain, where big game begin to congregate as the fall season progresses. Displacement would largely result from helicopter noise and overflights, and also from the increased presence, noise, and movement of personnel and equipment in the proposed Project Area. As game species are displaced, displacement of hunters would also occur. The distance and duration of displacement will depend largely on the animal species, individual animal, and type, duration, and intensity of disturbance.

The WGFD believes that because area elk in the South Rock Springs Elk Herd (Unit 424) is an interstate herd, and some animals could be displaced to more secure areas in Colorado (M. Zornes, WGFD Green River Wildlife Management Coordinator. Personal communication with D. Kane, TEC, Inc. July 17, 2008). Pronghorn from South Rock Springs Herd (Unit 412) and mule deer from the South Rock Springs Herd (Unit 424) would also temporarily disperse to other areas outside the proposed Project Area. Some hunters in the area could benefit from project activities if big game were displaced to areas with less security and cover, but with increased animal density due to displacement. Hunters who hunt areas outside the proposed Project Area may also benefit if animals disperse from the proposed Project Area to find security and cover. Depending on the area hunted, some hunters would not benefit from animals dispersing to other areas because game would be more scarce than under current conditions.

Overall, impacts to 2008 big game hunting from the Proposed Action would be mostly short-term and temporary, but negative.

However, the effects on hunters in the proposed Project Area would be negative, if displaced hunters are unsuccessful in harvesting game in another part of the hunt unit. Effects would be long-term for displaced hunters if they are unsuccessful in obtaining annual license draws in 2009 and subsequent years, due to the extremely high demand and low odds for obtaining a license. The WGFD has no mechanism to compensate 2008 big game hunters (e.g., reissue another license in another hunt area, increased preference points for licenses) displaced by the Proposed Action.

By the 2009 hunting season, most big game animals would be expected to return to the proposed Project Area, so that there would be little or no impact on the 2009 hunting season.

4.9.2 No Action Alternative

Under the No Action Alternative, the BLM would not select the Proposed Action and no additional project activities would occur. Therefore, there would be no change to existing conditions, and no potential recreational impacts.

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4.9.3 Additional Mitigation

No additional mitigation measures will be necessary.

4.10 VISUAL RESOURCES

4.10.1 Proposed Action

The Proposed Action would result in a moderate contrast to all elements of the landscape (form, line, color and texture). However, moderate impacts to the visual landscape conform to the management objective for VRM Class III; that is, shot hole drilling using heli-portable equipment and vehicle travel restricted to existing roads and two-tracks would not dominate the landscape, be short-term (45 days), and only temporarily occupy the visual landscape.

4.10.2 No Action Alternative

Under the No Action Alternative, the BLM would not select the Proposed Action and no additional project activities would occur. Therefore, there would be no change to existing conditions, and no potential recreational impacts.

4.10.3 Additional Mitigation

No additional mitigation measures will be necessary.

4.11 TRANSPORTATION AND ACCESS

4.11.1 Proposed Action

The Proposed Action would result in some minor increased levels of traffic on SH 430. Transporting crews by bus and limiting the number of light trucks accessing the proposed Project Area would reduce the number of person-trips and the subsequent risk of additional traffic accidents with livestock, wildlife, and other vehicles that occur along SH 430.

Transportation impacts would primarily be associated with unimproved roads and two-tracks, whose use could increase the risk of soil damage, erosion, fugitive dust, and the subsequent sediment load to area streams and ephemeral channels. Because no new roads would be constructed or upgraded and helicopters would be used extensively, the project footprint would be minimized. While the transportation map specifies the roads and two-tracks that Devon and their contractors will be restricted to using during seismic survey operations, their use could result in surface disturbance and damage because these roads have not been engineered to reduce stormwater runoff or control erosion. The project could, therefore, contribute to indirect, short-term increases to downstream sediment loads where roads and two-tracks cross ephemeral drainages and traverse steep slopes. The contribution would, however, be short-term and minor because the Proposed Action would occur over a relatively short timeframe (45 days). The effects of dust on vegetation, riparian areas, and wetlands have been discussed (Section 4.3). To minimize any long-term effects, Devon would be required to repair road damage from ruts, and vehicle use would be suspended if ruts develop more than four inches in depth.

