



United States Department of the Interior

BUREAU OF LAND MANAGEMENT

Cody Field Office

P.O. Box 518

Cody, Wyoming 82414-0518

(020)

3250

WYW-160167

December 5, 2005

Dear Reader:

This revised Environmental Assessment (EA) on the Clark 3-D Geophysical Project, proposed by Quantum Geophysical, Inc., is furnished for your review and comment. No decision has been made at this time regarding the proposal. The BLM will accept public comment for 30 days prior to making a decision. After analysis of the comments, BLM will document its decision in a Decision Record (DR). The BLM's decision will be with respect to the BLM-administered public lands in the project area only, and will not create nor abridge any rights on private or state lands within the project area. The U. S. Forest Service, a cooperating agency, will issue a separate decision for the National Forest System lands involved in the project.

The BLM could decide to approve the issuance of a permit for the proposed project, or for an alternative project configuration. If it were determined that the project could cause a significant impact to the human environment, it would be necessary to prepare an environmental impact statement before a final decision could be made. Alternately, BLM could deny the permit if there were a potential that the project could cause unnecessary or undue degradation to the public lands, or if it would threaten a violation of other Federal law.

This EA was prepared pursuant to the National Environmental Policy Act and other relevant law and regulation, to fully disclose the anticipated impacts of the proposed geophysical project and reasonable alternatives. A "No Action" alternative is also described. The project proponent's proposed action was modified to incorporate Project Design Features (PDFs) which avoid, minimize, rectify, reduce, eliminate, or compensate for adverse impacts. These PDFs reflect regulatory requirements, management plan requirements, surface use requirements, protective measures, operating procedures, and best management practices.

We will accept comments on the EA until close of business January 12, 2006. Comments should be mailed to:

BLM, Cody Field Office
Attn: Clark 3-D Project EA
P.O. Box 518
Cody, WY 82414

You may also e-mail your comments to:

cody_wymail @hlm.goy

Your participation in the NEPA process for this project is appreciated.

Sincerely,

/s/ Michael J. Blymyer

Michael J. Blymyer
Field Manager, Cody

Enclosure



U. S. Department of the Interior
Bureau of Land Management

Cody Field Office

December 2005



Clark 3-D Geophysical Survey
Environmental Assessment

MISSION STATEMENT

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

BLM/WY/PL-05/013+1320

ENVIRONMENTAL ASSESSMENT

CLARK 3D GEOPHYSICAL EXPLORATION PARK COUNTY, WYOMING

**Bureau of Land Management (BLM)
Cody Field Office
and
U.S. Forest Service
Shoshone National Forest
Clarks Fork Ranger District**

EA No.: WY-020-EA04-131
BLM Case No.: WYW-160167
Forest Service Case No.: G2-1401-0401

Final Document

DECEMBER 2005

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ENVIRONMENTAL ASSESSMENT

CLARK 3D GEOPHYSICAL SURVEY

PARK COUNTY, WYOMING

1.0 INTRODUCTION

1.1 DOCUMENT STRUCTURE

This Environmental Assessment (EA) has been prepared in compliance with the National Environmental Policy Act (NEPA) and other relevant federal and state laws and regulations. This EA is tiered to the Bureau of Land Management (BLM) Cody Resource Area (CRA) Resource Management Plan (RMP), the Shoshone National Forest (SNF) Land & Resource Management Plan (Forest Plan) as amended, and their associated environmental analyses and decision documents.

As 3-Dimensional (3D) geophysical exploration operations on both BLM-administered and National Forest System lands is being proposed, this EA is being prepared to evaluate effects on all federal and nonfederal lands in the potentially affected area. Because of the functional interdependence and geographical proximity (40 CFR 1501.5(2)) of the proposed activity on federal lands administered by two agencies, and as the majority of the activity is on BLM-administered public lands, the BLM is the lead agency for this effort and the Forest Service (FS) is a cooperating agency. The lead agency has the primary responsibility for preparing and supervising the preparation of this environmental document (40 CFR 1501.5).

This EA is not a decision document; the deciding officials will document their decisions in a separate decision document after a 30-day public review of the EA. The purpose of this document is to disclose the direct, indirect, and cumulative effects and consequences of the proposed action and alternatives to it. This jointly prepared EA will be used for evaluation of the alternatives and to make a determination of the need to prepare an Environmental Impact Statement (EIS) or a Finding of No Significant Impact (FONSI). The responsible line officers (BLM and FS) will make decisions based on consideration of the purpose and need for the project, the significance of the effects of alternatives, and public concerns. If impacts are not significant as defined in 40 CFR 1508.27, separate decision documents will be prepared by the appropriate agency officials (a Decision Record for the BLM, a Decision Notice for the Forest Service, and a joint BLM/Forest Service FONSI). Decisions will be prepared and distributed along with this EA, and a legal notice will be published in the *Powell Tribune* newspaper. If impacts are determined to be significant, the Environmental Impact Statement process will be initiated. For this project, the responsible officials are:

- BLM Field Manager, Mike Blymyer of the Cody Field Office
- Forest Service District Ranger, Dave Myers of the Shoshone National Forest

Tiering is in accordance with Council on Environmental Quality (CEQ) regulations (40 CFR 1502.20 and 1508.28), which allow the responsible official to focus on site-specific issues that are within the scope of a broader plan, program, or analysis that is already approved. All BLM documents that are incorporated by reference in this document can be reviewed upon request at the Cody BLM Office in Cody, Wyoming; and all Forest Service documents that are incorporated by reference can be reviewed upon request at the Forest Service Wapiti District Office in Cody, Wyoming. The document is organized into five main parts plus appendices:

Section 1 - Introduction: This chapter includes a brief description of the applicant's proposal, scope of the analysis, regulatory framework, the purpose of and need for the project, and information on the methodology and background to assist in understanding of the technical aspects of the project proposal. This section also details how the federal agencies informed the public and solicited their input relating to the proposal and how the public responded. Key issues that provided the focus for the analysis are identified in this chapter.

Section 2 – Comparison of Alternatives, Including the Proposed Action: This chapter provides a more detailed description of the applicant's proposal and the Agencies' proposed action, as well as alternatives. These alternatives were developed based on issues and concerns raised by the public, the involved agencies, and other agencies. This section also includes alternatives eliminated from in-depth analysis and the rationale, as well as Project Design Features (PDFs) that minimize adverse impacts and capitalize upon beneficial opportunities. Based upon the information and analysis presented in Chapter 3, this section summarizes the environmental effects of the alternatives in comparative form, thus sharply defining the issues and providing a clear basis for choice among the decision maker and the public.

Section 3 - Affected Environment and Environmental Consequences: This chapter describes the environmental effects of implementing the proposed action and other alternatives. This analysis is organized by resource, e.g., wildlife, recreation, vegetation, etc. Within each section, the affected environment is described first in order to provide a baseline for evaluation and comparison of the alternatives that follow. Direct, indirect, and cumulative effects of the proposed action and alternatives are disclosed.

Section 4 – Consultation and Coordination: A list of preparers, as well as persons and agencies consulted during the preparation of the EA is provided.

Section 5 – References Cited: Sources cited in the EA.

Appendices: The appendices contain more detailed information to support the analysis including a glossary (Appendix A), Notice of Intent (Appendix B), Summary of Scoping Comments (Appendix C), USFWS Concurrence Letter (Appendix D), Administration of Seismic Permits (Appendix E), and Land and Realty Authorizations (Appendix F). Additional information that supports the analysis presented in this document is contained in the project file located at the Cody BLM Office, 1002 Blackburn Avenue, Cody, Wyoming 82414.

1.2 BACKGROUND



Photograph 1. General view of the Beartooth Face area where 3D geophysical exploration is proposed.

1.2.1 History

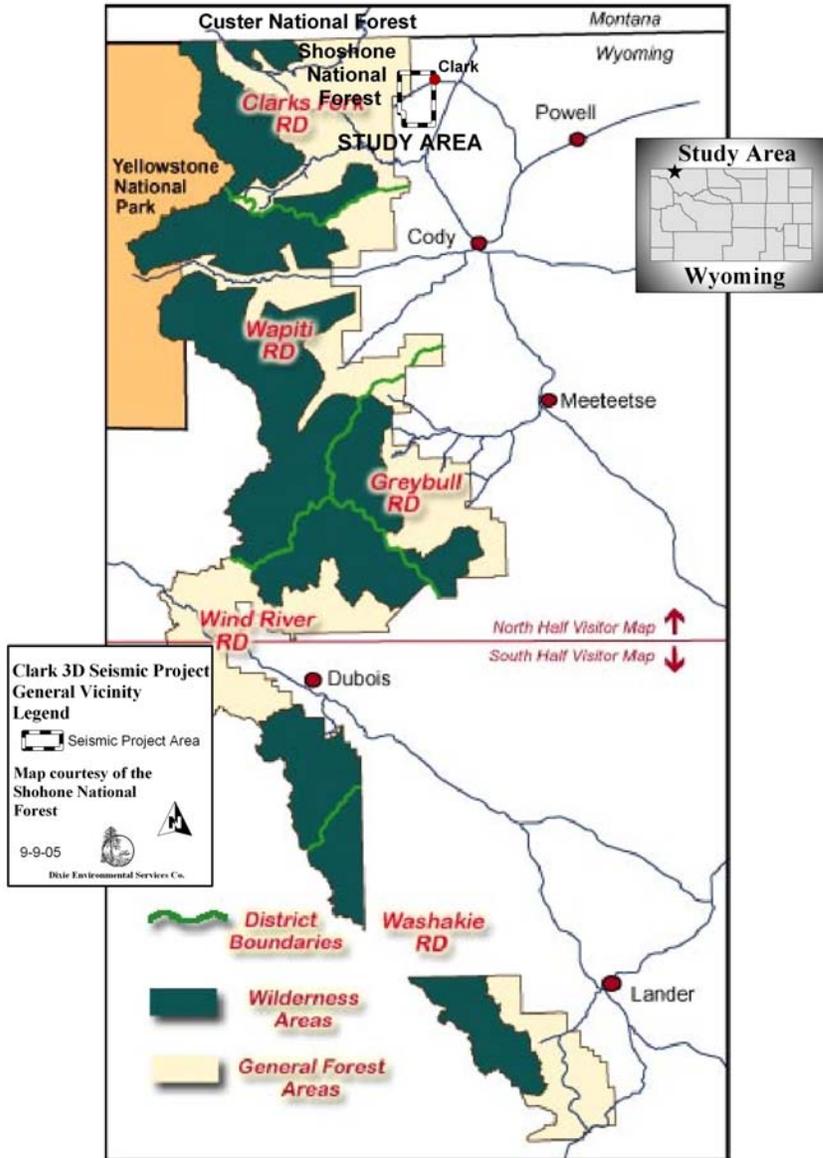
On March 25, 2004, Windsor Wyoming LLC (applicant) filed Notices of Intent (NOIs) with the Bureau of Land Management Cody Field Office (CYFO) and the Shoshone National Forest Clarks Fork Ranger District (FS) to have their contractor, Quantum Geophysical, Inc., conduct a three-dimensional (3D) geophysical exploration project. The proposal included both BLM administered lands and Forest Service System lands located west of the community of Clark, Park County, Wyoming. See **Map 1** for general location.

A pre-decisional EA was released for a 30-day public review period in May 2005. Because of comments received during that review period, which surfaced additional concerns and pointed out some analysis deficiencies, as well as the fact that new alternatives were analyzed, this EA is being reissued and an additional 30-day public review period would be initiated with its release. There is no need for persons to comment unless new or additional information or concerns have surfaced since the initial scoping and comment periods, as all previous comments, issues, and concerns are still on record in the project files.

1.2.2 General Geophysical Exploration (Seismic) Methodology

The general technique of the geophysical exploration operation proposed is referred to as seismic reflection method. This method utilizes an energy source that sends acoustic energy into the earth. This energy is reflected from subsurface layers and recorded at the surface with instruments (geophones) used to transform seismic energy into electrical impulses. A computer then processes the data and creates an image of the subsurface geology.

Map 1. Clark Seismic Project General Vicinity Map



Energy sources for seismic waves usually consist of specialized trucks equipped with metal pads that vibrate the ground (vibroseis method) or by detonating subsurface explosive charges that have been loaded into a drilled hole 3-4 inches in diameter (shothole method). (Note: No vibroseis is being proposed for this project). Shotholes may vary in depth from 30 to 60 feet. Energy source points are typically spaced approximately 220 feet apart. The above described seismic exploration method, when carried out with source point locations and geophones arranged along the same linear aspect is commonly referred to as 2-Dimensional (2D) seismic exploration.

New technology has allowed for the development of a higher definition survey referred to as 3-Dimensional seismic exploration (3D). With a higher concentration of receivers, and energy source points laid out in a grid pattern, data collected from 3D geophysical exploration operation has at least four distinct advantages over a 2D geophysical exploration operation.

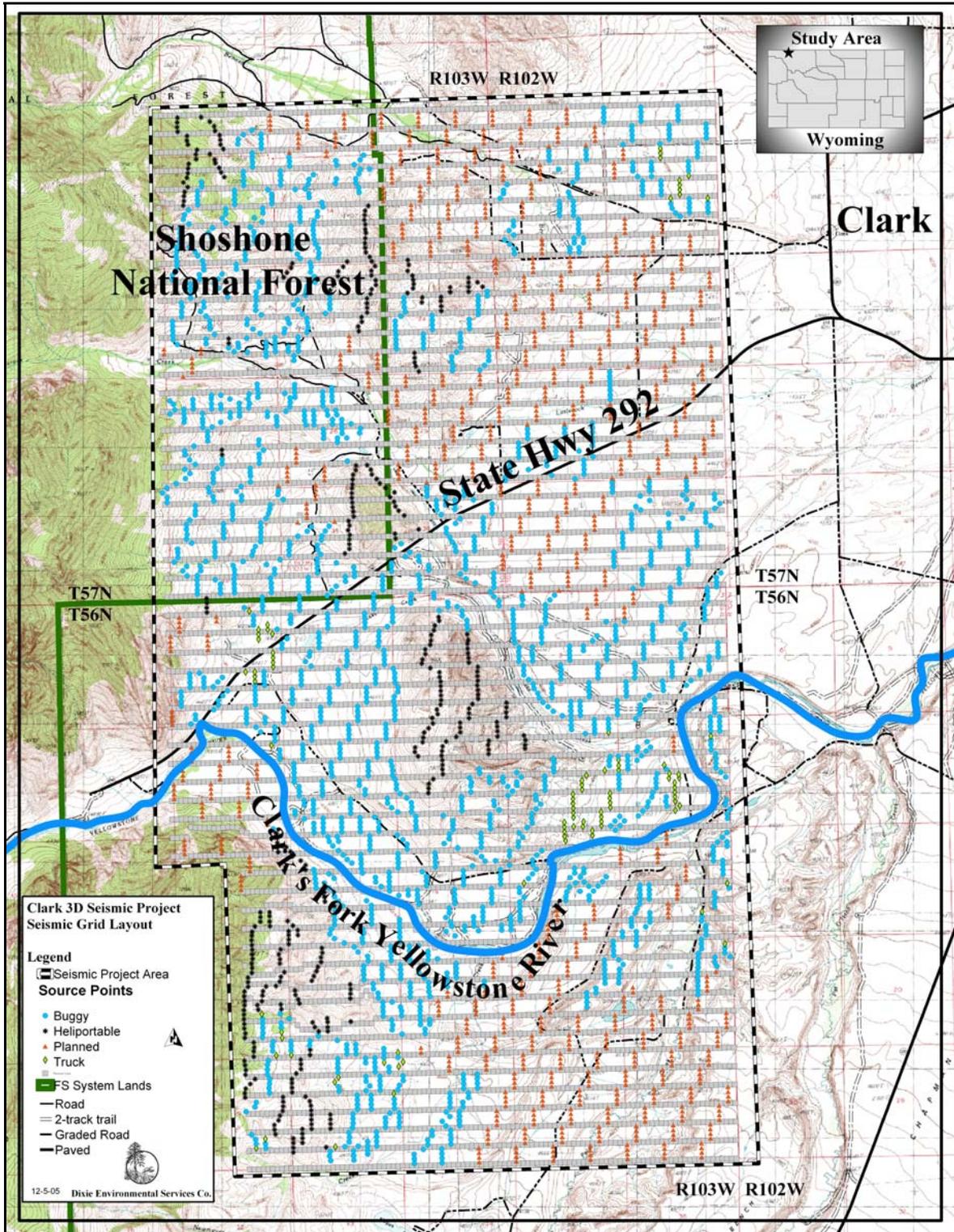
1. It more accurately depicts the subsurface reservoir's structural geology.
2. It more accurately depicts reservoir distribution and quality.
3. It provides more information about the reservoir's fluid content.
4. It allows for much more detailed and quantitative interpretations of the reservoir.

The effectiveness and value of a 3D survey is the generation of a relatively continuous image of subsurface conditions in essentially all dimensions. To illustrate, contrast the information provided by a two-dimensional (2D) survey. A 2D survey produces an image of a vertical slice directly beneath only the seismic line. Two dimensions are represented, the vertical dimension and the horizontal dimension beneath the line. Conditions between lines must be interpolated. Three-dimensional data allows reliable interpretation of stratigraphy, depths, and subtle contrasts in rock quality and trends in these characteristics for essentially every subsurface position within the entire survey area.

Three-dimensional surveys are necessarily more intensive, with a greater number of source points and receiver locations than 2D surveys. As a result, certain critical “density” of data must be achieved to provide the interpretive advantages of the 3D survey. Source line orientation is dictated by topography. The depth of desired imaging generally dictates the distance between source lines and the distance between receiver lines. Imaging shallower formations requires more closely spaced lines. The distance between individual source point and receiver locations controls the resolution and detail of the 3D images generated by the survey. See **Map 2** for source point and receiver point locations for this survey.

This survey would generate an image component for every 110 foot by 110 foot area in the subsurface. This resolution is consistent with data density needed to provide the interpretive capabilities of a 3D survey and is also consistent with typical industry practices for 3D geophysical exploration operations. Line spacing and source point and receiver point spacing influence the overall data quality. Every data point generated by the geophysical exploration operation is in fact a summation of the process signals from multiple detonations. The number of individual processed signals that contribute to the final imaged point is known as the fold number. At low fold numbers, less than 40 for this geologic and topographic environment of the project area, data becomes unacceptably unreliable for purposes of interpreting subsurface conditions. This survey is designed to provide a fold number of 50 or greater at targeted depths.

Map 2. Clark 3D Seismic Project Seismic Grid Layout



To effectively generate 3D seismic data that can be of value, it is imperative that the geophones (receiver points) are laid out and recording simultaneously across a large area (this is what determines a minimum size for a 3D project area). This simultaneous recording over a relatively large area is the very basis of 3D seismic methodology. As described above, this is totally different than layout required for 2D geophysical exploration. It is not reasonable to mobilize, drill, shoot, and record on only a small portion of a project area with 3D methodology, as the data would be of little value relative to three dimensional mapping of underground structure.

The Clark 3D project area overlaps three previous geophysical exploration efforts. The Bennett Creek 3D, which encompassed approximately 1.5 square miles in the northern portion of the project area, would be overlapped by the proposed Clark 3D project. The Bennett Creek 3D project was conducted in 1996 and consisted of 722 thirty-foot holes, loaded with 10-pound charges. The Bennett Creek 2D, conducted in 1984, is also overlapped by the proposed Clark 3D project on the north end; however, the area of overlap is considerably less due to the in-line nature of 2D projects. The Bennett Creek 2D extends about 3.5 miles into the proposed Clark 3D project area. A third seismic project, also a 2D project, is overlapped by the proposed Clark 3D project from the south and extends 2 miles into the proposed project area. Areas of overlap are necessary to allow the applicant to tie in data, as well as collect data specific to the desired imaging depths.

Although previous 2D geophysical surveys have been conducted, the data is of poor quality, thus limiting its use and, more importantly, dated 2D survey methods and resulting data is much less useful than the current technology of 3D surveys and resulting data. The proposed 3D geophysical exploration operation for the project area would provide about 8 times the density of data points for interpreting the subsurface conditions in comparison to the existing previous data sets (288 traces vs 2,304, respectively).

All of the BLM-administered lands within this project area are within Cody Field Office jurisdiction, and all National Forest System lands are within the jurisdiction of the Shoshone National Forest Clarks Fork Ranger District. **Please note that portions of the project occurring on private or state lands are not subject to BLM/Forest Service authorization.** Legal descriptions of all lands potentially affected by the proposed project are included in **Table 1**.