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The transportation map designating BLM-approved roads and two-tracks (Figure 3-5), along with the Applicant-Committed Environmental Protection Measures and COAs will serve as a travel management plan. No off-road vehicle use would be allowed for this project. Dust suppressants would be required, as deemed necessary by BLM. No chemical dust suppressants would be permitted. Devon will be responsible for the maintenance of existing access road in accordance with BLM road standards, while it is being used for the proposed action.

Given these requirements and the limited duration (45 days) of the Proposed Action, impacts resulting from transportation and access would be short-term and would not result in any long-term, adverse effects.

4.11.2 No Action Alternative

Under the No Action Alternative, the BLM would not select the Proposed Action and no additional traffic would occur. Therefore, there would be no change to existing conditions, and no potential transportation impacts.

4.11.3 Additional Mitigation

No additional mitigation measures will be necessary.

4.12 RANGE RESOURCES

4.12.1 Proposed Action

Impacts of the Proposed Action on rangeland resources would result in a total short-term loss of 87.8 acres of forage for grazing due to vegetation removal resulting from shot hole drilling and use of the proposed staging area. Other potential impacts could include an increased risk of cattle/vehicular collisions, temporary displacement of cattle during detonation of charges and geophone placement, and increased potential for invasion by nonnative plant species. Helicopters in the area would also disturb grazing cattle and cause some temporary displacement from areas of seismic activity. These impacts would be mitigated through reclamation, coordination between the Devon and permittees, and the timing of the drilling relative to the grazing season of use.

4.12.2 No Action Alternative

Under the No Action Alternative, the BLM would not select the Proposed Action. Because there would be no seismic exploration activities, no impacts to range resources would occur.

4.12.3 Additional Mitigation

The following are additional mitigation measures to protect livestock and rangeland under the Proposed Action:

- Coordinate with livestock permittees during seismic exploration activities.

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- Coordinate with livestock permittees on the shot hole drilling and detonation schedule to reduce or eliminate interactions with cattle (e.g., design grazing schedule to defer the areas until seismic activities are complete.
- Locate and mark range improvements such as stock waterlines, springs and tanks that may be in proximity to shot holes to alert permittees using the area. A 250-foot buffer on all stock waterlines would be implemented for shot holes.
- Complete reclamation immediately to reduce potential for invasive nonnative species and to restore forage on the sites.
- Carpool crews to the area to reduce traffic and potential for collisions with cattle.
- Strictly enforce speed limits.

4.13 WASTES, HAZARDOUS AND SOLID

A variety of materials typical of seismic survey operations could be onsite during the project program. Other solid wastes associated with the Proposed Action would include human waste and trash.

4.13.1 Proposed Action

The principal hazardous materials that would be used in the proposed Project Area would be explosives. Other hazardous materials would include diesel fuel, oil, and petroleum-based lubricants for drilling rigs, jet fuel for the helicopter, cleaners and solvents, and spray paint. Field personnel would be required to follow safe handling, transportation, and storage procedures enforced through the EPA, BLM, and the State of Wyoming. Because explosives and their storage would be handled by personnel licensed and responsible to do so, the potential impacts to human health and the environment would be negligible. Implementation of the Applicant-Committed Environmental Protection Measures, COAs, and BLM regulations would ensure that an Emergency Response Plan (ERP) and Spill Prevention, Containment and Countermeasure Plan would be implemented.

Field personnel would be required to immediately remove any human and other project-generated trash. Personnel mobilizing on foot would be required to immediately remove and carry out any trash where vehicle or helicopter access is not feasible. Given these required procedures, the impact from human trash would be minimal.

4.13.2 No Action Alternative

Under the No Action Alternative, the Proposed Action would not be selected, and no explosives or other hazardous materials would be used. Therefore, there would be no change to existing conditions, and no new impacts to the proposed Project Area.

4.13.3 Additional Mitigation

No additional mitigation measures will be necessary.

4.14 NOISE

4.14.1 Proposed Action

During geophysical exploration operations noise would be associated most of the main project activities, including helicopter use, drilling operations, seismic shots, vehicle traffic, and human activity within the proposed Project Area. Of these, the helicopter noise has the potential to cause the greatest disturbance to recreationists (i.e., hunters) and to wildlife. The relative quiet of the proposed Project Area in comparison to the project-related noise is a primary issue.

Seismic-related activities including the detonation of charges, support traffic, and helicopter noise would create sound disturbance within the immediate area of operations. Noise in the range of 90-100 decibels (dBA) for short durations (BLM 2003, U.S. Army 2008) would occur. These noises would be transient as the project operations proceed across the proposed Project Area, but would occur for the duration of the project (approximately 45 days). A short distance away from the project operations, the noise level would diminish considerably. For example using the Inverse Square Law of Noise Propagation to calculate attenuation, a 100 decibel sound would be attenuated to approximately 62 decibels at 1,280 feet (BLM 2008). Attenuation also depends on other factors such as vegetation or other physical obstacles.

Helicopters create more noise disturbance than other types of equipment. Noise from helicopters is complex, consisting primarily of engine noise (usually turbine), gearbox noise, blade loading noise, and a host of interaction noises. Helicopter noise is expected to last for approximately 45 days. Tests by the FAA on helicopters comparable to the ones used for seismic operations indicate 70-80 dBA levels at usual air speed and 1,500-foot flyover altitudes directly underneath the helicopter (BLM 2005b). Helicopter noise would occur over much of the proposed Project Area, but would be focused primarily along flight paths, staging areas, at shot hole drilling locations. Only one helicopter at a time is expected for the project, which would lessen overall noise impacts.

There would be drill rig noise for most of the 45-day duration of the project duration. The drill rig noise comes from the diesel engine that powers the compressor, the compressor, and the sound from the rotary drill rig itself. Up to eight drill rigs can be in use at any one time. The drill rig and associated noise can be relatively loud near the drill rig, and while the sound would become attenuated as the distance from the drill rig increases, the drill rig would likely be heard for a quarter-mile or more.

Vehicle traffic noise would be of a limited extent and not create noise levels substantially over current noise levels. Most of the traffic would be from light trucks and ATVs, with some semi-tractors used for moving the equipment and supplies to the staging area.

Direct human noise would be very limited and disturbance from workers to animals in the immediate vicinity would not likely to impact wildlife or recreationists, except over the short term.

The absolute noise level is not expected to exceed the 55 dBA level except for brief periods and then only if the recreationist (i.e., hunter) is in close proximity (less than a mile) from the

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operations or near the helicopter flight path. However, it is the relative change from background to project level noise that is likely to be of concern. Impacts from noise on wildlife are of primary concern for BLM-listed sensitive species, raptors, migratory birds, and big game species. The response and impacts from noise to wildlife is extremely varied and general conclusions about the type and magnitude are difficult to reach (Larkin 1996). Project-related noise may cause individuals or groups of animals to seek shelter or temporarily flee the immediate area of activity and move to adjacent suitable habitat. However, wildlife displacement would be expected to be brief and localized, as activities are concentrated in limited areas at any one time, the activity is fast moving, and the duration in any one area is short-term. The potential to reduce habitat effectiveness by disturbing or displacing individual animals during the project does exist; however, due to the nature of the operation such disturbance would be short-term and temporary and effects on individuals would likely be transient.

Explosive detonations would occur underground and therefore produce little aboveground noise. Noise from the seismic shots would be very brief thump sound, and no louder than small arms fire (J. Hughes, Devon Energy, personal communication with D. Kane, TEC, Inc., August 5, 2008). As a result, the impacts from the actual seismic shot should not impact wildlife any more than recreational small arms used during the hunting season. The impact could be somewhat greater for burrowing animals, who exhibit a keen sense of hearing. Although temporary noise impacts would occur, the noise impacts would not be expected to adversely affect general wildlife species on a population level basis, nor are they expected to result in a loss of viability of general wildlife species in the area.

4.14.2 No Action Alternative

Under the No Action Alternative, the BLM would not select the Proposed Action and no noise increasing operations would occur. Therefore, there would be no change to existing conditions, and no potential noise-related impacts to area wildlife and human visitors.

4.14.3 Additional Mitigation

Applicant-Committed Environmental Protection Measures would include development of a helicopter flight plan that is intended to minimize impact to big game species.

5.0 CUMULATIVE EFFECTS

Pursuant to NEPA, federal agencies must consider the cumulative effects of the Proposed Action in conjunction with other activities. Cumulative impacts are defined as the impact on the environment resulting from incremental impact of the [proposed] action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions. Cumulative effects are effects that increase by successive addition, or incrementally by a series of actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR 1508.7).