1.3 PURPOSE AND NEED FOR ACTION

The purpose of this action is to authorize Quantum Geophysical, Inc. to conduct geophysical exploration operations on federal lands near Clark, Wyoming to determine the potential for occurrence of oil and gas resources in the underlying formations. The results of this geophysical exploration operation are expected to provide the applicant with a high-resolution image of potential hydrocarbon bearing reservoirs underlying the project area. This action is needed because Quantum Geophysical has filed *Notices of Intent (NOIs) to Conduct Oil and Gas Geophysical Exploration Operations* on federal lands managed by the BLM and Forest Service. Through submission of the NOIs, Quantum Geophysical requested authorization to conduct seismic exploration operations on federal lands.

Table 1. Lands Affected by the Clark 3D Geophysical Exploration Project

Township & Range	Surface Management Sections Overlapped By Project Boundary			
	BLM*	NFS*	Private	State
T 56 N, R 103 W	1, 2, 3, 4, 5, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 20, 21, 22, 23, 24, 27, 28, 29	na	1, 2, 11, 12, 13, 14, 22, 23, 24, 25, 26, 27, 29	1, 11, 12, 16, 17, 25, 26, 28, 29
T 57 N, R 102 W	8, 18, 30, 32	na	7, 8, 17, 18, 19, 20, 29, 30, 31	na
T 57 N, R 103 W	12, 24	10, 14, 15, 22, 23, 26, 27, 34, 35	11, 12, 13, 23, 25, 26, 35	36

*All or portions of the sections that are in bold type are on a federal minerals lease held by Windsor Wyoming, LLC.

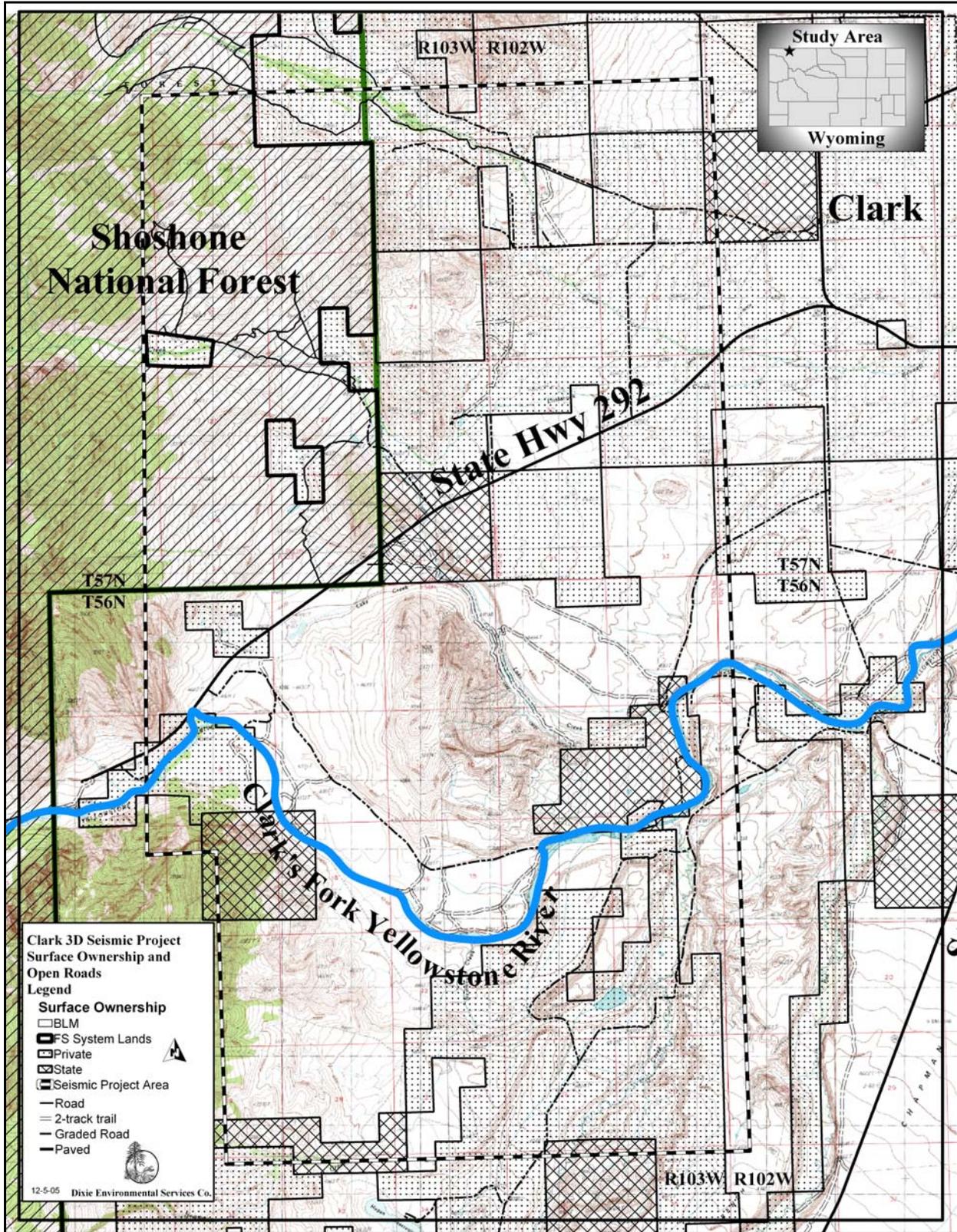
1.4 PROPOSED ACTION

The proposed geophysical exploration project would evaluate the subsurface geologic conditions for the presence of oil and natural gas resources in a project area approximately 5 miles wide by 9.5 miles long and covering approximately 29,300 acres (45.8 square miles) of federal, state, and private lands located near Clark, Wyoming. Of the total acreage in the project boundary, some 11,608 acres (41%) are BLM-administered public lands, 5,134 acres (17%) are National Forest System lands, 2,135 acres (7%) are state lands, and 10,435 acres (35%) are privately owned, as shown on **Map 3**.

Quantum has proposed to perform a 45.8 square mile, 3D, shothole operation with energy source points and receivers arranged in a grid pattern (**Map 2**). Receiver line spacing will be 1320 feet apart, with geophones spacing at approximately 220-foot intervals over 279 linear miles. Energy source lines will be placed perpendicular to the receiver lines, with shotholes also at 220-foot intervals along 139.5 linear miles. Shotholes for this project will be drilled to a depth of 30 feet. There would be a total of 3,420 shothole points and 7,018 geophone receiver points within the project area (approximately 1984 shotholes and 4,070 receiver points on federal land). Actual surface use by the proposed project would be restricted to 100-foot corridors along the seismic lines (source lines and receiver lines), as well as small staging and base station areas, comprising less than 17 percent of the total project area (approximately 5,000 acres).

The applicant would use the 3D shothole geophysical exploration method employing a combination of helicopter and wheeled vehicles for transport, drilling, and support to complete the geophysical exploration project (**Appendix B - Notice of Intent**). The use of truck-mounted drills, buggy-mounted drills, or heliportable drills would be based primarily upon terrain.

Map 3. Clark 3D Seismic Project Surface Ownership and Open Roads



No construction of roads, blading of staging areas, cutting of trees, or other major ground disturbance is proposed on federal lands. All known/discovered cultural resource sites, springs, wells, water sources, and other sensitive areas would be avoided by maintaining required distances to reduce the potential risk of adverse impacts. In addition, the western portion of the BLM-designated Resource Management Unit (RMU) Bald Ridge Seasonal Closure (for critical wintering range of elk and mule deer) that is on steep slopes would be excluded from survey operations.

Generally, cross-country travel on the source lines would only require one trip. However, where land obstacles, steep terrain, or cultural avoidance areas are encountered, the drill buggy would be required to backtrack on the source lines. Some portions of the source lines that are inaccessible by the drill buggy would be accessed using a small drill carried via helicopter (heliportable drill).

To position the geophones along the receiver lines, Quantum will use a helicopter to carry bags of geophone cable and associated equipment to various locations along the receiver lines. From the drop-off locations, crews will lay out equipment on foot. ATVs will also be used to transport equipment, where needed. To access the source locations, the buggy drill will travel on the receiver lines when necessary. The reverse process will take place when the equipment is retrieved. The support personnel necessary to layout and pickup the geophones will be transported via crew transport vehicles and ATVs. Other vehicles that may be used on the project include, but are not limited to: 1) one 3-ton recording truck, 2) four 1-ton line trucks, 3) one mechanic truck, 4) one support truck, 5) one helicopter support truck, and 6) one crew manager truck. These other vehicles would not be driven on the receiver lines. Staging areas for the equipment deployment, the helicopter landing zone, and the helicopter fuel storage will be located on various designated locations throughout the project area. Staging areas will be located on sites previously disturbed, where possible. Quantum would follow all project design features that were described on the NOI, project design features in this EA that would be incorporated in the plan of operations as Conditions of Approval, and the standard Special Terms and Conditions attached to the NOI. This would reduce or eliminate potential environmental impacts.

Proposed drilling operations would begin on private and state lands on May 15, 2006 and proposed drilling on BLM and National Forest System lands would begin July 1, 2006. Proposed recording operations on the project area would begin in August of 2006, and would be completed in approximately 30 days. Assuming this time period, the projected time for completion would be in mid-September. In reality, in order to maximize efficiency and minimize the period required for field operations, recording operations would be initiated when a majority of the drilling is completed. A majority of the project area must be drilled before recording can be initiated, and a minimum of 24 receiver lines must be laid out and operational during recording operations. In order to allow a reasonable time period for unforeseen delays caused by weather or other factors, this analysis assumed that the operating period would be between July 1 and October 10. The proposed time periods are based upon time schedules and completion periods for dozens of similar 3D projects completed previously in the western United States, many of which were in Wyoming.

Surveying of shothole and receiver point locations, as well as archeological surveying, has been completed on all BLM-administered and National Forest System lands to assist with planning. Because the entire project was determined to be an “Undertaking” pursuant to the National Historic Preservation Act, as amended, and because cultural resources were deemed important to the residents within the project area, all private surface, where permission to enter could be obtained, and State of Wyoming lands were inventoried for the presence of cultural resources. For consistency and efficiency, and because the BLM is the lead federal agency for this project, the archeological survey methods used on the Shoshone National Forest followed the BLM protocol. This is defined by the BLM programmatic agreement with the State Historical Preservation Office for seismic evaluation in order to comply with the National Historic Preservation Act provisions for cultural resource protection.

This EA addresses potential effects of the geophysical exploration operation within the project area on federal lands, regardless of federal administrative unit.

1.5 DECISION FRAMEWORK

1.5.1 Scope of This Analysis

Scope consists of the range of actions, alternatives, and impact to be considered (40 CFR 1508.25). The scope of this analysis is limited to geophysical exploration using the 3D seismic reflection method (shothole method) in the Clark area, utilizing a total of 3,420 thirty-foot shotholes loaded with 10 pound charges over 45.8 square miles and ground-vehicle mounted and/or heliportable transportation methods.

Geophysical exploration, using above ground explosives (surface shots or stake-mounted Poulter method) or charges more than 10 pounds and drill holes deeper than 30-feet, will not be analyzed.

This analysis is also limited to geophysical exploration operations. Analysis of land availability for oil and gas leasing and the land specific leasing decisions were made in previous decisions by both agencies (Cody RMP and SNF Land & Resource Management Plan) and are therefore outside the scope of this analysis. Applications for permits to drill (APDs), or potential development of oil and gas fields and ancillary facilities (i.e. compressor stations, pipelines, etc) in the Clark area are also beyond the scope of this EA and will not be addressed or discussed, as such actions would require separate NEPA analysis.

This document contains no discussion or analysis of seismic operations being permitted during the period October 15 to June 30, as there is no proposal to operate during this period. The applicant does not propose to operate on public land during the major hunting season that opens October 15, during the winter period (December thru March), or during the spring birthing/nesting periods (April thru June). Analysis of effects disclosed in the EA are limited to the time period specified in the proposed action, July 1 to mid-September, plus an approximate 30-day period for unforeseen delays (i.e. weather, breakdowns, etc.).

Discussion and analysis was limited only to the factors relevant to the decision. Although the EA displays some programmatic restrictions on crucial wildlife areas (i.e. sage grouse leks) during crucial periods (i.e. spring nesting), the discussion and analysis was limited to the effects of geophysical exploration operations on habitat components (i.e. sagebrush) potentially affected by the proposal. This was because no geophysical exploration operations would occur during these critical seasonal periods (i.e. winter, birthing/nesting).

1.5.2 Decision To Be Made

Given the purpose and need for this project, the deciding officials, BLM Field Manager Mike Blymyer, and Forest Service District Ranger Dave Myers, review the proposed action and the other alternatives in order to make the following decisions:

- Whether to implement the proposed action, an alternative to the proposed action, or the no action alternative. The decision will be documented in a Decision Record (BLM) and a Decision Notice (FS).
- Whether to prepare an environmental impact statement. If the environmental analysis indicates to the decision maker that impacts associated with the alternatives are not significant, then each will make a finding (Finding of No Significant Impact (FONSI), 40 CFR 1508.13) that allows the action to proceed without preparing an environmental impact statement.

1.5.3 Regulatory Procedure

The regulatory procedure for allowing geological prospecting (geophysical exploration) on federal lands is the same whether the applicant holds leases on those lands or not. This procedure requires the project applicant to file a *Notice of Intent and Authorization to Conduct Oil and Gas Geophysical Exploration Operations* (BLM Form 3150-4; FS Form 2800-16) with the appropriate surface management agency. Geophysical exploration operations authorized under this procedure are limited only to land in federal ownership. **There is no right of entry or occupancy for geophysical prospecting on private or state land via this authorizing procedure – even if the subsurface minerals under those lands are federally-owned.**

Authorization to allow geophysical exploration on lands in federal ownership (both leased and non-leased) can be permitted to individuals or companies other than a leaseholder. If any or all of the proposed geophysical exploration operations would occur on leases held by the applicant (or party who contracts a geophysical company to conduct a survey), then the following would apply:

1. Fees are not charged for the portions of the geophysical exploration operation occurring on leases.
2. Conducting the geophysical exploration operation is an exercise of lease rights and consequently the federal authorizing agency's decision space is constrained. Essentially, the federal agency has input on how the geophysical exploration operation can be done; however, they cannot refuse to allow the geophysical exploration operation to proceed.

Federal minerals underlie 17,528.92 acres of the project area, and Windsor Wyoming, LLC has leases on 12,477 of those acres. In addition, numerous leases have been secured for State land, privately owned minerals under private land surface ownership, and privately owned minerals under lands with BLM surface ownership.

Authorization for the Clark 3D Geophysical Project was requested by the filing of Notices of Intent with the BLM and Forest Service, as described above.

1.5.4 Consistency with Land Use Plans

The BLM and Shoshone National Forest are implementing their appropriate land and resource management plans as required by law and regulation. These plans establish management direction for the Cody Field Office of the BLM and the Shoshone National Forest. This management direction is described area-wide and by management area. The design and implementation of projects consistent with direction in these plans is the means to move federal lands toward the desired future conditions as described in the appropriate plan. Management plan direction established sideboards for the development of alternatives to the proposed action.

Within these sideboards, the Interdisciplinary Team (IDT) developed alternatives and Project Design Features (PDFs) that responded to the issues and concerns identified during internal and external scoping. Project Design Features have been integrated into the Proposed Action and its alternatives. All alternatives and associated PDFs are designed to be consistent with the appropriate plan direction unless specifically noted.

Cody Resource Area Resource Management Plan and Record of Decision

The project design features developed via this environmental assessment are in compliance with the applicable resource management plans. The BLM portion of the project area, located within Cody Field Office jurisdiction, is subject to the Cody Resource Area (CRA) Resource Management Plan (RMP) and Record of Decision (ROD), approved in November 1990. The plan and decisions were reviewed, and a determination was made that this proposal conforms to land use plan decisions, guidelines, terms, and conditions, as required by Federal Land Policy and Management Act (FLPMA) 43 CFR 1600.

The development of this project would not affect the achievement of the Wyoming Standards for Healthy Rangelands (August 1997). The project design features developed via this EA, and implemented as Conditions of Approval are in compliance with all relevant resource management plan decisions contained within the Cody Resource Area RMP ROD.

Shoshone National Forest Land and Resource Management Plan and Record of Decision

The National Forest System lands portion of the project area is located on the Shoshone National Forest and is subject to the Land and Resource Management Plan for the Shoshone National Forest (Forest Plan) and Record of Decision (ROD) approved in 1986, as amended. The Forest Plan and decisions relating to geophysical activity (Forest Plan (FP) page III 76-82), as well as other applicable statutes and regulations, were reviewed. FP III-76 (2.a.1.) directs that authorizations for geophysical prospecting will include terms and conditions controlling

operating methods and times to prevent or control adverse impacts on surface resources and users, and will be implemented according to the procedures outlined in the EA and Decision Notice for *Geophysical Investigations Non-wilderness and Non-primitive Areas of the Shoshone National Forest*. Page 10 of the EA stipulates that proposals for use of seismic methods requiring off-road use will require separate analysis.

The project design features (PDFs) in those documents that are applicable have been incorporated into this analysis (see **Section 2.3.2**), and site-specific analysis of off-road use (truck-mounted drills, buggies, and ORVs) is included in this document as required. Also of importance is the stipulation in the Decision Notice (page 14.d.) that directs that all geophysical exploration operations would be done in as short a time span as possible in order to minimize the duration of impacts to resources and land users. A “get in and get out” approach would be used. Based upon a review of existing plans and regulations it was determined that geophysical exploration operations can be permitted subject to conditions to protect the environment, forest users, and adjacent property interests, while completing the project in as short a time as possible.

In summary, the proposed project is located in an area identified by the Cody Resource Area Resource Management Plan for high oil and gas potential. The Cody Area Resource Management Plan and the Shoshone Forest Plan provide that federally administered lands in the project area will remain open to geophysical exploration, subject to mitigative provisions.

1.5.5 Legal and Administrative Framework

Federally owned oil and gas resources are managed by the U.S. Department of the Interior under the authority of the Mineral Leasing Act of 1920, as amended. Other congressional actions amplify and extend this base authority. The Federal Land Policy and Management Act of 1976 specifies that public lands are to be managed in a manner that recognizes the need for a domestic source of minerals and declares congressional policy that federal lands be managed recognizing the need for implementation of the Mining and Minerals Policy Act of 1970.

Authority for geophysical prospecting on BLM-administered public lands is contained in the Mineral Leasing Act of February 25, 1920, Title 30 Chapter 3A, as amended, and the Code of Federal Regulations 43 CFR 3150. Other relevant guidance includes BLM Manual 3150 and BLM Handbook 3150.

National Forest System lands are open to geophysical prospecting under authority of the Organic Administration Act of June 4, 1897, as amended; the Multiple Use-Sustained Yield Act of June 12, 1960, and the Forest and Range Renewable Resources Act of August 17, 1974, as amended. The Multiple-Use Sustained Yield Act declares a number of valid uses of National Forest System lands, but expressly provides that the Act shall not be construed to affect the use or administration of mineral resources on those lands. Other relevant guidance includes the Code of Federal Regulations 36 CFR parts 228 and 251, and Forest Service Manual 2800 (Chapter 2860).

Impacts to the entire proposed area, including state and private lands, have been considered; however, BLM and FS authority for entry and occupancy is limited to federal lands. Required Project Design Features (protective measures, best management practices (BMPs), or Conditions

of Approval of the NOI relative to the BLM and FS) pertain to protection of all lands that may be potentially affected by the activity on federal lands. As an example, offsets from springs, wells, or other water sources would be required even if the sources are on adjacent non-federal land.

1.6 SCOPING AND PUBLIC INVOLVEMENT

Scoping is an important part of the National Environmental Policy Act (NEPA) process and is used to determine the scope of issues to be addressed and for identifying the key issues related to a proposed action (40 CFR 1500.7). The scoping process can involve federal, state, and local government agencies, tribal governments, resource specialists, industry representatives, local interest groups, and members of the public. Scoping is an interdisciplinary process.

The following participated in the scoping process: Windsor Wyoming, LLC; Bureau of Land Management (BLM); United States Forest Service (USFS); Wyoming Department of Game and Fish, Native American tribes, Dixie Environmental Services Co. (DESCO); geophysical contractor Quantum Geophysical, Inc., (Quantum); mineral interest holders; geologists; geophysicists; members of the public; and others. Scoping was conducted primarily through meetings, phone conversations, written comments, and field observations and assessments.

Public notification and education were also integrated with scoping. A scoping notice was sent out to local residents and interest groups in and around the Clark 3D project area, briefly describing the proposed action. The notice provided information on a meeting, which would be held to address public concerns. The BLM and USFS hosted the public meeting or “open house” on June 23, 2004, at the Clark Recreation Center. Information was provided to all attendees on the technology and environmental management that would be employed by Quantum Geophysical during operations, including well and aquifer protection, fire control, and other issues. In addition, federal and state employees attended several additional meetings sponsored by residents of the Clark community to answer questions and clarify issues and concerns.

More than 50 comments and responses were received from the public as a result of the initial scoping process. Using the comments from the public, other agencies, and internally (see **Section 1.7**), the interdisciplinary team developed a list of issues to address. To help insure that all issues were adequately addressed, a predecisional EA was made available for public review for a period of 30 days. The predecisional EA was released on May 20, 2005, and the legal notice was published on May 24th. More than 50 additional comments and responses were received, the majority of which were form letters. This document incorporates and addresses all comments and responses received during both comment periods (scoping and predecisional EA comment periods). All correspondence is retained in the project file.

Appendix C contains a **Scoping Content Analysis** summarizing the general issues and concerns regarding the proposed action. This EA incorporates any additional concerns brought up during public review. A copy of this EA, and the associated decision documents (a BLM Decision Record, a FS Decision Notice, and a FONSI once completed if appropriate), will be posted on the BLM website (<http://www.wy.blm.gov/nepa/cyfodocs/>) and the Forest Service website (<http://www.fs.fed.us/r2/shoshone/>).

1.7 ISSUES

Issues are points of dispute or contention, as well as areas of concern or uncertainty. Issues define conflicts or problems to be addressed or resolved by analysis. In the NEPA process, they are further defined as cause and effect relationships based on the proposed action. Using comments from the public, other agencies, and tribes, the ID Team developed a list of key issues. All comments received through scoping and the public involvement processes were considered in developing the key issues and alternatives, which directed the analysis process. The key issues represent those issues that the decision maker needs to consider in selecting an alternative, and drive the NEPA analysis. The key issues include important issues, as defined in NEPA regulations (40 CFR 1500.4(1)), that are used in the development of alternatives to the proposed action. The key issues received the most public and internal specialist concern and define the specific conflict, problem, or point of uncertainty that was analyzed, evaluated, and resolved to the best of our ability based upon the best science and knowledge available.

In addition, BLM handbook direction identifies “critical elements of the human environment” that must be initially considered in all EA analysis. **Table 5, Section 3.1** identifies critical elements relating to this proposal, and discloses their status in the project area.

Guided by the appropriate management plans, the ID Team developed alternatives and project design features to address the key issues and critical elements identified during scoping.

Some key issues have indicators for display of effects. Indicators are measures or standards by which effects can be quantified, compared, and displayed. There are almost always tradeoffs relating to any action, and the use of indicators is just one way of assessing and disclosing those tradeoffs in a quantifiable manner. For comparison of alternatives, **Table 4, Section 2.5** provides a summary of indicators that can be quantified relating to the key issues.

1.7.1 Key Issues

The following key issues constitute the main subjects or questions of widespread public discussion and interest regarding geophysical investigation. These key issues provided the focus of this EA, were the basis for alternative formulation, and can be tracked through all sections of the document. Brief descriptions of the key issues identified for this project are as follows:

KEY ISSUE - WILDLIFE: HUMAN ACTIVITY, VEHICLE USE, AND HELICOPTER USE ASSOCIATED WITH GEOPHYSICAL EXPLORATION COULD ADVERSELY AFFECT WILDLIFE IN CRITICAL AREAS DURING CRUCIAL PERIODS; INCREASE THE POTENTIAL FOR INCREASED HUMAN/GRIZZLY CONFLICTS; AS WELL AS DISPLACE GAME ANIMALS AND DEGRADE HUNTING OPPORTUNITIES DURING HUNTING SEASONS.

Some individuals questioned the proposed action’s general impacts to wildlife. They also questioned whether or not the proposed action would impact wintering or birthing big game and/or important fisheries in the area. Residents felt that the potential for impact is increased by drought conditions. They also noted that the project area includes critical elk, mule deer, and

bighorn sheep winter habitat, as well as yearlong mountain goat habitat and elk parturition habitat. Residents requested a complete inventory of species. In addition, they recommended that RMP restrictions related to sage grouse be followed and that activity should not be permitted from November 15th through June 15th.

Other residents inquired specifically about potential impacts to threatened and endangered species, including wolf, grizzly bear, peregrine falcon, and bald eagles. A few people noted that there is a bald eagle nest within 2.5 miles of the proposed action, and the area is also within the ten-mile buffer zone of the grizzly bear recovery area.

Wyoming Game and Fish Department had concerns specific to bighorn sheep and goats and their sensitivity to helicopter disturbance. They were especially concerned that there might be a potential for conflict with the goat nursery area near the project area.

Other people were concerned that there would be a potential for conflict with big game hunting in the area.

Indicators:

- Number of helicopters required
- Duration of wildlife exposure to helicopter disturbance in days
- Magnitude of helicopter disturbance in total hours of flight time

KEY ISSUE - VEHICLE USE OFF ROAD: OFF-ROAD VEHICLE USE ASSOCIATED WITH THE PROPOSED GEOPHYSICAL EXPLORATION OPERATIONS COULD ADVERSELY AFFECT VEGETATION, WILDLIFE HABITAT, NOXIOUS/INVASIVE PLANT SPECIES, SOILS, VISUALS, CULTURAL RESOURCES, AND ENCOURAGE FUTURE UNAUTHORIZED OFF-ROAD TRAVEL.

Many individuals expressed concerns about vegetation and wildlife habitat, in that they suggested that no operations should be allowed on slopes of 25% or greater.

Others were concerned that noxious/invasive vegetation species could be brought into the area and spread by the use of wheeled vehicles.

Additional issues raised by local residents related to soil included compaction and rutting associated with off-road vehicle use.

A few individuals articulated concern regarding increased vehicle use in the project area. The BLM and Forest Service prohibit off-road vehicle use by the public; however, use for geophysical exploration is covered in the BLM RMP. It was suggested that members of the public might begin to travel off-road, following tracks created by equipment associated with the proposed action, and as a result, there would be lasting visual impacts in the form of new two-track roads or trails. Some individuals recommended that only 'designated' roads should be used to preserve the existing visual status.

Members of the public were also concerned that mounds of earth could be left near the shotholes after the holes were completed, changing the appearance of the natural landscape.

Indicators for Vehicle Use Off Road:

- Number of acres potentially directly disturbed by wheeled drill vehicle tracks
- Number of acres subject to potential temporary tire impacts from ORV support use

KEY ISSUE - HELICOPTER DISTURBANCE: NOISE FROM HELICOPTER USE ASSOCIATED WITH THE PROPOSED GEOPHYSICAL EXPLORATION OPERATIONS COULD DISTURB AND ADVERSELY AFFECT WILDLIFE, LIVESTOCK, RESIDENTS, AND RECREATIONISTS.

Some individuals were concerned that helicopters might disturb or displace wildlife, especially on critical areas during critical seasonal periods (i.e. birthing, nesting, denning, wintering, etc.) Species of concern were many big game species, sagebrush obligates including sage grouse, the listed (under the Endangered Species Act) species of grizzly bear, wolf, and bald eagle. Of major concern to the Wyoming Game and Fish Department was the particular sensitivity of mountain goats and sheep to helicopter disturbance, as the area just west of the project area contains yearlong mountain goat and bighorn sheep habitat, including kidding and bighorn sheep lambing areas.

A few individuals were concerned that noise from geophysical operations would scare domestic animals and/or livestock, causing them to harm themselves. An example offered in this regard was that horses or cattle could be spooked by helicopter noise, run into fences, and sustain injuries.

Concern was also expressed that noise would interfere with recreationists who visit public lands and surrounding areas for the quiet, serene atmosphere that exists. Visitors to the area presently enjoy activities such as camping, hunting, fishing, hiking, and other outdoor activities. Many individuals believe that these activities would be disrupted by the proposed action.

Additionally, some individuals residing in and around the project area are concerned that project-related noise would disrupt their daily activities.

Indicators:

- Number of helicopters required
- Duration of wildlife exposure to helicopter disturbance in days
- Magnitude of helicopter disturbance in total hours of flight time

1.7.2 Other Issues and Concerns

A number of issues and concerns, other than those determined to be key issues or critical elements, surfaced relative to this proposal. These issues, while valid and important, were determined to be not significant within the context of the NEPA process. They were either

outside the scope of analysis; cannot be adequately addressed at the project level and therefore are not relevant to reasonably foreseeable significant adverse impacts in this project area; or they are not essential to a reasoned choice among alternatives for this project. Other issues/concerns are already decided by law, regulation, Forest Plan, or other higher-level decision; related to non-discretionary standards; or they are conjectural and not supported by scientific evidence. Some issues/concerns were already addressed in that they were a part of the purpose and need for action and the reason for which the proposal was made. The Council on Environmental Quality (CEQ) NEPA regulations require this delineation in Section 1501.7, "...identify and eliminate from detailed study the issues which are not significant or which have been covered in prior environmental review (Section 1506.3)..." All issues/concerns are addressed in some manner. All comments, issues, and concerns were given in-depth review and consideration; however only key issues that provided the basis for alternative formulation were analyzed in-depth and addressed in detail.

The following subjects were concerns that were brought up during scoping, but were determined not to be key issues, as they do not drive formulation of alternatives nor do they need to be analyzed in depth. Issues/concerns outside of the scope of this analysis or not relevant to this decision are addressed here and will be discussed no further. Issues/concerns within the scope of analysis, but unaffected and/or negligibly affected by the proposed project are addressed below and will be discussed no further.

ISSUE - WATER: SHOTHOLE DRILLING AND SUBSURFACE EXPLOSIONS ASSOCIATED WITH GEOPHYSICAL EXPLORATION COULD ADVERSELY AFFECT SUBSURFACE AND SURFACE WATER.

Concern. A large number of residents were concerned that the detonation of charges in the proposed action could impact underground aquifers, springs, and domestic water wells in the area. Many wanted to know what effect the proposed action would have on water wells and septic systems. Residents mentioned that they are completely dependent on wells for domestic water, and furthermore, that those wells are dependent on a shale layer 90 feet below the surface. They felt that the offset from water wells should be a half-mile throughout the project area. Additionally, they suggested that the offset from developed springs should be two miles. They questioned if there was any indication that previous surveys caused damage to water wells and requested additional baseline data on wells in the area. Individuals also recommended that liquid wastes should not be disposed of on site.

Many members of the public also felt that the proposed action could degrade subsurface and surface water quality. Residents were concerned that shotholes, which were not properly plugged, could allow surface contaminants to reach groundwater and that chemical residue from explosives could degrade subsurface and surface water quality. A few individuals mentioned that the EPA classifies the Clarks Fork Yellowstone River Watershed as an impaired water body segment. They suggested that use should not be permitted within 500 feet of surface water or riparian areas. They also requested that impacts to reservoirs, ponds, floodplains, wetlands, and riparian areas be disclosed. Some residents were concerned that impacts to water quality as a result of the proposed action would affect a nearby fish hatchery and/or the Class 3 and Class 4 fisheries in the area.

Discussion. Water Quality – Ground Water

The project area is within the Northern Great Plains aquifer system (USGS, 2002), on the western edge of several underlying aquifers. The shallowest aquifers are alluvial and terrace aquifers on unconsolidated deposits of volcanic and sedimentary rock, usually located in stream valleys and on benches, and are generally associated with surface recharge from rivers and streams. Water from these alluvial aquifers is reported to be of a high enough quality to be suitable for most purposes. The Lower Tertiary aquifers are 1,000 to 3,000 feet deep. Other aquifers that underlie the project area are the Upper and Lower Cretaceous and the Upper and Lower Paleozoic. These aquifers are 3,000 feet and greater in depths. All aquifers yield varying amounts of usable water.

There are no records of any groundwater wells on BLM-administered or National Forest System lands within the project area; however, residents in and around the project area are completely dependent on wells for domestic water.

With the applicant's implementation of project design features (see **Section 2.3.2**) incorporating offsets for protection of hydrologic features and/or groundwater wells, no negative impacts are expected. No charges would be detonated within one-quarter ($\frac{1}{4}$) mile of groundwater wells, and shotholes drilled to depths of only 30 feet present a low likelihood of penetrating alluvial and/or terrace aquifers underlying the project area, and subsequently causing an interchange of surface and ground water.

The public expressed great concern for the water quality of water wells on private lands within the project area, especially since the area has experienced drought conditions over the past few years. In order to help insure that water wells are not damaged and water quality in wells is not negatively affected by the proposed project, all shotholes would be offset at least one-quarter ($\frac{1}{4}$) mile from any ground water well, regardless of property ownership. This is included as a project design feature in **Section 2.3.2**.

To verify that the one-quarter ($\frac{1}{4}$) mile offset distance would be appropriate, the applicant contracted the services of Dr. Kenneth King, licensed Geologist and Geophysicist, to conduct a vibration assessment of sample holes, consistent with those proposed for the Clark 3D. The purpose of the assessment was to determine if the detonation of 10-pound charges of Seis-Gel, 30 feet below the ground (from the proposed distance) would likely have any effect on aquifers, other hydrologic features, or ground water wells. Dr. King is an independent consultant, who has conducted numerous vibration assessments, many of which were associated with 2D or 3D seismic projects. He was Chief of the USGS's Field Vibration Investigation Group for eight years, and prior to that, was in charge of the USGS Vibration Monitoring Program for all of nuclear blast testing and/or high yield testing. He has a great deal of experience to draw from. The applicant arranged to have three 30-foot test holes drilled on private property within the project area on September 20, 2004. Each hole was loaded with a 10-pound charge of Seis-gel, as proposed for operations. Dr. King observed the drilling, loading, and plugging of the holes to record information relevant to vibration analysis.

Dr. King observed that the shotholes penetrated soft sandstone, claystone, and shale, and that the substrate in which the charge was actually located (30 feet deep) consisted of shale-claystone. Dr. King set his seismometer up at different distances from each of the shotholes to get several readings for comparison and analysis purposes. Vibration measurements were obtained from 300, 500, and 1320 feet away from each of the blasts. Attenuation values were calculated and compared to average values in similar substrate to determine probability of impact and appropriate offset distances. Results from each of the test holes indicated that a 500-foot separation distance from hydrologic features and/or ground water wells would constitute a very low to no vibration risk, and vibrations induced from the blast at a distance of 1,320 feet (1/4-mile) from the hole were only just above the ambient background.

A search of scientific literature revealed a single publication documenting research on the effects of seismic operations on groundwater aquifers. This study, conducted by Ernest W. Bonds (1975), in association with the Montana Bureau of Mines and Geology, tested the possible physical and chemical effects of detonating seismic explosives in or near aquifers in Montana. Of the five test sites studied, only one was conducted in the unconsolidated superficial aquifer similar to the aquifers in question on the Clark 3D project area.

There were only slight effects from the test on the physical and chemical characteristics. These effects included temporary changes in depth of the aquifer and slight increases in total dissolved solids and specific conductivity. However, none of these changes affected the water quality significantly enough to prevent normal uses.

Bond (1975) recommended that all seismic shotholes should be plugged to prevent interflow between aquifers with degraded water quality and aquifers with high quality water. Plugging is standard operating procedure and required by State regulations. Once a shothole has been loaded with a ten-pound charge, the hole would be plugged in accordance with the Wyoming Oil and Gas Conservation Commission (WOGCC) rules and regulations manual. The plugging of shotholes should effectively prevent the potential interchange of surface and ground water and/or the interchange of water between aquifers; therefore, there should be no negative impacts to ground water resources within the project area. The probability of connecting aquifers present in the project area is very low. The shothole depth is limited to 30 feet and only reaches the unconsolidated superficial aquifer associated with sedimentary and alluvial materials. The next aquifer is present at depths of approximately 1,000 feet.

If an explosive is detonated within an aquifer in the project area, there would be no negative effect to water quality of the aquifer. Bob Belock of the Austin Powder Company reported that most of the materials in the proposed explosive, Seis-gel, end up as carbon monoxide (CO), carbon dioxide (CO₂), nitrogen (N₂), nitrous oxides (NO_x), and water. All of the mass of the charge is converted to gasses, heat, water, and other trace chemicals that are in such small quantities that they do not measurably affect water quality. As well, if an explosive is left undetonated and decomposes over time in an aquifer, there would be no negative effect to water quality of the aquifer. During decomposition, the majority of the materials again end up as gasses, water, and small quantities of trace chemicals that do not measurably affect water quality. **Table 2** lists common decomposition products of dynamite.

Table 2: Common Decomposition Products of Dynamite Explosives	
Mols/kg	
CO	0-2.1
CO ₂	6-11
H ₂	0-0.2
N ₂	5-10
Na ₂ O ₃	0-1.6
CaO	0.1
SO ₂	0-0.05
NH ₃	0-0.7
H ₂ O	10-22
Mols gas/kg	25-38

Reference: Bond, 1975

With implementation of project design features and required distance offsets, adverse impacts to hydrologic features or groundwater wells would be mitigated.

Discussion. Water Quality – Surface Water Including Floodplains, Wetlands, and Riparian Zones

Perennial water resources present within the project area include the Clark’s Fork of the Yellowstone River. Other possible perennial water resources in the project area include Lake Creek, Little Rock Creek, Bennett Creek, Anna May Ditch, Paint Creek, Newmeyer Creek, an unnamed creek which runs from Hogan’s Reservoir to Paint Creek and the Yellowstone River, as well as several reservoirs and ponds. There are numerous ephemeral tributaries that drain into one of the above-mentioned creeks and the river. The Clark’s Fork of the Yellowstone River meanders across the southern third of the project area from west to east. The Yellowstone River runs northeast toward Montana and empties into the Missouri River near the North Dakota/Montana border. Lake, Little Rock, and Bennett Creeks, as well as Anna May Ditch, drain the northern portion and a majority of the project area. Paint Creek, Newmeyer Creek, and the unnamed creek drain the southern portion of the project area. All of the creeks empty into the Clark’s Fork of the Yellowstone River. The creeks on the northern side of the river run generally in a southeasterly direction. The creeks on the southern side of the river run generally in a northeasterly direction.

Floodplains, riparian zones and/or fringe wetlands have the potential for occurrence along the river, major creek corridors, and surface impoundments within the project area. All floodplain, wetland, and riparian areas within the project area are present in close proximity to surface water resources.

Several ponds and reservoirs are present within the project area. Many of the ponds and reservoirs may have been dammed to water cattle and improve wildlife habitat. Within the proposed project area, the BLM and Forest Service have classified all of the creek corridors, the river corridor, and the surface water impoundments as riparian/surface water resource areas.

Many past and present actions have influenced the watershed components, including but are not limited to historic and ongoing grazing, roads, fire suppression, developments and infrastructure, wildlife browsing, weed control, and recreation use activities. In addition to these considerations, it is widely recognized that watersheds experience periodic natural disturbance events that vary in size, duration, intensity, and frequency. The Deep Lake Fire and the recent drought are prime examples in the project area.

A large portion of the project area on federal lands is operating under natural conditions. The major human caused soil-disturbing activities in the project area are distributed in localized concentrations throughout the associated watersheds and include roads, farming, residential developments, irrigation diversions and facilities, and oil well pads.

The Clark's Fork of the Yellowstone River watershed has been classified as impaired by the US Environmental Protection Agency (EPA) for higher than normal levels of cadmium, copper, silver, and fecal coliform. The state did not report any known sources or total maximum daily loads (TMDL) for these constituents to the EPA. Cadmium, copper, and silver occur naturally and have man-made sources in the environment. Cadmium is associated with zinc ores and phosphate fertilizers; copper is naturally occurring in minerals like azurite and malachite and copper sulfides; copper sulfate is a commonly used herbicide for algal growth in water bodies; and silver is a naturally occurring element associated with argentite ores and sulfides. Fecal coliform is a measurement of bacteria; the most common is *Escherichia coli*, which is associated with fecal material from warm-blooded animals. The environmental source of these bacteria is fecal material from livestock and/or leaking or malfunctioning septic systems or wastewater treatment systems.

Past management activities on federal lands in the analysis area are not resulting in detrimental erosion, sedimentation, or compaction, and did not remove excessive ground cover, organic matter, or nutrients from the sites. Localized areas of erosion, sedimentation, or compaction have occurred on many developed areas of private land.

No drilling and no vehicle use off open roads would be allowed within 500 feet of the Clark's Fork of the Yellowstone River and/or within 150 feet of the high water mark of all other live waters in the project area. All placement of recording equipment and cables would be conducted on foot with helicopter support within these sensitive areas.

Geophysical exploration operations would not result in any negative effects on surface water, floodplains, wetland or riparian zones within the project area. In addition, there would be no negative impacts on existing levels of water quality constituents in surface waters within or downstream of the project area because of the implemented project design features discussed in **Section 2.3.2**. In summary, analyses of the geophysical exploration operations demonstrate that the PDFs would eliminate or adequately mitigate any adverse effects to surface waters or other sensitive areas and they will not be discussed any further.

ISSUE - CULTURAL RESOURCES: DRILLING, OFF-ROAD VEHICLE USE, AND OTHER GEOPHYSICAL EXPLORATION ACTIVITY COULD ADVERSELY AFFECT CULTURAL RESOURCES.