A general perspective of how the Proposed Action relates to the overall cumulative effects can be achieved by asking how the single action proposed contributes to potential threats or changes from all sources in an area over the long term. This cumulative effects analysis asks the following questions:

- Could the additive effects of the Proposed Action be of such magnitude that it could have significant influence on resource abundance, productivity, condition, or trend over the cumulative effects area well into the future?
- Does the Proposed Action contribute significantly to making conditions worse (negative or adverse)?
- Does the Proposed Action have little bearing or no detectable influence on changes or threats to the resource (neutral)?
- Does the Proposed Action contribute to making conditions better (beneficial)?

Although the cumulative effects analysis requires analysis that is forward looking, it focuses only on the potential additive impact of the Proposed Action when added to the aggregate effects of past, present, and reasonably foreseeable future actions, as required by NEPA. To achieve this, the cumulative effects analysis of this single geophysical exploration was bound temporally and spatially, defining the duration and area for project effects. The time period within which cumulative effects were bounded is roughly from the 1970's through 20 years from project initiation, or about 2028. This timeframe over which the analysis is conducted includes the decision(s) made, and potential follow-up actions that would be implemented and completed. The cumulative assessment includes an analysis of impacts of past, present, and reasonably foreseeable future actions in an area BLM has identified based on big game hunt units, and the Pine Mountain Management Area.

Past and Present Actions Relevant to this Cumulative Effects Analysis

The major critical elements that contribute to past and present actions relevant to this cumulative effects analysis include minerals activities; cultural resources; vegetation/fire management; road construction, reconstruction, and improvement; visual resources; recreation; wildlife; and land use and development.

Mineral Activities

- Previous seismic activities have occurred in the general area including portions of the proposed Project Area.
- Mineral leasing for oil and gas exploration and development has occurred.

- Several non-producing oil wells were drilled previously and four exploratory wells have recently been approved on BLM-administered lands with the proposed Project Area.
- Several producing wells and associated pipelines occur in the vicinity of the proposed Project Area.

Cultural Resources

- Cultural resources with Native American religious concerns remain undiscovered in the vicinity of the proposed Project Area.

Vegetation/Fire Management

- Prescribed burns have occurred on federal lands.
- Commercial livestock grazing has been permitted and has occurred on federal and state lands within the proposed Project Area.
- Invasive nonnative plant species have occurred on federal and state land.
- A BLM fire management plan has been in effect and wildland fire suppression has occurred.

Road Construction/Reconstruction/Improvement

- Many miles of new road have been constructed or improved across BLM-administered and State public land to allow better access for public land users, utility access, and mineral exploration.

Visual Resources

- A Class III visual resource management classification requires that lands within the vicinity of the proposed Project Area will require that management actions and continue to partially retain the existing character of the landscape.
- All surface disturbing actions, regardless of the visual resource management class require mitigation to reduce visual impacts.

Recreation

- Motorized recreation use (including ATVs and snowmobiles), as well as non-motorized recreation use, has occurred and is continuing to occur.
- The Cherokee Trail provides recreational opportunities.
- Big game hunting and fishing has been permitted and historically occurred.
- Demand for big game hunting license in the vicinity of the Project Area is high.
- Outfitting/guiding has been permitted and historically occurred.

Wildlife

- Wolves have been protected, reintroduced, delisted, and relisted.
- Pygmy rabbits, white-tailed prairie dogs, and Wyoming pocket gopher are under consideration for federal threatened or endangered species protection.

Land Use and Development

- Human use in the area has increased.
- Roads, transmission lines, telephone lines, and ancillary transmission line facilities have been constructed.

Range Resources and Livestock Grazing

- Springs and seeps have been developed, and water diversions, stock tanks, and stock water pipelines have been constructed.
- Livestock operators have retained grazing permits in the Pine Mountain Allotment.

Reasonably Foreseeable Future Actions That Will Likely Occur In Addition to Recurring and Continuing Activities

Additional oil and gas activity could occur in the proposed Project Area as leases have been secured from the federal government and the State of Wyoming. Four exploratory wells were approved in 2007 for drilling in or near the proposed Project Area on BLM-administered lands, and should they prove to produce, full field development could be proposed which would require new NEPA analysis. Based on existing trends, the demand for dispersed motorized and non-motorized recreation use, including ATV use, would likely increase on public lands.