Concern. There were concerns expressed that cultural resources may be adversely affected by off-road project activities on federal, private, and State lands. Many individuals suggested that cultural resources should be inventoried and protected in the area of the geophysical exploration, and one member of the public was concerned that geophysical exploration operations would impact the Nez Perce National Historic Trail.

Discussion. Federal agencies are required by law and regulation to consider effects to cultural resources on the federal part of the project. Due to the legal requirements, the BLM required that applicable project portions on all federal surface, areas overlying federal minerals, and on State and private surface be inventoried for the presence of cultural resources. TRC Mariah Associates Inc. (TRC Mariah) conducted a Class III cultural resource inventory on Bureau of Land Management (BLM)-managed sections and U.S. Forest Service Shoshone National Forest (USFS-SNF)-managed sections, during the first phase of the inventory. A 100-ft (30-m) wide right-of-way (ROW) was inspected for both the staked source lines and receiver lines intended for access and the existing access roads.

The BLM further required that Quantum ascertain, by direct contact, which private landowners wanted their lands inventoried and which did not. Quantum was also required to document contacts with surface owners and their responses in writing. Approximately 70 private landholders are within the project area. Attempts were made to contact each landowner to offer the opportunity for cultural surveys to be conducted on their private lands. Twelve individuals, representing approximately 600 acres of ownership, requested that cultural surveys be completed on their private lands. Surveys were completed on a subset of the private lands that are within the area of potential effect. Seventeen landowners did not respond to the project applicant's inquiries. In this manner, a good faith effort was made to address both BLM's statutory and regulatory compliance requirements and to respond to public concerns identified during scoping.

Additional source points located on State of Wyoming sections and private parcels, as well as revised source points, were inventoried during the second phase of the inventory.

File Search Results

Several file searches were completed between September 2004 and March 2005, at the Cultural Records Office of the Wyoming State Historic Preservation Office (SHPO). The file searches included all 50 sections that occur within the Clark 3D seismic project area. The following discussion summarizes the previous cultural resource projects and the sites recorded within the sections located within the project area.

Of the 31 previously recorded sites, 10 are located within the 100-foot project right-of-way (ROW) where vehicles would be allowed, 12 sites are located within the seismic grid but outside the project ROW, and nine sites are located outside of the seismic grid. The project was redesigned to avoid the 10 sites within the project ROW.

Nine of the 10 sites located within the project ROW are recommended as eligible for listing on the NRHP, with SHPO concurrence, and one is recommended as not eligible. These sites are located along both sides of the Clarks Fork and would be avoided by project redesign.

Based on an examination of the file searches, prehistoric stone circle sites ("tipi rings") appear to be the most common site type in the project area. These sites tend to contain numerous stone circles covering a relatively large area and are generally located in proximity to watercourses.

Survey Results

A total of 132.6 miles (213.4 km) of source line ROW and receiver line access was inventoried for the project. A total of 11.3 miles (18.2 km) of access roads were also inspected. Sixteen (16) newly recorded sites and fifteen (15) isolated finds were identified and recorded in conjunction with the Clark 3D seismic project. Ten previously recorded sites occurred within the project ROW, but the project was redesigned to avoid these sites. The previously recorded sites were not re-recorded and were not located in the inventoried area.

The 16 newly recorded sites consist of one multi-component site, eight prehistoric sites, and seven historic sites. The multi-component site is comprised of one stone circle and lithics in association with historic pits. The prehistoric sites consist of four stone circle sites, two lithic scatters, one open camp, and one pit structure. The seven historic sites consist of two ditches, two dumps, one corral, one can scatter, and one cairn.

Management Recommendations And Stipulations

All actions contemplated within the project area that would have an effect on cultural resources were considered pursuant to existing legislation, regulation, manuals, and agreements pertaining or applicable to cultural resources. The determination of whether an action is an undertaking that is likely to produce effects to cultural/paleontological resources would be made by the Authorized Officer in consultation with the Field Office archaeologist or paleontologist.

The Class III cultural resource inventory of the Clark 3D seismic project identified 16 new cultural properties and 15 isolated finds. Ten previously recorded sites occurred within the project ROW, and the project was redesigned to avoid these sites. Fourteen of the newly discovered sites have not been evaluated for listing on the NRHP and would require the same avoidance stipulations that apply to the 10 previously recorded sites--all stone circle sites require a 300-ft (91-m) avoidance buffer and no vehicle access on two-track roads through stone circle sites, and all other sites require a 100-ft (30-m) avoidance buffer. All source points and receiver line access routes within these buffers have been removed and the new access routes have been inventoried. These changes are detailed in site-specific contexts in the inventory reports.

With the implementation of project design features to protect cultural resources, in conjunction with management recommendations from the Class III Cultural Resource Inventory of the Clark 3D project (summarized above), no negative impacts to cultural resources are expected. Management recommendations include the movement of shot points and access paths along ROW lines for avoidance of all newly discovered sites. Specifics on recommendations, as well

as complete findings for each site, are included in the document *A Class III Cultural Resource Inventory of the Quantum Geophysical Clark 3D Seismic Project, Park County, Wyoming*, on file at the BLM Cody, Wyoming Field Office. Isolated Finds (IF) were recorded in detail in the Cultural Resource Inventory. Based upon the completion of an in-depth inventory, it was determined that the Clark 3D would have no effect on IF cultural resources.

Therefore, as the probability of affecting cultural resources is extremely unlikely, and PDFs are in place to protect such sites if discovered, they will not be discussed any further.

ISSUE – NATIVE AMERICAN RELIGIOUS SITES: DRILLING, OFF-ROAD VEHICLE USE, AND OTHER GEOPHYSICAL EXPLORATION ACTIVITY COULD ADVERSELY AFFECT NATIVE AMERICAN RELIGIOUS SITES.

Concern. There were concerns expressed that Native American religious sites may be adversely affected by project activities, especially the use of vehicles off road.

Discussion. The area under consideration contains known potential areas or locations of religious or cultural concern to Native Americans.

The BLM, as the lead agency in the development of this EA, sent out 33 letters of consultation to interested individuals and representatives of nineteen Native American Tribes in order to solicit input or concern. Follow-up telephone calls were made to the recipients of these letters during February and March 2005. Attempts were made to contact each person twice by phone. None have requested in-person consultation at this time, but some indicated that they might have additional input after review of this EA.

If additional areas are subsequently identified or become known through the Native American notification or consultation process, they would be considered during the implementation phase. The federal agencies would take no action that would adversely affect these areas or locations without consultation with the appropriate Native Americans.

Geophysical exploration operations would have no effect on known locations of religious or cultural concern to Native Americans, as all known sites would be avoided by all vehicles by a distance of 300 feet or more along the Clark's Fork of the Yellowstone River and by a distance of 100 feet in all other areas.

If any additional sites of potential Native American religious concern (e.g. rock art, vision quest structures, human burial sites, prehistoric cairns, stone circles) are identified by the applicant's personnel within 500 feet of any proposed off-road travel route, regardless of surface ownership, the appropriate agency shall be promptly notified. The need for special mitigative measures and/or additional Native American consultation shall be determined by the appropriate agency.

As the probability of affecting Native American religious sites is extremely unlikely, and PDFs avoid any known sites, it will not be discussed any further.

ISSUE - PALEONTOLOGIC RESOURCES: DRILLING, OFF-ROAD VEHICLE USE, AND OTHER GEOPHYSICAL EXPLORATION ACTIVITY COULD ADVERSELY AFFECT PALEONTOLOGY RESOURCES.

Concern. There were concerns expressed that paleontological resources may be adversely affected by off road travel and drilling on federal, private, and State lands.

Discussion. The BLM and Forest Service have no records of documented paleontology sites within the project area. For this resource evaluation analysis, the potential for discovery of significant fossils within the project area is considered to be low to moderate. If any fossils are located within the project area, activities (primarily drilling) could damage the fossils, and the information that could have been gained from them would be lost. The significance of this impact would depend upon the significance of the fossil. Ceasing operations and notifying the appropriate line officer (BLM or FS) immediately upon discovery of a fossil during activities could effectively mitigate this impact, as discussed in the project design features (see **Section 2.3.2**). An assessment of the significance would be made and a plan to retrieve the fossil or the information from the fossil would be developed. Inventories conducted as a result of geophysical exploration could also constitute a beneficial impact to paleontological resources by increasing the chances for discovery of scientifically significant fossils.

ISSUE - FUTURE MINERALS DEVELOPMENT: GEOPHYSICAL EXPLORATION COULD LEAD TO FUTURE MINERALS EXPLORATION AND DEVELOPMENT IN THE AREA RESULTING IN ADVERSE EFFECTS TO RESOURCES AND LAND VALUES.

Concern. A few individuals worried that the geophysical exploration would lead to eventual exploratory drilling or field development.

They felt that open pits could damage aquifers; water disposal could damage surface water; roads, well locations, and ancillary facilities would be constructed; and land values would be adversely affected.

Discussion. The proposed geophysical exploration is a survey providing critically needed data to help determine the practicality, feasibility, and economic realities associated with possible future energy exploration and development in the project area. The scope of this EA is focused on the acquisition of field data relating to the potential likelihood for energy resources in the area. How this data would be used is unknown at this time. An attempt to assess the impacts from possible further energy exploration and development would have to be considered speculation at this time and inappropriate for inclusion in this EA.

The data resulting from this proposed geophysical exploration project may or may not be useful in determining the viability of future development projects, however a decision relative to this geophysical exploration proposal will not automatically trigger a decision for future exploration, and the two actions (geophysical exploration and future exploration/development) can proceed independently of one another.

There is no specific data available for the success ratio of wells drilled based on a 3D geophysical exploration methodology. However, the geophysical industry has identified that a wildcat exploratory well will have a 10% chance of success without seismic data and a 60% to 70% chance of success with the data.

While no data is available for a success ratio within the project area, it is expected that fewer exploratory wells would be drilled if applicants have access to good seismic data processed with today's technology. Likewise, development wells would have considerably higher success ratios with 3D seismic data.

In *Southern Utah Wilderness Alliance et al.*, 122 IBLA 165, 168 (1992), the Interior Board of Land Appeals (IBLA) held that a geophysical project and subsequent drilling of a well in the project area are not connected actions because drilling activity can take place with or without geophysical exploration, and geophysical exploration does not necessarily lead to drilling. In addition, full field development is not necessarily foreseeable at the time exploratory wells are drilled. Therefore, the subsequent drilling of wells in the project area would not be considered a connected action or a reasonably foreseeable future action. The analysis of the geophysical exploration data may or may not be useful in determining the viability of future development projects. A decision on this seismic action will not automatically trigger a decision relating to future exploration or development. Any of the actions (seismic, exploratory drilling, and development) can proceed independently of one another. Further, they are not interdependent within the scope of a larger action, and do not depend on each other for justification.

Approval of this geophysical exploration proposal would not grant approval for future well drilling, or ancillary facilities construction and operation under oil and gas field development. Thus, this EA focuses only on the possible direct, indirect and cumulative effects of the Clark 3D geophysical exploration project.

This issue related to future exploratory drilling and development was eliminated from further analysis, as it is outside the scope of analysis, and is therefore not a part of the decision to be made. Should proposals be received for future exploratory or development actions, they would each be evaluated under a separate analysis and separate decision documents would be required.

ISSUE – SOCIOECONOMICS: GEOPHYSICAL EXPLORATION WILL RESULT IN INCREASED OIL/GAS DEVELOPMENT THAT COULD ADVERSELY AFFECT SOCIOECONOMICS OF THE SURROUNDING COMMUNITY.

Concern. Some individuals felt that this project would lead to increased oil/gas exploration and development that would decrease the quality of life for residents of the area, decrease property values, increase criminal activity as a result of transient workers, etc. Many suggested that a more in-depth cumulative effects analysis be completed.

Discussion. See above discussion on minerals development. This issue was beyond the scope of analysis of this EA. No long term impacts or permanent structures are associated with a decision to allow geophysical exploration. Any attempt to predict future development and its effects on socioeconomic factors would be beyond the scope of this EA. According to the Park County

Sheriff's Department, historically the majority of major criminal activity within the county has been associated with the local populace, even during the previous periods when major energy booms have occurred.

The Clark 3D project is located in Park County, Wyoming, and includes Federal, State, and private lands. Oil and gas exploration and production, as well as agriculture, ranching, and tourism are the main economic staples of Park County and the surrounding area.

Clark, a small community, is located just east of the project area, and Cody is located several miles to the southeast. The majority of residents live in the area because of the quality of life afforded to them by the presence of public lands and the natural environment associated with them. The ecological and intrinsic values, as well as the recreational opportunities associated with this relatively undeveloped landscape, scenery, and wildlife are important aspects of the residents' well-being. This project has been designed with safety, resource protection, and viewshed protection in mind.

Many elements influence and affect local economies. Population growth, economics, and economic diversity and dependency of counties and communities all affect local economies. All of these elements, in the long term, potentially influence and benefit local economies and tourism.

Demographic changes are affecting communities along the Absaroka Front (including the Beartooth Face), as well as the role and relative position of ranchers and ranching-based agriculture in the communities. In small communities such as Clark, that are experiencing significant population growth, agricultural interests are slowly becoming a smaller fraction of the community, and the communities are becoming more socially diverse as a whole. Most communities along the Front have strong traditional cultures that are often based on a history of ranching, dude ranching, mining, timbering, and agriculture. Much of the present economy along the Front is based on businesses associated with natural resource related values such as recreation, wildlife, outfitting, dude ranching, etc. In addition, many retirees have moved to the area, and technology allows other residents to reside in the area while operating their businesses "on-line."

While many of the newcomers were attracted to the area by open spaces, availability of public lands, and the associated high quality of life, many are engaged in developing and building homes that occupy these open spaces. Segments of the community, new and old, express ideas that include taking the livestock off public lands, stopping logging and minerals development on public lands, and the need for greater zoning type restrictions on both public and private lands.

The ideas of allowing some growth, while not becoming overly developed, and protecting critical natural areas and viewsheds along the Absaroka Front, seem to be prevailing feelings of most all people living in the area. Although there has been serious discussion and implementation of local zoning regulations, these notions of protection at the landscape scale are not directly reflected in most local plans or their implementation at the present time, as there is not complete agreement on an acceptable strategy. People also hold very strongly to the notion of private property rights, and the freedom to manage and deal with one's own land as one will.

There are strongly held and differing opinions on how best to achieve the objective of managed growth and economic development, while maintaining private property rights and natural areas. It appears that state laws, local regulations, and tax codes do not readily facilitate easy solutions to this somewhat conflicting maze of imperatives.

The natural setting around most communities has been affected by the appearance of new homes, small ranchettes, and subdivisions within the past several decades in areas previously used for farming and ranching. Maintaining open spaces/natural areas and the associated quality of life is quickly becoming a major concern of most all individuals and special interest groups in the area. Even though many present residents have built homes that occupy these previous natural areas, they are worried that additional private lands will be sold and sub-divided, thereby changing a significant part of the culture of the area and causing the loss of the very values that caused most people to reside here.

The proposed action would generate an undisclosed amount of revenue for the local economy through private landowner access fee payments, as well as from purchases of food, fuel, lodging, and incidental purchases for the seismic crews. The short-term nature of the seismic operations and the remote location of the project area would reduce the likelihood of most local residents being affected socially or economically as a result of the proposed action.

As the Beartooth Face and Clarks Fork Canyon areas are an important recreational and historical area from a regional perspective, the two aspects of socio-economics that are potentially the most impacted by cumulative effects are quality of life values and tourism related to recreational use. Although the action alternatives would have some short-term direct and indirect effects on residents, users, and the economic revenues during the period of operations, the action alternatives would not contribute in any significant additive manner over time to changing the socio-economic status of the area.

If future successful drilling were to occur as a result of the 3D seismic project, revenue from oil and gas production would affect only a small number of people, and not necessarily people from the socioeconomic area in the vicinity of the project. On the other hand, increased oil and gas activity in the area could potentially have restrictive effects on the local economy, like fluctuations in the housing market and/or property values. Both of these effects are speculative and impossible to quantify at this time, since it is not known if the geophysical exploration project would identify any targets of interest for exploratory drilling; whether any exploratory wells, if drilled, would encounter commercial quantities of oil or gas; or the nature and location of production if any is established.

A more in-depth cumulative effects analysis is included in **Section 3.0**, but it must be noted that although cumulative effects analysis is forward looking, **it focuses only on the potential additive impact of the proposed geophysical exploration action when added to the aggregate effects of past, present, and reasonably foreseeable future actions.** The disclosure of all adverse impacts resulting from all previous actions (i.e. land conversion to agriculture, housing development, road building, etc.) and future actions (that is speculation at best) is not required. A concise description of the identifiable present effects of past actions is required only to the extent that they are relevant and useful in defining the current condition of the affected

environment and analyzing whether the reasonably foreseeable additive effects **of this single specific seismic action** have a significant cause/effect relationship. Although many people have concerns of cumulative effects in general, NEPA cumulative effects analysis does not require analysis and prediction of impacts of all activities from all jurisdictions in an area. It only requires disclosure of how **this single geophysical exploration action** would add to, modify, or mitigate the aggregate effects of past actions while looking forward. This issue is therefore outside of the scope of analysis, not relevant to the decision, and will not be discussed further.

ISSUE - LAND MANAGEMENT PLAN ADEQUACY: THINGS HAVE CHANGED IN CLARK AREA, THEREFORE LAND MANAGEMENT PLANS ARE OUTDATED AND SHOULD NOT BE USED AS A BASIS FOR DECISIONS ON OIL/GAS EXPLORATION.

Concern. Many individuals commented that the Cody RMP and the SNF Land & Resource Management Plan are no longer valid, as they are over a decade old. They expressed concern that rapid population growth has changed the character of the Clark area, and that the area should be closed to oil and gas operations until new resource management plans are written.

Discussion. Although the Cody RMP was implemented in 1990 and the Shoshone Forest Plan was implemented in 1986, they were designed to protect the resources, including those in the Clark area. Even if the character of the private land in the Clark area has changed as a result of population growth, the resources on public lands have changed very little. Extensive planning went into the development of the Cody RMP and the Shoshone Forest Plan to help insure the protection of area resources and to determine allowed land uses.

Development of a new BLM Cody RMP is scheduled to begin in 2006, and the Shoshone National Forest has initiated development of a new Forest Plan in early 2005. Until those plans are finalized and approved, activities on federal lands are managed under the existing plans. This issue is outside the scope of this analysis, not relevant to this decision, and will be discussed no further.

ISSUE - GEOLOGY AND MINERALS: SOME PEOPLE BELIEVE THAT THE CLARK AREA HAS LITTLE POTENTIAL FOR OIL AND GAS, AND THEREFORE GEOPHYSICAL EXPLORATION SHOULD NOT BE ALLOWED.

Concern. Many individuals were concerned that the Clark area is much too important relative to its intrinsic values, and due to its low potential for oil/gas, no oil/gas exploration of any kind should be allowed. Others felt that the area has high potential for oil/gas deposits, and that exploration should be encouraged.

Discussion. The proposed Clark 3D project lies within the Bighorn Basin, an area notable for a high potential for hydrocarbons. When compared to surface geological data, most of the area is composed of terrace deposits, colluvium, and glacial outwash from tributaries of the Yellowstone River (Case and Arneson, 1998). Records indicate the majority of federal minerals in the Clark area were leased in the 1970s, but only two oil wells were drilled within the project area boundary, along with associated access roads (FS 1977). Neither well is currently producing, as both were drilled and then permanently abandoned in the 1970s. Since both of the wells

identified within the project area have been permanently abandoned, seismic operations near oil wells and related facilities would not damage them.

There are several producing wells adjacent to the project area, and one rig is presently drilling on non-federal land within the project area on Bennett Creek. An application for rights-of-way to construct an oil/gas pipeline from the Line Creek area to Little Elk Basin across parcels of BLM lands has been submitted and the decision is pending. Some additional requests for leasing of parcels for oil/gas have been received.

The Clark 3D project area overlaps three previous geophysical exploration efforts. Areas of overlap are necessary to allow the client to tie in data, as well as collect additional data specific to the desired imaging depths.

Present activity on State of Wyoming lands in the Clark area is related to minerals development, primarily oil and gas, and some oil and gas development is expected to occur in the future on both State of Wyoming and private lands.

There is much controversy as to the potential for oil/gas deposits in this area. Interpretation of subsurface geology, based on existing data relating to surface structures and known geology, has some geologists convinced that subsurface structures containing oil/gas deposits are negligible (Barreda 2005). The Cody RMP states that the area has high oil/gas potential and the Forest Plan working papers indicate that the potential for oil and gas discovery in this area is high (FP J-27 & J-39). Other sources point out that many of the Paleozoic and Mesozoic sedimentary formations underlying portions of the area are known petroleum producers. During mountain uplift, these formations were folded and faulted, creating potential traps for petroleum. The extent these formations underlie the area is unknown, but is limited by the Beartooth fault zone. Geophysical exploration and exploratory drilling would be necessary in order to discover potential petroleum traps and determine the nature and potential of the Beartooth fault zone. Until such exploration occurs, the petroleum producing potential of the area will remain unknown (FS 1977).

Implementation of the proposed action would allow the applicant to effectively evaluate the potential hydrocarbon reserves underlying the project area. The 3D survey would provide a high-resolution image of subsurface geological features underlying the project area. Projections of future development as a result of the proposed action are remote and speculative. The BLM has not received any concrete proposals for development of wells within the Clark 3D project area; therefore, there will be no attempt to analyze impacts of potential development within this EA other than a broad-based, generalized discussion provided in the Cumulative Impacts Section (see **Section 3.9**) of this document.

It should be noted that 3D geophysical exploration may contribute in a beneficial manner to reducing adverse effects on surface resources in the future if additional oil and gas exploration and development were to occur in this area. The data obtained from 3D geophysical exploration allows for more accurate identification of mineral reserve locations, minimizing the likelihood of drilling dry wells.

This issue is a point of conjecture, outside the scope of this analysis, and not relevant to a reasoned choice among alternatives.

ISSUE - AIR QUALITY: DUST RESULTING FROM GEOPHYSICAL OPERATIONS COULD ADVERSELY AFFECT THE AIR QUALITY IN AND AROUND THE SURROUNDING AREA.

Concern. A few individuals questioned the effect on air quality as a result of wind erosion induced by geophysical exploration. They were concerned that dust generated as a result of vehicle travel would cause a substantial increase in particulate concentrations. An individual stated concern over the potential for severe wind erosion in this area as a result of geophysical exploration operations.

Discussion. Existing air quality in the project area is good. There are no EPA-listed Clean Air Act non-attainment areas in Wyoming except for Sheridan County, which is not located in close proximity to the project area. Sheridan County is listed for moderately high particulate matter. Other non-attainment areas exist in neighboring states; however, there are no non-attainment areas in close proximity to the project area.

Slight impact to air quality would occur from exhaust fumes emitted by trucks, drills, ATVs, helicopters, and miscellaneous support vehicles. Emissions would be present throughout the duration of proposed field operations and be similar to that of eight semi-trucks and ten cars. Impacts resulting from exhaust emissions are expected to be negligible, based on the implementation of project design features discussed in **Section 2.3.2**.

Air quality would also be slightly altered by fugitive dust resulting from vehicle travel on existing roads and trails, and to a much lesser extent, dust from cross-country vehicular travel. This dust would contribute to particulate matter in the air. Helicopters and ATVs, rather than equipment trucks, would be used to transport cable, portable drills, and geophone equipment off road, thus minimizing dust creation. On roads, all vehicles would adhere to posted speed limits. If the need arises as a result of seismic traffic (as determined by the permit administrator), water would be applied to roads to reduce fugitive dust resulting from vehicle traffic. Overall, fugitive dust/particulate matter contributions are expected to be negligible, short term, and localized. As adverse effects are expected to be negligible and PDFs are in place to negate this issue, it will be discussed no further.

ISSUE - CLARKS FORK RIVER PROTECTION: DRILLING, OFF-ROAD VEHICLE USE, AND OTHER GEOPHYSICAL EXPLORATION ACTIVITY COULD ADVERSELY AFFECT THE CLARKS FORK OF THE YELLOWSTONE RIVER'S POTENTIAL FOR DESIGNATION AS A WILD OR SCENIC RIVER.

Concern. Many members of the public thought that impacts resulting from geophysical exploration operations would negatively affect the Clarks Fork of the Yellowstone River within the project area. They were concerned that the operation would affect the potential for designation of this portion of the river as "Wild or Scenic," as defined by the *Wild and Scenic Rivers Act (WSRA) of 1968*.

Discussion. The *Wild and Scenic Rivers Act of 1968* protects identified values, free flowing condition, and associated water quality of rivers designated under the Act. According to the *Wild and Scenic Rivers Act*, a wild, scenic, or recreational river area eligible to be included in the system is a free-flowing stream and the related adjacent land area that possesses one or more of the following: outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values. “Wild River Areas” are those rivers or sections of rivers that are free of impoundments and generally inaccessible, except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. “Scenic River Areas” are those rivers or sections of rivers that are free of impoundments, with shorelines or watersheds still primitive and shorelines largely undeveloped, but accessible in places by roads. “Recreational River Areas” are those rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past.

A segment of the Clark’s Fork of the Yellowstone River within the Shoshone National Forest, upstream from BLM-managed public land, is designated as a Wild River under the *Wild and Scenic Rivers Act of 1968*. Proposed activities would have no effect on the portion of the Clark’s Fork River on National Forest System lands designated as a Wild River, as no activities would be conducted in close proximity to that portion of the river, subject to the protection granted by the *Wild and Scenic Rivers Act of 1968*.

A 7.4-mile segment of the river from the Shoshone National Forest boundary to Paint Creek was determined to meet the Wild and Scenic rivers eligibility criteria in the inventory and review that was completed by the BLM in 1993. This determination was made based on the outstanding scenic and geologic characteristics of the area. However, this segment of river (including that portion in the project area) was found to be unsuitable for designation as a Wild and Scenic River, based on authority of the WSRA in 1993 because of potential use conflicts, as well as previous understandings with the State of Wyoming relating to development of water resources, adverse effects to historical and existing water rights, and diminished values of State’s water rights and ability to control them under WSRA designation. The stretch of the river within project boundaries has not been designated as a part of the Wild and Scenic Rivers System.

Proposed activities would have no adverse effect on water quality, free-flowing condition, or other values identified above. No off-road vehicle activity would be permitted within 500 feet of the river, as discussed in the project design features in **Section 2.3.2**. Therefore, as characteristics relating to evaluation for designation would not be affected, this issue related to Wild and Scenic Rivers protection is not relevant to the decision to be made and was eliminated from further analysis.

ISSUE – ROADLESS AREA PROTECTION: DRILLING, OFF-ROAD VEHICLE USE, AND OTHER GEOPHYSICAL EXPLORATION ACTIVITY COULD ADVERSELY AFFECT THE CHARACTER OF THE INVENTORIED ROADLESS AREAS (IRA).

Concern. A few individuals were concerned that no use should be permitted in the FS South Beartooth Highway Roadless Area, as the Clark 3D project area overlaps parts of this inventoried roadless area.

Discussion. Proposed geophysical exploration operations would not degrade roadless character within the inventoried roadless area, as no significant land disturbance would occur, no roads would be constructed or reconstructed, and no trees would be cut. Therefore, as roadless area characteristics would not be adversely affected, the issue of roadless area protection was eliminated from further analysis.

ISSUE – EXPLOSIVES SAFETY: THERE WAS CONCERN THAT IMPROPER USE AND HANDLING OF EXPLOSIVES COULD RESULT IN UNACCEPTABLE SAFETY RISKS.

Concern. Individuals wanted to be assured that safe-handling procedures for explosives would be utilized if the project were approved. Others were concerned that underground explosive detonations could disturb humans and wildlife, and suggested that passive seismic methods be used in lieu of 3D. A few were concerned that underground explosions might disrupt denning bears or normal activity patterns. Effects of explosive detonations are addressed in the above section on subsurface water.

Discussion. Storage and handling of explosives would be in accordance with all Occupational Safety & Health Administration (OSHA), U.S. Bureau of Alcohol, Tobacco, and Firearms (AFT), and transportation regulations; as well as project design features in **Section 2.3.2** and standard operating procedures relative to explosives used by the geophysical industry. Other than the sections referenced above, this concern will not be discussed any further.

ISSUE - HELICOPTER SAFETY: HELICOPTER USE, ESPECIALLY OVERFLIGHTS AND SLING LOADS, POSE A POTENTIAL SAFETY RISK TO RESIDENTS, RECREATIONISTS, AND PERSONNEL.

Concern. Safety concerns were expressed regarding the proposed use of helicopters for transporting equipment to and from source and receiver lines. In addition, they wanted to be assured that heliportable operations would pose no safety risk to residents or recreationists within or adjacent to the project area. Since equipment and/or loads of material would be transported by helicopter, via long-line cable, there was concern that direct flights over residences or high recreational use areas could pose a threat to individuals occupying these areas in the event of an emergency or accident in which a load would have to be released or is accidentally dropped. Others had concerns that increased helicopter use increased the exposure time of pilots and crews to safety hazards associated with helicopter use.

Discussion. All helicopter use would be conducted according to restrictions shown in **Section 2.3.2**. Flight lines would be designated to avoid overflights of buildings, residences, recreation areas, and other areas of human activity. In addition, users in the area would be notified of operations, the daily operating period is restricted, staging areas are designated, and other PDFs assure that the safety hazard would be minimal. Accident probabilities by alternative are displayed in **Section 3.4.2**.

ISSUE – BALD RIDGE SEASONAL CLOSURE AREA (SCA): MANY INDIVIDUALS QUESTIONED THE USE OF WHEELED VEHICLES IN THE BALD RIDGE SEASONAL CLOSURE AREA, AS SUCH USE HAS NOT BEEN ALLOWED PREVIOUSLY FOR GEOPHYSICAL EXPLORATION.

Concern. Many people were concerned about the inconsistency between the Record of Decision for previous geophysical exploration operations in the Bald Ridge SCA, which restricted use to foot/helicopter, and this proposal that allows off road vehicle use in the area.

Discussion. Due to this concern, and the fact that only the ends of a few of the receiver lines were located on steep terrain in this area, the applicant has modified their proposal to exclude this steep terrain from any geophysical exploration operation. See discussions relating to off road effects on vegetation, soils, and visuals in **Section 3** for additional discussion and analysis of effects of wheeled vehicles, as well as the trade-offs relative to use of wheeled vehicles verses use of helicopters.

ISSUE – WILDFIRE HAZARD: DRILLING, OFF-ROAD VEHICLE USE, AND OTHER ACTIVITIES ASSOCIATED WITH 3D GEOPHYSICAL EXPLORATION OPERATIONS COULD START WILDLIFES.

Concern. One individual questioned whether or not geophysical exploration operations were capable of starting wildfires in this high-wind area. Wildfire concerns are elevated in the area as a result of drought conditions that have existed over the past several years. The public is concerned for safety of individuals and property in the event of a wildfire.

Discussion. Fires resulting from explosive detonations are not a concern because there would be no surface detonations, as with Poulter seismic methods that require surface blasting. In addition, project design features in **Section 2.3.2** require an emergency fire response plan, address fire prevention requirements and fire communications protocol, and require the applicant to have helicopter water bucket capability for initial attack. This concern is adequately addressed and will be discussed no further.

ISSUE – WASTES (HAZARDOUS OR SOLID): MANY PEROPLE WERE CONCERNED THAT GEOPHYSICAL OPERATIONS HAVE THE POTENTIAL TO RESULT IN UNACCEPTABLE AMOUNTS OF LITTER AND POSSIBLE SPILLS OF HAZARDOUS WASTES.

Concern. There was concern that litter for operations (garbage, flagging, lath, etc.) may be left onsite or scattered by the wind. In addition, there was concern that spills of fuel or oil may occur.

Discussion. Wooden lath, ribbon flagging, and pin flags would be used along shothole source lines, receiver lines, and access routes to indicate shothole and receiver point locations and guide equipment through the project area. In addition, gasoline and diesel fuel, as well as small amounts of substances, such as vehicle lubricating and hydraulic oil, would be used in the field during project operations for maintenance of project vehicles.

The applicant has made an operational commitment in their proposed action to remove all project lath, flagging, and other refuse as operations progress, so no debris should remain behind the project as planned. No impact in this regard is foreseen with the implementation of the project design features.

Hazardous substances could contaminate natural resources, if spilled. With implementation of proper waste disposal and spill clean-up project design features, and an approved emergency response plan, no adverse impact is foreseen.

ISSUE – EMERGENCY RESPONSE PLAN: THE LACK OF A GOOD EMERGENCY RESPONSE PLAN COULD RESULT IN UNACCEPTABLE RESPONSE TO HAZARDOUS SPILLS, FIRE, ETC.

Concern. The need for a good Emergency Response Plan and Contingency Plan for hazardous spills, injuries, and the like, was identified.

Discussion. An emergency response plan relative to fires is required as specified in **Section 2.3.2**. In addition, many of the PDFs in **Section 2.3.2** address contingencies and response requirements relating to health and safety, hazardous spills, etc.

2.0 ALTERNATIVES, INCLUDING THE PROPOSED ACTION

This chapter describes and compares the alternatives that were considered for the Clark 3D geophysical exploration project. It includes a description of each alternative considered. The alternatives represent a range of reasonable alternatives. A reasonable alternative is one that can be implemented and achieves the purpose and need, while not violating any environmental standards. Three alternatives were analyzed in detail, and seven alternatives were considered but eliminated from detailed study. Based upon the information and analyses presented in **Section 3.0**, this section also summarizes the environmental effects of the alternatives in comparative form, thus sharply defining the differences between each alternative and providing a clear basis for choice among alternatives. Some of the information used to compare the alternatives is based upon the design of the alternative (i.e., ground based vehicle support versus helicopter support) and some of the information is based upon the environmental, social, and economic effects of implementing each alternative (i.e. the amount of wildlife disturbance or relative cost of ground based vehicle support versus skidding).

2.1 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

The ID Team considered a number of alternatives to the proposed action. Following are brief descriptions of alternatives eliminated from detailed study and the reasons for eliminating them.

2.1.1 Do Not Allow Geophysical Exploration on Public Lands in the Clark Area

Several respondents suggested that public lands in the Clark area were too valuable as habitat for wildlife, recreation, visual settings, and open spaces to allow them to be explored by geophysical survey and possibly developed for oil and gas. Under this alternative, geophysical exploration would not be authorized on BLM-administered public lands or National Forest System lands, preventing the gathering of data from 58% of the total proposed project area. The proposed action could still occur on state and private lands within the project area (42%); however, this would provide very limited data and would not address the purpose and need for responding to the applicant's proposal.

In addition, this suggestion is contrary to the national energy policy, regulations, and applicable land management plans. The "no action" alternative would have the same effects, and it was analyzed in detail. For these reasons, the alternative was not considered in detail.

2.1.2 Allow Geophysical Exploration Only on Leased Lands

Under this alternative, federal agencies would deny all applications for geophysical exploration unless they were from the holder of a lease. As geophysical surveys on leased lands are an exercise of lease rights, the agencies are mandated to authorize such activity. Because the agency's decision space is constrained, the agency response would be only to include stipulations that would become part of an operating plan approved by the BLM.

Many people want the benefit of geophysical mapping obtained from seismic exploration before they decide to apply for a lease. In addition, 3D geophysical exploration is usually not confined to a small land area because the data collected within a small area usually does not provide sufficient information for valid geophysical analysis.

Under this alternative, due to the limited area and variable ownership of leases, reliable 3D information could not be obtained regarding subsurface structures. Only individual lessees could collect any data, and non-leased lands could not be surveyed. This alternative is contrary to the national energy policy, regulations, and applicable land management plans, and would not address the purpose and need for responding to the applicant's proposal. For these reasons, this alternative of allowing geophysical activity only on leased lands was discarded from further consideration.

2.1.3 Allow Only Vibroseis Operations

The vibroseis method of geophysical exploration generates seismic waves created by specialized buggies equipped with large metal pads that vibrate the ground. At each energy source location, vibrating buggies would lower their pads to the ground to create seismic waves that are recorded by surface recording equipment.

Each vibrator buggy is 10 feet 2 inches high, 30 feet 6 inches long, and 11 feet 2 inches wide. They weigh 62,500 pounds. To generate the seismic waves necessary to image subsurface features, each vibrator buggy lifts up onto a vibrator pad measuring approximately 4.5 feet x 7.5 feet in size, which is centered under each vehicle. The weight of the vehicle on the pad is used to

create and control the vibration. To safely accomplish this objective, the vehicles need to be positioned on stable, fairly level surfaces. Vibroseis operations are best suited for gentle terrain exhibiting little topographic relief and containing sufficient access and substrate that would adequately support the truck's weight.

The topography and geology associated with the project area does not provide a surface conducive to safe vibroseis operations. Portions of the project area that do exhibit suitable terrain for vibroseis are too limited to provide quality data needed to accurately image the targeted depths. In addition, to access suitable terrain, the vibroseis buggies would have to utilize meandering routes to avoid areas containing high slopes, hills, cliffs and gorges. This being the case, the project area would be subjected to additional environmental impact in areas outside of the 100-foot corridor surrounding shothole source lines and designated access routes, increasing the overall surface area disturbed as a result of seismic operations. These factors taken into consideration, vibroseis operations were eliminated as an option, as well as from further analysis.

2.1.4 Limit Geophysical Exploration to Existing Open Roads and Motorized Trails

This alternative would limit seismic exploration operations to existing open roads and motorized trails. However, the limited amount and distribution of open roads within the proposed project area would not allow for a sufficient number and distribution of source points to provide the data necessary to effectively define the area using seismic technology. The proposed action is far superior in gathering good data in that it maintains relatively high fold, as well as wide azimuth and offset distribution, across the entire survey area. Gathering the widest range of azimuths and offsets, while maintaining high fold, is critical when considering the implications relative to seismic data processing and interpretation requirements. Based on previous experience, an alternative limited to existing open roads and motorized trails would yield a poor quality 3D volume, having little value as a subsurface mapping tool. The fold map generated from an open roads/trails design would provide substandard fold data, which would lead to an ambiguous or incomplete interpretation. The alternative would not meet the purpose and need for this project. Therefore this alternative is not considered further in this analysis.

2.1.5 Extend the Geophysical Exploration Operation Over a Several Year Period

This alternative is in response to many commenters that suggested scheduling the project in two phases to be implemented over a two-year period, as they did not believe the project could be completed in the proposed time period. Based on discussion with people having knowledge and experience with previous geophysical exploration surveys in the intermountain west, and review of the literature, the proposed scheduling is adequate to complete this action. Also, in order to minimize the impact on residents, recreationists, and resources, it is best to complete the project in the shortest time possible, and that is agency philosophy. In addition, from a logistical and financial point of view, it is not practical to schedule, mobilize, and complete the operation over a several year period. This option is environmentally undesirable and not economically justifiable. Therefore this alternative is not considered further in this analysis.

2.1.6 Use Passive Seismic Technology for Geophysical Exploration

The Big Horn Basin in Wyoming is actively being explored for oil and gas. A clear image of the subsurface is needed to accurately locate and drill commercial oil and gas wells. 3D active seismic reflection surveys are commonly used in areas of high structural complexity, such as the Big Horn Basin, to map seismically reflective layers in the subsurface. The following is a discussion of active 3D and passive 3D seismic data. Although it is compelling to consider the potential environmental advantages of a 3D passive seismic survey for mapping (Durham, 2003), active 3D seismic is the technically superior and proven methodology for subsurface structural mapping for oil and gas well placement in the Big Horn Basin. A passive 3D seismic survey in this area does not have the vertical and horizontal resolution needed for oil and gas exploration. This is due to the large survey area, the earthquake sources are too low frequency and distant, and the lack of seismic velocity contrast in the area of interest. The passive seismic method cannot achieve the high spatial resolution needed to accurately place an exploration well location.

Passive seismic imaging has been used for the past 20 years to delineate rock property changes in a variety of crustal studies, from the deep mantle to shallow volcanic systems (for example Woodhouse and Dziewonski, 1984; Van Wagoner et al., 2002; Thurber et al., 2003; Haslinger et al., 2000). The technique is used to image geological features ranging in size from hundreds of miles to as small as 5 feet (Maxwell and Young, 1995). A new passive seismic method using naturally occurring low-frequency signals emanating from hydrocarbon deposits has just been introduced for commercial use, Hydrocarbon Microtremor Analysis (HyMAS) (Holzner, et al, 2005).

3D passive tomographic seismic surveys use seismic ray paths and changes in seismic velocity structure to map subsurface geology. Similar to an active 3D seismic survey, an array of geophones is placed on the surface to record energy. However, natural background earthquakes are recorded instead of active sources such as dynamite, vibrators or air guns. Because the data collection is dependent on natural sources, data collection times vary. A sufficient number of events must be collected to perform a stable numerical tomographic inversion of the data for velocity structure. In addition, adequate ray path coverage from source to receiver and a contrast in rock properties must be present in order for the technique to be successful.