Cumulative Effects of the Proposed Action When Added to Past, Present, and Reasonably Foreseeable Future Actions

To date, there have been no significant impacts to resources on federal lands within or adjacent to the proposed Project Area that has been identified in NEPA documents prepared for previous actions. A series of EAs, FONSI, and Decision Records were issued in 2007 for four exploratory wells, and Applications for Permit to Drill (APD) for these exploratory wells were issued in spring and summer 2008.

The proposed 3D geophysical seismic exploration or the No Action Alternative would not significantly contribute incrementally to long-term changes or conditions of the major critical elements identified on the previous page.

Any potential adverse long-term cumulative effects of the Proposed Action have been adequately mitigated through project design, Applicant-Committed Environmental Protection Measures, Conditions of Approval (COA), and additional mitigation measures recommended. The effect of these measures renders the Proposed Action to such a degree that project impacts can be considered cumulatively minor.

The 3D geophysical seismic exploration also contributes beneficial impacts by reducing adverse effects on resources over the long term if future oil and gas exploration and development were to occur. Little data is currently available to determine the potential success ratio of wells to develop oil and gas resources. Data collected using 3D seismic exploration methods could reduce the number of exploratory and development wells necessary to extract oil and gas resources with a higher success ratio. Fewer wells would result in the long-term reduction in potential disturbances to area resources, activities, and users from well pads, roads and other ancillary facilities.

Although the Proposed Action is neutral from a cumulative effects aspect, the Proposed Action cannot offset or compensate for past, present, and reasonably foreseeable adverse cumulative effects caused by non-Federal actions or actions on non-Federal lands.

6.0 CONSULTATION AND COMMUNICATION

An EA aids a federal agency in making decisions on an action by presenting information on the physical, biological, and social environment of a Proposed Action and alternatives. The Council on Environmental Quality (CEQ) regulations requires that an early scoping process be conducted to determine the issues related to the Proposed Action and the alternatives that the EA should address.

6.1 PUBLIC PARTICIPATION

Public participation is a critical element in the scoping process. A Scoping Notice for the *Horseshoe Basin 3D Seismic Survey Proposal* was mailed to government agencies, government officials, public land user groups, private landowners, newspapers, radio stations, environmental organizations, and posted to the BLM website (<http://www.blm.gov/wy/st/en/info/NEPA/rsfodocs.html>). The scoping process included a public comment period from August 15 to September 15, 2008. During the comment period 17 letters were received, which included a total of 167 comments. A list of agencies, organizations, and individuals that submitted comments along with a summary of comments and responses to those comments are provided in Appendix E.

6.2 PREPARERS AND REVIEWERS OF THE EA

This EA was prepared by TEC Inc., a third party contractor, for the BLM. The names and disciplines of the preparers are provided in Table 6-1. The BLM resource specialists who reviewed and approved the Horseshoe Basin 3D Seismic Survey EA are provided in Table 6-2.

Table 6-1. List of Preparers of this EA

Resource(s)	Name	Education/Yrs. Experience
Project Coordinator, Project Manager, Proposed Action, Rangeland Resources, Recreation, Visual Resources, Noise, Transportation, Cumulative Impacts, Coordinator – Public Comments/Response	David Kane	Ph.D. Studies, Ecology B.S. Wildlife Ecology/22 years.
QA/QC, Technical Editor	Marion Fischel	Ph.D. Biology M.A. Zoology B.A. Biology/25 years
QA/QC, Technical Editor, Cultural Resources	Kurt Schweigert	M.A. History B.A. History/32 years
Groundwater	Kristin Brown	B.S. Geology/4 years
Surface Water, Public Comments/Response to Comments	Chris Rowe	B.S. Water Resources M.S. Watershed Science/12 years
Paleontology	Gus Winterfield	Ph.D. Geology B.S. Geology/25 years
Document Processing	Josie Jackman	B.S./4 years
GIS, Maps	Melissa Johnson	B.S. Environmental Science/8 years