The spatial resolution of passive seismic tomography depends on the spacing of the geophones and the frequency of the recorded earthquakes. Very high spatial resolution can be obtained in special cases, such as mining-induced seismicity where changes in rock properties as small as 3 feet were detected (Maxwell and Young, 1995). In this case, the earthquakes with frequencies as high as 1500 Hz were recorded and geophone spacing was 30 feet. Areas of extreme topography and difficult surface geology such as thick volcanics are also good potential candidates for passive seismic surveys, where classic 3D active seismic data is difficult to collect.

The spatial resolution that could be expected with a theoretical 45 square mile 3D passive seismic survey in the Big Horn Basin would be on the order of approximately 2-5 miles using a station spacing of about 1 mile. From historical seismicity maps of the Wyoming area, it appears the Big Horn Basin is fairly quiet seismically (University of Utah, 2005). Just to the west of the Big Horn Basin is Yellowstone National Park, an area of very high seismic activity and

historically large earthquakes. Thousands of earthquakes occur in Yellowstone every year (USGS, 2004), the larger of which can be recorded and processed for a velocity structure in the Big Horn Basin. The direction and similarity of seismic ray paths from Yellowstone to the study area on the northwest side of the Big Horn Basin limit the resolution of the method. In order to resolve lateral differences in velocity a variety of ray paths, both short (from close earthquakes) and long (from distance events) must be recorded. The frequency of the seismic waves created by Yellowstone earthquakes would be on the order of 1 to 10 Hz and the station spacing of about 1 mile would confine the resolution of such a survey to 2 –5 miles spatially. The depth resolution would be poor due to the limited ray path coverage, because primarily laterally distant events are recorded.

The seismic recorders in the field would need to stay in place long enough to record sufficient number of earthquakes. The amount of recording time would depend on the rate of seismicity. Large passive seismic surveys have taken as long as 11 months to collect sufficient number of events for a stable velocity inversion (Durham, 2004). Each seismic site would need to be checked periodically and downloaded for data, unless a telemetry system was deployed at each site, which is very expensive. The possibility of detrimental environmental effects of the periodic station visits (every 2-7 days, depending on station data storage) at 40 plus stations over a years time should be reviewed prior to any survey.

A new passive seismic method has become available commercially, Hydrocarbon Microtremor Analysis or HyMAS (Holzner et al., 2005). Similar to a tomographic passive seismic survey, seismic instruments are deployed to record naturally occurring signals from the earth. Instead of active earthquake signals, the method records low-frequency background noise that has been absorbed and amplified by the hydrocarbon reservoir (Holzner et al., 2005). The method appears to have an advantage over tomographic studies, as earthquakes do not need to be recorded. The HyMAS method is not proven technology. To determine the depth of the mapped hydrocarbon tremor anomalies, the processed data must be calibrated with existing oil and gas wells (Holzner et al., 2005). The repeatability of the HyMAS method is questionable; however it does appear to determine the edges of hydrocarbon bearing formations. Similar to the tomographic studies, the HyMAS spatial resolution is low, and because HyMAS provides no depth information, it is an unsuitable mapping method for targeting oil and gas exploration wells.

The oil and gas targets in the Big Horn Basin are from approximately 7,000 to 11,000 feet below the surface in the Cretaceous sediments including the Dakota Sandstone and the Frontier Formation. Structural complexity has created oil and gas plays on the order of 1000 to 3000 feet horizontally (1/2 to 1/4 mile). The seismic velocity contrast in these sediments is very low (Figure 1). Over the zone of interest, the velocity variation is less than 3,000 feet/sec, hampering the resolution of the passive seismic method, which attempts to distinguish velocity variations. Because of the low velocity contrast, the target zone would be nearly invisible to the passive seismic method.

In contrast, an active source 3D seismic reflection survey works on an even grid of receiver and source locations. In the Big Horn Basin, the explosive source creates frequencies as high as 65 Hz. A typical survey is designed with 72 shots per square mile, the receiver lines are set out at 220' spacing (6 geophones per point), with 880 feet spacing between lines. The explosive

sources are recorded on the lines of geophones and processed for reflective energy of the subsurface strata. This is a proven technology with a large number of geophysical contractors allowing for rapid, accurate and cost-efficient data collection. This high frequency source and close receiver spacing create subsurface reflection images with spatial resolution of less than 100 feet, adequate for mapping oil and gas plays.

Two other active 3-D surveys in the Big Horn Basin area have had no long-term environmental impact. The estimated time to perform an active 3D seismic survey is 30 days. The shallow boreholes used to place explosive charges are typically undetectable after 6 months.

Accurately placed wells in the initial stages of oil and gas exploration mean less dry holes, less surface disruptions and better long-term field management. The ecological impact of precisely placed wells and less drilling is paramount to a successful and environmentally sensitive exploration program. Active 3D seismic data provided accurate subsurface data, allowing for accurate subsurface maps and well-placed well bores.

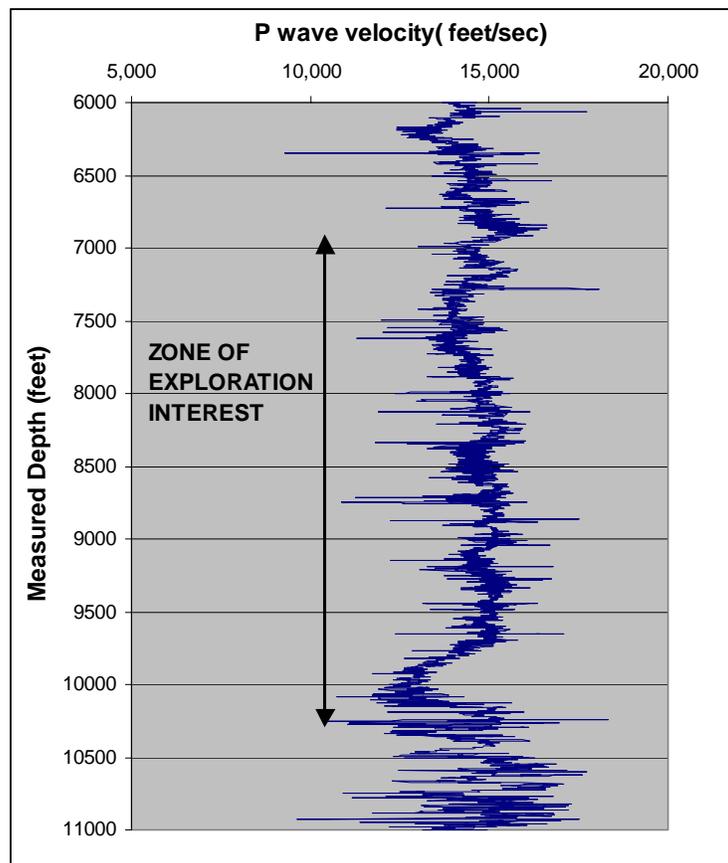


Figure 1. P-wave velocity versus depth derived from sonic well log in the Big Horn Basin area illustrating minimal velocity contrast in the productive hydrocarbon bearing horizons.

Per conversations with personnel of Seismic Micro, Inc. (8-11-05) the passive seismic technique as it would be applied to the Clark 3-D area would not provide data equivalent to the conventional 3-D survey and would have several shortcomings for this application.

- 1) Passive seismic has difficulty defining hard boundaries (ie: faults). Fault definition is a key aspect to the structural mapping necessary in the Clark Area.
- 2) The velocity modeling, on which Passive Seismic mapping is based, is dependent on contrasts in the velocity of the subsurface formations. The prospective reservoirs, which have been encountered in drilling in the area, do not exhibit strong velocity contrasts to the non- reservoir formations.
- 3) Estimated timing to acquire the data to attempt to replace the conventional 3-D seismic technique was estimated to be a year or longer. The cost, due to the time necessary would equal or exceed the cost of the conventional 3-D. The impact to the area would be much longer when compared to the acquisition time for the conventional 3-D.

Seismic Micro, Inc. does not recommend the passive seismic technique as a replacement for the conventional 3-D seismic technique in the Clark area. They feel that the data generated would not be near the equivalent of the conventional data and would most likely not provide the resolution for well site selection, while the conventional data has been proven to provide such necessary definition based on previous drilling.

2.2 NO ACTION (ALTERNATIVE 1)

Under the No Action alternative, the project would not be authorized on BLM-administered or National Forest System lands, which comprise 58% of the Clark 3D project area. Operations could still possibly occur on state and private lands (42% of the total project area) if the applicant secured authorizations from the landowners, however the feasibility of attaining useable data under this scenario is questionable.

NEPA regulations require the federal agencies to identify the no action alternative and use it as a baseline for comparing the environmental consequences of the other alternatives (40 CFR 1502.14(d)). Under the no action alternative, existing land and resource use activities, as well as trends within the project area, would continue generally as is on federal lands. This alternative would not be responsive to the purpose and need for responding to the applicant's proposal.

2.3 THE PROPOSED ACTION (ALTERNATIVE 2)

The proposed action is for the BLM and Forest Service to authorize Quantum Geophysical to conduct the Clark 3D Geophysical Exploration project starting on July 1, 2006 and completing the project within 75 days (mid-September), using a combination of wheeled vehicles and helicopters for drilling, layout, recording, and support.

The following discussion includes a brief description of 3D geophysical exploration methodology being proposed and the applicant-committed environmental protection measures. This section also includes a description of the Project Design Features (PDFs) that have been integrated into the proposed action and its alternatives. PDFs are appropriate mitigation

measures as required by 40 CFR 1502.14(f) in order to avoid, minimize, rectify, reduce, eliminate, or compensate for adverse impacts (40 CFR 1508.20). These PDFs reflect regulatory requirements, management plan requirements, surface use requirements, protective measures, standard operating procedures, and best management practices. These PDFs were developed early in the process to be responsive and help resolve identified issues and concerns. PDFs were formulated to capitalize on beneficial opportunities, as well as to minimize potential adverse impacts to resources on federal and nonfederal land; to various users on federal and adjacent lands; and to structures, facilities, and developments on federal and nonfederal lands.

The BLM and the Forest Service would conduct regular compliance inspections to monitor environmental concerns and adherence to project design features. In addition, the BLM and the Forest Service would conduct a post-project assessment to determine if any restoration/rehabilitation is necessary within the project area. Should the agencies identify areas requiring restoration/rehabilitation (i.e., trails created as a result of operations), a restoration/rehabilitation plan would be developed by the agencies and be implemented by the applicant.

2.3.1 Description of 3D Seismic Methodology Proposed by Applicant

The general technique of the type of geophysical exploration proposed is referred to as the seismic reflection method. This method utilizes an energy source, which sends acoustic energy into the earth. This energy is reflected from subsurface layers and recorded at the surface with an instrument used to transform seismic energy into electrical impulses (geophones or receivers). A “source” line is a series of shotholes in a line. A “receiver” line is a series of geophones or receivers in a line. Computers process the collected data to create an image of the subsurface geology.

The shot-hole method that the applicant proposes generates seismic waves, created by the detonation of 10-pound explosive charges, one at a time, in 30-foot drill holes below the ground, which are recorded by surface recording equipment. Note: Drill holes are also referred to as shotholes or source points.

A combination of truck-mounted combination drills, buggy-mounted combination drills, and heliportable drills are included in the proposed action. Usage of each of the drills would be dependant upon terrain and access. As the surveyors assess the local topography, they would determine which of the drills would be better suited for accomplishing project objectives in any given area. Buggy mounted drills would be utilized in the majority of the project area. These drills are suitable in areas where adequate road access is available, slopes are 25% or less (RMP requirement), and where drilling operations could be accomplished safely. Truck-mounted combination drills would operate on more gentle slopes in the bottom areas on some parcels of the project area. Since the truck-mounted drills are heavier, and the weight distribution is not as even as that of the buggy drills, their operation would only be permitted in areas containing sufficient access and substrate that would adequately support the truck’s weight. Rougher terrain and lack of access would dictate the use of heliportable drills in the steeper slopes of the Beartooth Mountain foothills on the western boundary of the project, as well as near riparian or other sensitive areas.

Drilling, using the different types of drills, would be occurring simultaneously to complete the operation in the shortest time reasonable. In addition, drilling operations for each method of drilling would be concentrated in one area at a time for efficiency of operations and to minimize impacts of disturbance. In general, drilling operations would move from east to west across the project area. The one exception to this schedule is that helicopter-drilling operations along the western edge of the project would also be initiated at the beginning of the project, as helicopter drills are less efficient than buggy drills due to their smaller size. Heli-drilling would be scheduled in the beginning in order to ensure that it would be completed in a timely manner. This would minimize potential impacts of helicopter disturbance on wildlife and recreationists whose use increases as the fall season approaches.

Separate operational and scheduling phases of the proposed project are described below.

Planning and Permitting: The initial phase of operations includes planning tasks associated with developing the geophysical survey program and acquiring permissions, authorizations, and regulatory approvals. The applicant is responsible for obtaining approvals and permits from landowners prior to commencement of activities. Many of these tasks have been underway for some time. Final regulatory approvals have been applied for. Properties for which authorization cannot be obtained would be omitted from the survey.

Survey/Staking: Survey/staking operations on federal lands to assist with planning efforts were previously authorized and have already been completed. During the survey/staking phase, the applicant utilized eight crews, each consisting of one surveyor and one helper. The crews placed a pin flag at every proposed receiver location and marked each proposed shothole location with lathes, utilizing global positioning system (GPS) units. All paint used for marking was water-soluble and will dissipate over time. See **Map 2** for shothole and receiver line locations.

ATVs were used to carry crews and equipment; however, equipment was carried by hand in those areas restricted to or not accessible to ATV travel. The ATVs used were typical one-passenger all-wheel drive four-wheelers with 9-inch (0.75 foot) wide tires. ATVs were limited to slopes of less than 25% (RMP requirement). Terrain permitting, a single ATV pass was made along shothole and receiver lines to accomplish project staking. Several survey base stations for GPS radio towers were required.

One hundred forty four (144) receivers per square mile were aligned east/west across the project area, with a spacing of 880 feet between lines. Receiver points were pin-flagged every 220 feet along each of the lines, with a total of 6,696 receiver points located over 279 linear miles.

Shothole lines were placed in a double-bricked pattern (slightly offset diagonally similar to how bricks are laid), with a general northeast to southwest orientation, between each pair of receiver lines over 57 swaths. Shothole source line spacing was 1,760 feet apart, and shothole locations were marked with lathes at intervals of 220 feet along each of the shothole source lines, with a total of 3,348 points over 139.5 linear miles.

Shothole locations: Shothole locations were placed in offset positions as necessary to avoid rivers, streams, riparian areas, wetland areas, trees, rough terrain, existing facilities, sand dunes, archeological sites, sensitive species habitat, and other areas of concern. Offset distances from facilities were based on Accepted Industry Standards based upon peak particle velocities as shown in **Table 3**, and Project Design Features shown in **Section 2.3.2**.

Directional stakes were placed at various locations throughout the project area to mark access, and support trucks were limited to existing roads and open two-track trails only. The optimum method of drill transport from the applicant's perspective (use of the conventional truck-mounted combination drill, the buggy-mounted combination drill, or the heliportable drill) was evaluated during this phase as the surveyors assessed the local topography and access.

Table 3: Accepted Industry Offset Distances From Shotholes to Various Objects*						
Size of Charge (lbs) and Setback Distance (ft)						
Object	1#	5#	6-10#	11-15#	20-35#	40-50#
Pipeline <6 inches diameter	--	120'	140'	230'	280'	340'
Pipeline 6-12 inches diameter	--	165'	250'	340'	420'	510'
Pipeline >12 inches diameter	--	240'	350'	460'	540'	680'
Telephone line	--	50'	67'	91'	96'	138'
Railroad track or paved highway	--	180'	260'	340'	220'	520'
Electric power line	--	300'	300'	300'	300'	300'
Oil well, water well, building with foundations, spring, or underground cistern	200'	500'	700'	850'	1320'	1550'

* Accepted industry standards based on peak particle velocities.

Drilling: Drilling within the Clark 3D project area is proposed to begin on July 1, 2006 and last for a duration of approximately 45 days. This estimate of scheduling is based on past experience relating the time period required for completion of drilling operations on numerous previous 3D projects in similar terrain. Three different types of drilling equipment would be utilized:

1. Conventional Truck-Mounted Combination (air/mud) Drill Shothole Method: Shotholes would be drilled in portions of the project area utilizing conventional truck-mounted combination drills. Two truck-mounted drills are proposed for use within the project area. One truck-mounted drill would travel along each shothole source line designated for truck access, drilling a 30-foot deep hole at each shothole location along the line. The drills proposed for use are 35 feet long, 10 feet high, and 8 feet wide. Each truck has tandem rear axles, supporting dual tires, which help to distribute the weight of the truck (approximately 50,000 pounds) equally over a greater surface area to minimize impacts.

Weight distribution equates to approximately 41.3 pounds per square inch of pressure exerted on the substrate. Truck weight and tire dimensions were provided by Terry Williams of Wilderness Exploration. The area where truck-mounted drilling is proposed is very limited due lack of suitable substrate to handle the weight of the vehicles and the terrain required for such access.

2. *Combination Buggy Drills:* Shotholes in the majority of the project area would be drilled using combination buggy drills. Four buggy drills are proposed for use within the project area. As with the truck-mounted drills, one buggy drill would travel along each shothole source line designated for buggy access, drilling a 30-foot deep hole at each shothole location along the line. The buggy drills proposed for use within the project area are 27 feet long, 9 feet 6 inches high, and 8 feet 4 inches wide. They weigh approximately 26,800 pounds; however, the weight of each buggy is distributed very well over large tires in order to minimize impacts to the substrate. The tires are 26 inches wide and about four feet tall, equating to a PSI value of 9.8 pounds per square inch, according to Douglas Exploration's Randy Sober. Buggy drills would be limited to slopes of less than 25% (RMP standard), however their use is also limited by other terrain factors (i.e. incised terrain, gullies, outcroppings, etc.), and the ability to travel sideslope (which is limited to 12%). See **Photo 2** of a buggy mounted drill.
3. *Heliportable Drills:* Heliportable drills would be utilized in areas exhibiting rough terrain, as well as in sensitive areas that are not able to support the weight of the truck-mounted or buggy drills. Six heliportable drills are proposed for use within the project area. See **Photo 3** of a helicopter transportable drill. A Llama helicopter would be used to transport portable drills to each designated shothole location, eliminating the need for cross-country vehicle travel. The area of impact from drilling operations would be limited to approximately a 50-foot radius immediately surrounding the shothole location. Three pieces of equipment would be transported to each applicable shothole location, each of which weighs approximately 1,300 pounds:
 - The heliportable drill, which is 40 inches wide, 8 feet long, and equipped with a seven-foot tall mast
 - A compressor, which is 30 inches wide, 48 inches long, and 36 inches tall. The compressor allows the heliportable unit to drill through solid rock
 - A support basket, which is 5 feet long, 5 feet wide, and 3 feet tall. The support basket is used to carry the drill stem, fuel, and other supplies

Each shothole would be drilled to a depth of 30 feet and loaded with a ten-pound charge, composed of Seis-Gel™. Seis-Gel is a high velocity, 60% seismic explosive, characterized by consistent performance under severe winter conditions. The benefits of using Seis-Gel include consistent detonation, producing a sharp pulse of seismic energy; availability in plastic threaded cartridges or paper shell; and prolonged sleep time.

Very little water, if any, would be required to drill to the required 30-foot depth, and necessary water would either be lowered in by helicopter to the drill location or pumped from a nearby, agency-approved source. Any hoses used to suction surface water from approved sources within the project area would be screened at the opening to prevent the uptake of aquatic species.

Plugging: Shotholes would be plugged in accordance with the Wyoming Oil and Gas Conservation Commission (WOGCC) Guidelines [Ch. 4, Sect 6, (p - r)]. A non-metallic plug with the applicant's identification code would be placed in the hole at a depth of three feet. The remaining hole would then be tamped to the surface with cuttings and native soil. Cuttings around the hole would be raked and spread so that they are less than one inch in thickness. A sufficient mound of native soil would be left over the hole to allow for settling.

Cable Layout: A helicopter would be used to transport receiver equipment along receiver lines. Caches of cables, data collectors, batteries, and geophones would be placed along receiver lines, normally at intervals of six geophones per station (every 1,320 feet). Several four to five-person crews would alternately layout and pick-up as needed. These crews would accomplish equipment unpacking and layout; trouble-shoot geophones, boxes, and cable connections; and bundle equipment for helicopter pick-up. Traffic along receiver lines crossing federally administered land would be restricted to personnel on foot or using ATVs. Helicopters would be used for troubleshooting operations if a complete line goes down.

ATV use would be limited to the degree possible. Their use would be restricted to slopes of less than 25%, where potential resource impacts dictate otherwise, and where user safety is a concern (i.e. steep sideslope). Field operations would be performed during permitted daylight hours.

Data Collection/Recording: Quantum is proposing to begin recording this program in August of 2006. It is expected that recording would be completed in approximately 30 days. Again, this estimate of scheduling is based on past experience relating the time period required for completion of drilling operations on numerous previous 3D projects in similar terrain. Personnel on foot or ATVs would travel along each shothole line and remotely detonate charges, one at a time. Controlled detonation of explosive shots and recording would begin shortly after placement of initial grouping of receiver stations/geophones. Time between detonations is typically five to ten minutes, but can take longer depending on terrain and accessibility of the shot points. The energy generated from the detonation would be reflected by subsurface horizons and received by the geophones. Recording would be accomplished using an I/O System Two MRX recording system. Seismic cables would transmit signals to a recording truck containing a seismograph.

During the data acquisition phase of the project, 3D geophysical data would be recorded using the following specialized equipment:

1. 2 One Ton Crew Cab Trucks (Support/Personnel Transfer)
2. 1 F800 Recording Truck
3. 1 15 passenger crew van
4. 3 ¾ ton pickup trucks
5. 5 One ton stake bed trucks to transport personnel and recording equipment
6. 1 One ton service truck

7. 6 Honda 4-wheel drive ATVs
8. 2 48-foot Van Trailer (Equipment Transport / Battery Charging)
9. 1 48-foot Flat Deck Trailer (Equipment Transport)
10. 2 20-foot ATV Trailers
11. 1 Llama Helicopter
12. 1 Fuel Trailer
13. 1 Support Vehicle
14. 8000 Channel MRX Recording System (Boxes, Batteries, Cables, Geophones)

All vehicles and equipment would be properly maintained to minimize exhaust emissions and would be properly muffled to minimize noise. All ATVs would be equipped with spark arresters. All four-wheel drive buggies would be diesel powered. All vehicles would be equipped with fire extinguishers and shovels. When a helicopter is on location, it would be equipped with a water bucket.



Photo 2. Buggy-Mounted Drill



Photo 3. Heli-Portable Drill

Trouble-Shooting: Trouble-shooting of equipment during recording operations would be accomplished primarily on foot if near a road, through the use of ATVs, and occasionally helicopters. Quantum would minimize ATV passes along receiver lines to the maximum extent possible; however, multiple passes along receiver lines may become necessary in areas to correct or replace recording equipment. If multiple passes become necessary, ATV paths would be offset and/or helicopter transport would be used to minimize impacts to resources.

Truck/Buggy Breakdowns on the Line: A repair-buggy may need to travel off-road if a drill truck or buggy needs repair and cannot return to a staging area or road. The repair vehicle would limit travel to routes surveyed and cleared previously for archeological and biological resources.

Misfires: If any misfires occur due to faulty cap wire, the explosive charge would not be removed. Several safety measures would be employed: each misfire would be recorded; the cap wire would be pulled out of the hole; and the hole would be checked to insure that it is plugged in accordance with WOGCC rules. Misfires generally occur in an average of less than 1% of the total number of shotholes included in a project of this size and nature. Within the Clark 3D project area, 1% of the 3,420 shotholes is equal to approximately 34 misfires. Under optimal conditions, this number could be even lower. Any misfires resulting from proposed operations would be reported to the appropriate agency (BLM or FS).

The seismic explosive proposed for use on this project, Seis-gel, has a two-year sleep time, during which the charge has the highest probability of detonating. After that time period, the explosive begins to deteriorate and the probability of detonating decreases, until it eventually becomes completely inert.

Blowouts: Should the detonated explosive blow the plug and the drill cutting out of the hole (a blowout), the limited disturbance to the surface would be repaired as part of the line restoration/reclamation, including re-plugging and replacing the hole packing materials with drill cuttings and soil materials that were expelled from the hole by the blast. Based on experience in similar geologic settings, blowouts are unlikely to occur.

Staging Areas: All staging areas would be located on private property. Should it become necessary to establish staging areas on BLM-administered or National Forest System lands, an archeological review of the location would be completed, and any necessary permits would be obtained prior to the commencement of operations in these areas.

Quantum would set up two staging areas for the deployment of equipment from a helicopter loading zone, and a third staging area for an explosive magazine. Locations of the staging areas for storing equipment, refueling the helicopter (from a helicopter service and fuel truck), and sling-loading bundles of equipment for helicopter transport were selected to minimize resource and human disturbance. Servicing and re-fueling of trucks and buggies would take place at designated staging areas and/or road access points with mobile service vehicles. Facilities at the staging areas would consist of three equipment trailers, helicopter fuel storage, drilling equipment fuel storage, and parking for crew transport vehicles. All of the fuel storage tankers would have double-walled containment. A typical staging area is 200 by 200 feet in size.

The staging area for the explosive magazine would be approximately eight feet by six feet by ten feet in size. A temporary fenced area or dumpster would be established to hold empty explosive boxes and trash. All staging areas would have bear-resistant storage containers for temporary storage of bear attractants.

Clean-up Operations: Project design requires that 24 receiver lines are laid out and operational during recording operations. This being the case, equipment could be on the ground along any given receiver line for a period of 20 to 30 days, prior to being picked up. As shot points are detonated, crew members would clean up all equipment, markers (lathe, ribbon, etc.), cap wire, and refuse along shothole source lines and deposit the items into the nearest cache bag, in preparation for transport out of the project area. Cache bags would be located along receiver lines. The bags would be picked up by helicopter once they became full. Some cache bags would not be picked up until the receiver line is picked up; however, the cache bags provide suitable containment for equipment and refuse (no bear attractants) to prevent it from blowing away in high winds, which are characteristic of the project area. Receiver lines would be picked up as project operations proceed and the lines are no longer necessary for recording operations. Crew members would travel the lines, picking up all cable, geophones, project markers (lathe, ribbon, etc.), and other refuse and depositing the items into cache bags. The cache bags would be transported out of the project area via helicopter. All trash would be disposed of properly at a Wyoming DEQ approved disposal site.

2.3.2 Project Design Features Common to All Action Alternatives (as applicable)

As explained earlier, PDFs are appropriate mitigation measures as required by 40 CFR 502.14(f) in order to avoid, minimize, rectify, reduce, eliminate, or compensate for adverse impacts (40 CFR 1508.20). These PDFs reflect regulatory requirements, management plan requirements,

surface use requirements, protective measures, standard operating procedures, and best management practices. They would become conditions of approval contained within the authorization allowing the geophysical activity.

The BLM and the Forest Service would conduct regular compliance inspections to monitor environmental concerns and adherence to project design features. Based upon the project administration criteria identified in the EA, **Appendix E**, Page 2, the appropriate federal agency would have a full-time, on-site permit administrator during field operations on federal lands in order to work with the applicant and assure compliance with project design features.

In addition, the BLM and the Forest Service would conduct a post-project assessment to determine if any mitigation/rehabilitation is necessary within the project area. Should the BLM or Forest Service identify areas requiring mitigation/rehabilitation (i.e., trails created as a result of operations, habitat fragmentation, etc.), the applicant would work with the BLM or Forest Service to develop an acceptable mitigation plan. Additional mitigation is not necessary because the BLM and Forest Service have worked with the applicant to design the proposed action and incorporate design features to minimize adverse impacts while being responsive to issues/concerns, purpose and need, Land Management Plan mandates, and the regulatory restrictions.

General Conditions

1. **Compliance.** The applicant is responsible for complying with all federal, state, and local laws and regulations.
2. **Violations.** For willful, flagrant, or major violations of the terms of the permit, the offending individual (pilot, juggies, drill operators, etc.), as well as the applicant, would be issued a warning notice, a violation notice, or cited into court, depending on the severity of the infraction.
3. **Indemnification.** The applicant would indemnify the United States against any liability for damage to lives or property arising from the occupancy of use of federal lands under this authorization.
4. **Bonding.** A bond to insure rehabilitation and protect against damage would be required.
5. **Operator representative.** The applicant or their designated representative would be present on the premises at all times when the operations are being conducted on federal lands. The applicant would notify the appropriate line officer (BLM or FS) or his/her designated representative in writing of whom their representative would be.
6. **Notification to proceed.** The applicant would inform the appropriate line officer (BLM or FS) or his/her designated representative one week advance of all locations and times where work is being conducted.
7. **Daily progress reports.** Daily progress reports would be submitted to the appropriate line officer (BLM or FS) or his/her designated representative, providing information on the following:
 - Charges that have been shot, and the area cleared of all explosives, litter, and other materials used during the operation.
 - Blowouts that have been (or need to be) plugged.
 - Misfires

8. **Line completion statement.** When the statement of line completion is submitted for the last line to be shot under terms of this authorized operation, it shall also state, “All explosives stored or not used in the blasting operation have been destroyed or removed from federal lands.”
9. **Land survey markers.** The applicant would protect all land survey markers.
10. **Cutting of trees.** No cutting of trees would be authorized for this action.
11. **Crew camping.** Crews would not camp or reside on federal lands during the course of the project.
12. **Expiration date.** Any authorization relative to this proposal would specify an expiration date.
13. **Extension of operating period.** No extension is stated or implied. Any extension of time beyond the expiration date must be in compliance with this site-specific NEPA documentation relative to the project. If, due to unforeseen circumstances, an extension in time to complete the project is requested by the applicant, and that extension of time intrudes into the period of time outside of that evaluated in this document; additional site-specific NEPA analysis and a separate decision document would be required to address the proposal.

Right to Suspend Operations

1. **Flagrant or willful violations.** Operations would be suspended for flagrant or willful violations of term of the NOI that are rated as “hazardous” or “major” until such time as the problem is cured to the satisfaction of the appropriate line officer (BLM or FS) or his/her designated representative. See **Appendix E**, Page 3 of the EA for severity ratings.
2. **Public health and safety.** Operations would be suspended when, in the opinion of the appropriate line officer (BLM or FS) or his/her designated representative, such action is necessary to insure public health and safety.
3. **Fire danger.** Operations would be suspended during periods of extreme fire danger when warranted by conditions identified in the Wyoming Interagency Fire Restriction Plan (i.e. large fire activity on unit, severe shortage of resources, high potential for fire starts, fuel moistures are extremely low, etc.).
4. **Bear/human conflict.** Operations would be suspended, if necessary, to resolve a grizzly/human conflict situation as determined by the appropriate line officer (BLM or FS) or his/her representative. The applicant shall cooperate fully in meeting grizzly bear management goals and objectives. Non-cooperation would result in termination of the authorization.
5. **Game and fish violations.** Operations would be suspended for game and fish statute violations (i.e. harassment with aircraft), as the applicant is responsible to insure employees on duty adhere to all state and federal wildlife laws.
6. **Soil resource protection.** Operations would be suspended if the appropriate line officer (BLM or FS) or his/her designated representative determines that weather conditions or soil/slope conditions may result in unacceptable rutting.

Cultural/Historical Resource Protection

1. **Cultural resource inventory.** Permitted archaeologists have conducted a Class III cultural resource inventory of all public lands where use of full-sized or heavy vehicles (drills and pick-up trucks) is planned. The inventory covered 50 feet either side of the flagged centerline of these routes, for total inventory coverage of 100 feet. Such inventory was not required for improved roads or areas covered by previous inventories, provided that previous inventories met current standards. Sites previously determined to be un-eligible for nomination to the NRHP require no further action if the field examination confirms that the previous recordation is still accurate. The cultural resource inventory was designed to locate, record, and prescribe avoidance routes or other mitigation for all significant sites, previously recorded as well as newly discovered.
2. **Inventory report.** The Class III inventory, completed in December of 2004 and entitled *A Class III Cultural Resource Inventory of the Quantum Geophysical Clark 3D Seismic Project, Park County, Wyoming* was submitted to the BLM Cody, Wyoming Field Office and used as a resource during project design to minimize impacts.
3. **Identification/marketing of sites.** The applicant permitted archeological consultant shall obtain a cultural resource file search printout from the State Historic Preservation (SHPO) Cultural Records Office (CRO) shortly before commencing fieldwork. Based on this, the consultant would identify significant and unevaluated previously recorded cultural resource sites on federal and non-federal lands in the project area. Using site form copies obtained from the SHPO, the consultant would plot these sites onto the Clark 3D project map for the applicant, who is requested to arrange avoidance for these properties.
4. **Site avoidance.** Known cultural resource sites would be avoided, and operations would proceed incorporating recommendations detailed to the degree specified in the completed *Class III Cultural Resource Inventory of the Quantum Geophysical Clark 3D Seismic Project, Park County, Wyoming*. Standard site avoidance (by all vehicles including ATVs) entails a 32.8-meter (100 foot) or more buffer zone around all eligible and unevaluated sites. Vehicle/equipment traffic on federal lands would be confined to a corridor 100 feet wide (50 feet either side of the flagged centerline) along off-road routes and roads and trails which have been inventoried for cultural resources and which are free of significant or unevaluated cultural resources. All stone circle sites require a 300-ft (91m) avoidance buffer, and no vehicle access will be permitted on two-track roads through stone circle sites. Avoidance of cultural sites not located near or accessed by existing roads would be achieved by means of flagged cross-country site avoidance routes.
5. **Employee notification.** All of the applicant's employees and their contractors would be informed, before commencement of project operations, of critical elements of compliance with the Archeological Resources Protection Act (ARPA) and the National Historic Preservation Act (NHPA); and that any effects on, defacement of, or removal and/or disturbance of archaeological, historical, or sacred material shall not be permitted. Violation of the laws that protect these resources would be treated as law enforcement/administrative disciplinary action.

6. **Discovery of cultural resources.** If subsurface cultural resources are found during project operations, all work in the vicinity of the resource would cease and the applicant would notify the appropriate agency (BLM or FS) immediately. The applicant would implement appropriate measures requested by that agency to protect the resource until it could be adequately evaluated.
7. **Discovery of human remains.** If human remains are encountered during project operations, all work in the vicinity of the remains would cease and the remains would be protected from further exposure or damage. The applicant would notify the appropriate agency immediately of such a discovery.
8. **Native American Religious Concerns.** Sites of potential Native American concern are subject to special measures, as specified below:
 - **Avoidance offset distance.** Regardless of surface ownership, all known sites containing prehistoric cairns, stone circles, or rock art would be avoided by all vehicles by a distance of 300 feet or more along the Clark’s Fork of the Yellowstone River and by a distance of 100 feet in all other areas.
 - **Discovery of new sites.** If any additional sites of potential Native American religious concern (e.g. rock art, vision quest structures, human burial sites, prehistoric cairns, stone circles) are identified by the applicant’s personnel within 500 feet of any proposed off-road travel route, regardless of surface ownership, the appropriate agency shall be promptly notified. The need for special mitigative measures and/or additional Native American consultation shall be determined by the appropriate agency

Explosives Handling and Blasting Operation Requirements

1. **Standard operating procedure.** The applicant shall perform all work with explosives in such a manner as not to endanger life or property.
2. **Transportation/storage/markings.** The method of storing and handling explosives and flammable materials shall be in accordance with Occupational Safety & Health Administration (OSHA); U.S. Bureau of Alcohol, Tobacco, and Firearms (ATF); and Federal Department of Transportation regulations. Explosives and detonator caps would be stored in a designated area on private land in secure magazines. Signage for the magazines would not be placed on the magazines, but on adjacent posts or other permanent structures. All storage places for explosives and flammable material shall be marked “DANGEROUS”.
3. **Loss/theft of explosives.** In case of the loss or theft of explosives, the Forest Service, BLM, and the Park County Sheriff would be notified immediately.
4. **Blasting in/near ROWs.** Flagmen or warning devices must be used while operations are being conducted within or adjacent to road right-of-ways.
5. **Safety personnel requirement.** Observers, guards, or flagmen would be posted at safe distances during blasting operations. There would be a minimum of two crewmembers observing each detonated shothole. The shothole detonation observers would wear a hardhat and safety goggles. A shothole detonation observer would release 3 blasts from an air horn to warn any crewmembers or public that may be near but not in clear sight of an impending detonation prior to releasing a hand-held trigger that would allow the detonation to occur.

6. **Posting of blasting area.** Trails leading into the area would be posted by the permittee stating, "Caution – Blasting Area". Signs shall also contain approximate directions and distances to the blasting area.
7. **Recon of blasting area.** The appropriate line officer (BLM or FS) or his/her designated representative may require the applicant to perform daily flights of the daily blasting area to insure that blasting activities would not endanger National Forest users who may inadvertently enter the project blasting area.
8. **Disposal of litter.** No explosives boxes or prima cord reels would be left in the field, nor may they be burned on federal lands.

Fire Prevention and Reporting Measures

1. **Emergency fire response plan.** The applicant would coordinate project activities with appropriate fire-response agencies. The applicant would prepare a brief but specific instruction plan (crew contingency plan) for emergency fire response and would submit it to the appropriate line officer (BLM or FS) or his/her designated representative for concurrence. The crew contingency plan would include a fire communications protocol for contacting the BLM, Forest Service, and/or other appropriate agencies (i.e. County) in the event of a fire.
2. **Fire reporting.** The applicant would report all fires to the to the Fire Dispatcher in Cody, Wyoming (307) 578-1250 or 1-800-295-9954.
3. **Fire extinguishers.** All vehicles would be equipped with fire extinguishers and shovels.
4. **Staging areas & water buckets.** Helicopter landing zones at each staging area would be equipped with fire extinguishers. In addition, each helicopter would have a 100-gallon water bucket should the helicopters be needed to fight a fire in the area, regardless of the fire's source.
5. **Buggy requirements.** Off-road buggy drills would be diesel powered (no catalytic converters).
6. **Vehicles with catalytic converters.** Vehicles with catalytic converters would be restricted to existing roads and trails; parking or idling would not be permitted in portions of roads or trails with taller vegetation, as determined by the permit administrator.
7. **Portable generators.** Portable generators used in the project area would be required to have spark arresters.
8. The following direction would be provided to all field personnel:
 - **Vehicle fire prevention inspections.** All brush build-up around mufflers, radiators, headers, and other engine parts must be avoided; periodic checks must be conducted to prevent this build-up.
 - **Smoking.** Smoking would only be allowed in company vehicles and/or designated smoking areas; all cigarette butts would be placed in appropriate containers and not thrown on ground or out windows of vehicles.
 - **Fires.** Cooking, campfires, or fires of any kind would not be allowed.

Floodplains, Wetlands, and Riparian Zone Protection

1. **Shothole restrictions.** Drilling of shotholes for geophysical exploration is prohibited where:
 - Artesian wells are suspected
 - In wetland or riparian areas where perennially high water tables exist
 - In areas where and when soils are saturated
 - Immediately upslope from springs or bogs where water flow to the spring or bog could be impaired
2. **Surface disturbance.** Drilling, off-road vehicular use (including ATVs), or any other surface-disturbing activity would be prohibited within 150 feet of the high water mark of any perennial body of water on federal lands. Helicopters would be used to lower recording equipment along receiver lines to reduce surface disturbance. Intermittent and ephemeral channels would be avoided.
3. **Stream crossings.** All vehicle stream crossings would be designated and approved by the appropriate agency onsite field representative prior to use. All stream crossings would be selected to minimize streambed and bank damage.
4. **Vegetation removal.** No wetland/riparian vegetation would be removed during any phase of the project.
5. **Drill hole log.** A log of all holes drilled would be kept; noting the presence of water, the depth if possible, and if an artesian aquifer has been tapped.
6. **Water collection.** Water would be collected from the closest source, if needed, as approved by the on-site permit administrator.

Geology / Mineral Facilities Protection

1. **Offset from oil/gas facilities.** Shotholes would be located a minimum of 300 feet from oil/gas wells and pipelines, unless written permission to encroach closer has been given by the owner.
2. **Offset from mining operations.** No shotholes or receiver lines would be placed in any active mining operation, including gravel pits, within the project area.

Grizzly Bear Protection, Attractant Storage, Facilities, and Handling Procedures

1. **Suspension.** The authorized officer may order an immediate temporary suspension of all human activity permitted by the geophysical permit to resolve potential or existing grizzly/human conflicts. Furthermore, the geophysical permit may be revoked or terminated when, in his/her judgment, such action is necessary to prevent confrontation or conflict between humans and grizzly bears. The applicant shall immediately comply with such action. The United States shall not be liable for any consequences from such suspension, revocation, or termination. Such suspension, revocation, or termination may be appealed to the next higher level.