SECTION 5: CUMULATIVE EFFECTS

Resource(s)	Name	Education/Yrs. Experience
Wildlife, Special Status Species, Fisheries	Walt Moore	B.S. Zoology/30 years
Vegetation, Wetlands/Riparian, Special Status Plant Species, Noxious Weeds and Invasive Nonnative Plant Species	Sam Bamberg	Ph.D. Plant Ecology/ 37 years
Cultural Resources	Joel Tyberg	B.S. Archaeology M.S. Archaeology/12 years

Table 6-2. List of BLM Reviewers

Resource(s)	Name	Office
BLM Project Manager, Fluid Minerals	Russell Boulware	BLM Rock Springs
Assistant Field Manager-Minerals & Lands	John MacDonald	BLM Rock Springs
Assistant Field Manager-Resources	Bernie Weynand	BLM Rock Springs
Paleontology	Adam Day	BLM Rock Springs
Hydrology	Dennis Doncaster	BLM Rock Springs
Recreation/OHV/Visual Resources/Wilderness	Jo Foster	BLM Rock Springs
Special Status Plants	Jim Glennon	BLM Rock Springs
Fisheries/Riparian/Wetlands	John Henderson	BLM Rock Springs
Wildlife/Special Status Animals	Nick Kaczor	BLM Rock Springs
GIS	Douglas Kile	BLM Rock Springs
Environmental Planning and Coordination	Kathryn Lloyd	BLM Rock Springs
Document Editing	Angelina Pryich	BLM Rock Springs
Livestock Grazing/Weeds	Jonathon Sheeler	BLM Rock Springs
Cultural/Nat American/Trails	Colleen Sievers	BLM Rock Springs

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8.0 ACRONYMS

ACEC – Area of Critical Environmental Concern
AUM – Animal Unit Month
AO – Authorized Officer
ATVs – All Terrain Vehicles
BLM – Bureau of Land Management
BMP – best management practice
Ca – Calcium
CEQ – Council on Environmental Quality
CERCLA – Comprehensive Environmental Response, Compensation and Liability Act
CFR – Code of Federal Regulations
CO – Carbon Monoxide
COA – Conditions of Approval
CRCT – Colorado River Cutthroat Trout
CWA – Clean Water Act
dBA – Decibel A-weighted filter
Devon – Devon Energy Production Company, L.P.
DOI – Department of the Interior
DR – Decision Record
EA – Environmental Assessment
EIS – Environmental Impact Statement
EPA – Environmental Protection Agency
EPCRA – Emergency Planning and Community Right-to-Know Act
EO – Executive Order
ERP – Emergency Response Plan
ESA – Endangered Species Act
Fe – Iron
FEMA – Federal Emergency Management Agency
FLPMA – Federal Land Policy and Management Act
FONSI – Finding of No Significant Impact
GPS – Global Positioning System
HCPC – Historic Climax Plant Community

SECTION 8: ACRONYMS

K – Potassium

Mg – Magnesium

Mn – Manganese

mg/L – Milligrams per Liter

MLA – Mineral Leasing Act

MSDS – Material Safety Data Sheet

NAAQS – National Ambient Air Quality Standards

NEPA – National Environmental Policy Act

NHPA – National Historic Preservation Act

NOA – Notice of Availability

NOI – Notice of Intent

NRCS – Natural Resources Conservation Service

NRHP – National Register of Historic Places

NWI – National Wetlands Inventory

O₃ – Ozone

OHV – Off Highway Vehicle

OSHA – Occupational Safety and Health Administration

P – Phosphorous

PFYC – Potential Fossil Yield Classification

PM₁₀ – Particulate Matter less than 10 Microns in Diameter

PMMA – Pine Mountain Management Area

RCRA – Resource Conservation and Recovery Act

RMP – Resource Management Plan

ROW – Right-Of-Way

RSFO – BLM Rock Springs Field Office

SARA – Superfund Amendments and Reauthorization Act

SHPO – State Historic Preservation Office

SPCC – Spill Prevention, Containment, and Countermeasure

TDS – Total Dissolved Solid

TCP – Traditional Cultural Property

USFS – United States Forest Service

USFWS – United States Fish and Wildlife Service

USGS – United States Geological Survey

WYCRO – Wyoming Cultural Resources Office

WYDOT – Wyoming Department of Transportation

WGFD – Wyoming Game and Fish Department

WOGCC – Wyoming Oil and Gas Conservation Commission

WSA – Wilderness Study Area

WYNDD – Wyoming Natural Diversity Database