2. **Responsibility.** The applicant assumes full responsibility and shall hold the United States harmless from any and all claims by him/her or by third parties for any damage to life or property arising from the activities authorized and encounters with grizzly bears, or from suspension, revocation, or termination of activities authorized by the geophysical permit.
3. **Negligent acts.** Intentional or negligent acts by the applicant, his/her agents, employees, contractors, and subcontractors that result in injury or death of a grizzly bear would be cause for revocation or termination of the geophysical permit in whole or part.
4. **Failure to comply.** Failure to comply with these Conditions of Approval may result in suspension, revocation, or termination of the geophysical permit in whole or part and may cause criminal action to be taken against the applicant under provisions of the Endangered Species Act of 1973, as amended, or other applicable authority.
5. **Grizzly bear attractant storage requirements.** The applicant, his/her agents, employees, contractors, and subcontractors would comply with the following requirements relative to the grizzly bear in the conduct of any and all activities authorized. This is to assure compliance with regulations and best management practices in order to prevent human/bear conflicts and to minimize injuries if involved in an encounter with a bear. All human food, beverages, garbage, refuse, and other odorous substances associated with geophysical operations would be made unavailable to grizzlies through proper storage, handling, and disposal when unattended. Edibles and/or garbage should not be allowed to accumulate; sight and/or smell of edibles and/or garbage should not be dominant and edibles and/or garbage should be made unavailable. Petroleum products such as antifreeze and lubricants are attractants. **UNAVAILABLE** means stored in a bear-resistant container (approved by a federal official) or stored inside a hard-sided vehicle constructed of solid non-pliable material until disposed of outside the federal lands. **ATTENDED** means that someone is within sight and sound of the items at all times. Coolers and lunch boxes are NOT considered bear resistant.
6. **Burying of attractants.** Burying food, garbage, or refuse is prohibited.
7. **Bear training.** All persons associated with the project would have completed human safety awareness training that includes training on proper behavior in bear country, human/bear conflict prevention procedures, and encounter procedures. As a minimum, viewing of the video “Staying Safe in Bear Country – A Behavioral-Based Approach to Reducing Risk” and review of the booklet “Hunting in Grizzly Bear Country – Safety for People, Safety for Bears” would be required of each crewmember.
8. **Notifications of bear siting.** BLM and FS should be notified within 24 hrs if a grizzly bear is observed anywhere within or in close proximity to the project area. Notification would include location and time of observation and number of animals.
9. **Compliance monitoring.** Permit administrators and other federal officers would routinely monitor staging areas, vehicles, and other aspects of the operation to assure compliance with attractant storage requirements.

Helicopter Operation Requirements

1. **Discretionary authority to require helicopter support.** The on-site permit administrator would have the discretionary authority to require helicopter drilling or helicopter support at any time, as conditions dictate, in order to protect resources or provide for human health and safety.

2. **Helicopter use.** Helicopter landing, loading, and staging areas, as well as flight lines or corridors, would be coordinated with the appropriate agency permit administrator to insure public safety and minimize wildlife disturbance prior to use.
3. **Staging area locations.** Landing/staging areas for support of operations would be located as to allow a reasonable distance for gaining the required altitude for overflights.
4. **Helicopter flight corridors.** Helicopter flights would be permitted only in flight corridors as designated by the agency permit administrator.
5. **Helicopter operating corridors.** In helicopter operating corridors (between staging areas and the seismic line being worked), helicopters would be confined to designated corridors no more than ½ mile in width and are required to maintain an altitude of 1000 feet above or a minimum of 500 feet horizontal distance to the ground, and would maintain constant movement (no hovering). Within 1 mile of seismic lines being worked or the staging areas being used (still within the corridor), there are no altitude or movement restrictions in order to allow safe operation of the aircraft.
6. **Helicopter travel corridors.** In helicopter travel corridors (between staging areas and overnight parking locations), helicopters would be confined to designated corridors no more than ½ mile in width, and are required to maintain an altitude of 1,500 feet and 500 feet horizontal to the ground, and would maintain constant movement (no hovering). Within 1 mile of staging areas or overnight parking areas there are no altitude or movement restrictions in order to allow safe operation of the aircraft.
7. **Operating outside of corridors.** If helicopters were forced out of designated flight corridors or below the required flight ceilings (or in case is highly probable as determined by the on-ground permit administrator) more than one day in 10 due to weather, the operation would be suspended until such conditions are unlikely.
8. **Overflights of developments.** Direct overflights of buildings, dwellings, developed areas, recreation areas, and other areas of human concentration would be avoided.
9. **Avoidance of occupied raptor nests.** No helicopter activities would be permitted within three quarter (¾) mile or the visual horizon (whichever is closer) of active raptor nests during the July 1st to July 31st time period, in accordance with CRA RMP ROD (Raptor Decisions). Flight corridors would be rerouted around nest sites if they were occupied.
10. **Overflights of private lands.** Helicopters would avoid direct over-flights of residences, buildings, and other private land facilities.
11. **Overflights of unoccupied raptor nests.** Direct helicopter overflights of unoccupied raptor nests would not be permitted.
12. **Distance from private residences.** Helicopter activities are prohibited within ¼ mile of private residences unless approval is secured from the landowner and such documentation is provided to the appropriate line officer (BLM or FS) or his/her designated representative.
13. **Daily reconnaissance flights.** During recording operations, the appropriate line officer (BLM or FS) or his/her designated representative may require the applicant to perform daily flights of the project area to insure that blasting activities would not endanger National Forest users who may inadvertently enter the project blasting area.

14. **Wildlife disturbance.** Helicopters would not harass or disturb wildlife species to the maximum extent possible. This means helicopter pilots would not go out of their way to observe or photograph wildlife; helicopter pilots shall take deliberate evasive action to avoid wildlife when observed, even if the possibility of disturbance is minimal.
15. **Daily work hours.** Helicopter use in support of operations on federal lands, excluding travel to/from overnight parking areas to operational staging areas, shall be limited to the time period beginning one hour after sunrise and ending one hour before sunset in order to minimize disturbance to private landowners, public land users, and wildlife. The excluded crepuscular hours represent important wildlife activity periods.
16. **Dropped loads.** Any sling loads or other materials intentionally jettisoned for safety purposes or accidentally dropped from helicopters will be immediately retrieved.

Livestock /Range Facility Protection

1. **Notification of grazing permittees.** The applicant is charged with the responsibility of notifying grazing permittees prior to entering their allotments. Affected grazing permittees are listed in the EA, and their addresses are available from the Forest Service upon request.
2. **Fence crossing.** The applicant would make every effort to avoid disturbing or altering fences. Gates would be used when possible. All gates within the project area would be left as they are found (i.e., open gates would be left open, closed gates would be closed) in keeping with standard rangeland management practices. If a fence must be crossed, it would be let down or cut (as determined by permit administrator), crossed, and immediately put back up. The wires would be stretched to the original tension from the nearest brace or gate panel.
3. **Livestock water facility offset.** Shotholes would be located a minimum of one-quarter (1/4) mile of any water well, flowing spring, reservoir or stock water pipeline, regardless of ownership, in accordance with WOGCC Guidelines [Chapter 4, Sect. 6 (r)(i)], unless written consent to encroach closer is obtained from the surface owner.
4. **Repair of range/livestock facilities.** Any and all facilities damaged, destroyed or removed in connection with this geophysical exploration operation would be immediately restored to original condition or replaced with a similar facility.
5. **Personnel instruction.** Personnel associated with the project would be instructed to minimize contact and avoid harassment of livestock.

Paleontological Resource Protection

1. **Fossil discovery.** If any fossils are discovered during geophysical operations, then all activity in the area would cease and the appropriate agency would be notified immediately. An assessment of significance would be made within an agreed timeframe. Operations would resume only upon written notification by the appropriate line officer (BLM or FS) or his/her designated representative.

Private Land/Facilities Protection

1. **Shothole offsets from private facilities.** Shotholes associated with seismic activities are prohibited within one-quarter (1/4) mile of the following on private lands:
 - Residences
 - Buildings
 - Wells and springs
 - Septic systems
2. **Overflights.** Helicopters would avoid direct over-flights of residences, buildings, and other private land facilities.
3. **Distance from private residences.** Helicopter activities are prohibited within 1/4 mile of private residences unless approval is secured from the landowner and such documentation is provided to the appropriate line officer (BLM or FS) or his/her designated representative.
4. **Daily work hours.** Helicopter use in support of operations on federal lands, excluding travel to/from overnight parking areas to operational staging areas, would be limited to the time period beginning one hour after sunrise and ending one hour before sunset in order to minimize disturbance to private landowners.

Public and Crew Safety

1. **Advance notice of operations.** The applicant would notify both the BLM Field Manager and the North Zone District Ranger, or their designated representative(s), one week in advance of conducting operations, and provide notice of all locations and times that work is being planned.
2. **Avoidance of recreationists.** The applicant would avoid, to the maximum extent possible, working in the immediate vicinity of hunters, fishermen, and other forest users known to be utilizing the area. Survey crew/staff would keep the public a safe distance away from all buggy activity.
3. **Vehicle limitations.** With the exception of off-road truck and buggy drills, as well as ORV support vehicles, vehicle traffic would be limited to open roads. Vehicles would travel at speeds within set speed limits of main access roads, and at slower speeds appropriate for conditions on more remote roads and two-track trails.
4. **Signage.** Safety-warning signage would be placed on main access roads to make the public aware of road traffic related to project activities. Signs warning the public of project activity would be located at the closest road intersections on either side of the next day's planned drilling activity. No road closures are proposed, and any short-term delays on use of roads would be communicated to the public by signage and flagmen.
5. **Wearing of safety vests.** The applicant would require all crewmembers to wear orange and yellow safety vests to make them easily visible to all recreationists for safety purposes.
6. **Helicopter operating period.** All helicopter operations would be limited to the time period beginning one hour after sunrise and ending one hour before sunset to minimize human disturbance.

7. **Helicopter overflights.** Helicopters would be prohibited from flying directly over developed recreation areas, trailheads, parking areas, or recreationists. Helicopter flight corridors would be coordinated with the appropriate line officer (BLM or FS) or his/her designated representative for public safety (avoidance of direct overflights).
8. **Cables across waterways.** Cables crossing waterways would be weighted and staked to keep them from floating up from the bottom of the waterway to help insure that the cables do not interfere with recreational use.

Rights-of-Way Protection

1. **Offset from rights-of-way.** Shoatholes would be offset at industry accepted distances from rights-of-way, as set forth by the International Association of Geophysical Contractors to avoid disturbance to utility, access road, canal/drainage, and other land and realty features (**Appendix F**).

Sanitation, Clean-up, and Rehabilitation Requirements

1. **Cleanup scheduling.** The project clean-up phase would proceed concurrently with the recording phase. Equipment, pin flags, lathe, ribbon flagging, trash, and any other materials brought in by the seismic crews would be removed as the recording crew works through the project area.
2. **Proper trash disposal.** Trash would not be burned or buried. Trash would be packed out and disposed of properly at a Wyoming DEQ approved disposal site. No explosives boxes or prima cord reels would be left in the field, nor may they be burned on federal lands.
3. **Staging area trash disposal.** Bear resistant storage containers are required for all refuse or garbage that may be, or contain attractants. At staging areas, litter containers (for non-attractant litter) with functional, protective lids from wind would be in use at all times. Litter would be placed in containers immediately and not left on the ground to be policed at a later time.
4. **Sewage disposal.** Self-contained portable sewage disposal units would be provided and used at staging areas. Contents of these units would be disposed of at appropriate facilities. Away from staging areas, individuals would bury feces in “cat holes” six to eight inches deep.
5. **Proper storage of attractants.** As the project is within “occupied” grizzly bear habitat, all garbage that can serve as an attractant (food wrappers, beverage cans, etc.) would be stored in a bear resistant container or inside a closed vehicle when unattended. **ATTENDED** means that someone is within sight and sound of the items at all times.

Soils Protection

1. **Offset from bodies of water.** Drilling, off-road vehicular use, or any other surface disturbing activity would be prohibited within 150 feet of the high water mark of any perennial body of water on federal lands to minimize impacts to soils in areas with high water erosion potential. Intermittent and ephemeral channels would be avoided.

2. **ORV slope restrictions.** No off-road vehicle use would be permitted on slopes greater than 25 percent (RMP standard) or where terrain or soils dictates otherwise. Equipment deployment, pick-up, troubleshooting, and other operations would have to be accomplished on foot and/or with helicopter support on slopes greater than 25%.
3. **Offsetting ATV routes.** Vehicle travel along shot point and receiver lines would be limited to the minimum number of passes necessary to accomplish project objectives. Should multiple passes become necessary in any given area, vehicle travel paths would be offset along seismic lines and access routes to minimize compaction.
4. **Suspension during wet weather.** The applicant would conduct no vehicle operations during periods of saturated ground conditions when surface rutting could occur. Operations would be suspended if the authorized officer determines that weather conditions or soil/slope conditions may result in unacceptable rutting.
5. **Vehicles.** The spinning of all vehicle wheels would be avoided, where possible, to minimize the potential for soil displacement and impacts to soils.
6. **Dust abatement.** If the need arises as a result of seismic traffic, as determined by the permit administrator, water would be applied to roads to reduce fugitive dust resulting from vehicle traffic.

Vegetation Protection

1. General Vegetation

- **Vehicle pass limitations.** Off-road vehicle travel along shothole source lines, receiver lines, and access routes would be limited to the minimum necessary to accomplish project objectives.
- **Vehicle track offsets.** Should more than one pass be necessary in any given area, vehicle paths would be offset to minimize impacts to vegetation.
- **Discretionary authority to require helicopter support.** The on-site federal agency permit administrator shall have the discretionary authority to require helicopter drilling or helicopter support at any time as conditions dictate, in order to protect resources or provide for human health and safety.
- **Helicopter verses off-road travel.** In sensitive areas (soil or vegetation) helicopter support would be utilized for drilling and recording operations to the maximum extent possible in order to limit the number of off-road vehicles passes that are necessary.

2. Noxious / Invasive Plants

- **Equipment washing prior to entering project area.** To prevent the introduction and spread of new weeds, all equipment, including on-road and off-road equipment, would be thoroughly power-washed to remove weed seed and soil (that may contain weed seed) prior to transporting the equipment to the project area and commencing operations on public lands.
- **Crew training.** Crewmembers will be provided with information, including photographs, on noxious weeds known or with potential to occur in the project area so they can identify and avoid areas of infestation.

- **Washing after weed contamination.** Should crewmembers encounter existing noxious weeds within the project area; equipment and/or vehicles exposed to the weeds would be washed prior to entry into other areas.
- **Reclamation/reseeding.** The applicant would reclaim and reseed all off-road areas disturbed by geophysical operations as directed by the Authorized Officer. Reclamation efforts may include disking or ripping the ground surface, reseeding and mulching. Best management practices would be used in the re-vegetation efforts to insure a higher success rate in problematic weed areas (i.e. south facing slopes and high wind and water erosion areas).

3. Trees and Timber

- **Tree avoidance.** Shotholes and vehicle traffic would be offset around individual trees and, where possible, entire tree stands, as these can sometimes occur in tight clusters.
- **Cutting of trees.** Cutting of trees would not be permitted.

Visual Impact Minimization Requirements

1. **Offsetting off-road vehicle travel paths.** Vehicle travel paths would be offset to minimize visual and soil/water impacts. To the maximum extent feasible, the applicant would offset side-by-side all off-road vehicle traffic (wheeled drill buggies and ATVs) over a 50-foot wide swath on either side of the staked seismic line, so that one vehicle does NOT drive the same path as another vehicle to prevent the creation of trails or two-track roads.
2. **Maintaining visual quality of fences.** When crossing fences, crews would use gates whenever possible and would notify the appropriate agency if fences need to be cut for access. All fence crossings where fences are cut would be rebuilt and stretched back to original conditions immediately after crossing to minimize impacts to visuals and livestock containment.
3. **Slope limitation for wheeled vehicles.** In order to minimize visual impacts as well as to minimize impacts to soil/water, no off-road ORV operations would be conducted in areas containing slopes greater than thirty percent (25%).
4. **Suspending operations during wet conditions.** Use of roads, other than those adequately protected by an all weather surface, would be prohibited when the road prism is wet to prevent visual impacts and impacts to soil/water caused by rutting and gulying. These conditions generally occur from late March to late June, but can occur at any time. Operations requiring ground-based vehicles would be temporarily suspended when these conditions exist.
5. **Rehabilitation.** Roads or areas damaged by vehicle use would be rehabilitated to minimize visual impacts in accordance with specifications established by the appropriate line officer (BLM or FS) or his/her designated representative.
6. **Drill hole cuttings.** Hand raking of topsoil and the remaining cuttings at drill holes would be conducted to minimize visual impacts, as determined by the appropriate line officer (FS or BLM) or his/her designated representative.

7. **Raking of tracks.** Driving of any wheeled vehicles in areas void of vegetation and/or containing soils subject to long-lasting tracks (i.e. bentonite????) would be avoided, or the area hand-raked immediately after use to reduce the visual impact. Buggy drill operators would approach open road and trail crossings at reduced angles to make tracks less noticeable to recreationists. When deemed necessary by the appropriate permit administrator (BLM or FS), all visible vehicle tracks departing from existing roads would be raked out to the original contour to disguise the seismic lines and discourage use by off-road vehicles (ORVs).
8. **Signing/barricading line entry points.** In order to discourage the future use of seismic lines for ATV travel, signs and barricades would be placed at access points to seismic lines, as deemed necessary by the permit administrator

Wastes (Hazardous or Solid) Requirements/Reporting

1. **Storage.** Fuel and lubricants would be temporarily stored in transportable containment-trailers at locations within staging areas to minimize potential for accidental releases/spills.
2. **Hazardous waste spills.** Major hazardous waste spills would be reported immediately to the appropriate line officer (BLM or FS) or his/her designated representative. The applicant would clean up spills in accordance with all applicable regulatory guidelines and as outlined in the applicant's Emergency Response/Contingency Plan, which is on file with the BLM and Forest Service.
3. **Minor spills.** All spills or leaks of diesel fuel, hydraulic fluid, lubricating oil, and coolant, including contaminated soil material, would be excavated to an appropriate container and transported to an approved disposal site.
4. **Site cleanup.** The applicant would clean up all project lath, flagging, solid waste, and incidental trash as operations proceed through an area. The collected trash would be hauled to a WDEQ approved disposal site.

Water Quality Protection - Ground Water

1. **Shothole offset distance.** Shotholes would be located a minimum of **one-quarter (1/4) mile** away from any water well, flowing spring, reservoir or stock water pipeline, regardless of ownership, in accordance with Wyoming Oil and Gas Conservation Commission (WOGCC) Guidelines [Chapter 4, Sect. 6 (r)(i)], unless written consent to encroach closer is obtained from the surface owner.
2. **Shothole plugging.** All shotholes would be plugged in accordance with WOGCC rules and regulations, in order to prevent the potential interchange of surface and ground water.

Water Quality Protection – Surface Water

1. **Shothole offset distance.** Surface-disturbing activities (i.e. shothole drilling or ground vehicle use) would not occur within **500 feet of the Clarks Fork of the Yellowstone River**. In addition, surface-disturbing activities (i.e. shothole drilling or ground vehicle use) would not be conducted within **150 feet of the high water mark of other live waters** located within the project area. Any geophysical exploration operations (i.e. placement of receiver lines) authorized within 500 feet of the Clarks Fork of the

Yellowstone River and/or 150 feet of other creeks and drainages on BLM and National Forest System lands would be conducted on foot with helicopter support.

2. **Stream crossings.** All vehicle stream crossings would be designated and approved by the appropriate agency onsite field representative prior to use. All stream crossings would be selected to minimize streambed and bank damage.
3. **Crossing washes.** Washes or alluvial valleys would not be crossed if water is visible in the channel.
4. **Water sources.** Water needed for drilling would be collected from the closest source, if needed, as approved by the on-site permit administrator.

Wild and Scenic River Characteristics Protection

1. **Offset from Clarks Fork River.** No shotholes would be placed within 500 feet of the Clarks Fork of the Yellowstone River. Recording equipment would be laid out on foot, with helicopter support. No additional mitigation actions beyond those outlined for surface water resources should be necessary to protect the identified values, free flowing condition, and water quality of the Clark's Fork of the Yellowstone River.

Wildlife Protection Requirements

1. **Compliance with wildlife laws.** The applicant would observe all applicable wildlife restrictions. The applicant's crewmembers would not harass, injure, or destroy wildlife within the project area. The applicant is responsible for ensuring that all crewmembers on duty adhere to all wildlife laws.
2. **Helicopters & wildlife.** (Also see helicopter section)
 - **Wildlife disturbance.** Helicopters would not harass or disturb wildlife species to the maximum extent possible. This means helicopter pilots would not go out of their way to observe or photograph wildlife; helicopter pilots shall take deliberate evasive action to avoid wildlife when observed, even if the possibility of disturbance is minimal.
 - **Helicopter coordination.** Helicopter landing, loading, and staging areas, as well as flight lines or corridors, would be coordinated with the federal agency permit administrator to insure public safety and to minimize wildlife disturbance prior to use.
 - **Flight corridors.** Helicopter flights would be permitted only in flight corridors, as designated by the permit administrator.
 - **Flight hours.** All geophysical exploration operations using helicopters shall be limited to the time period from 1 hour after sunrise to 1 hour before sunset to minimize disturbance to wildlife and humans. The excluded crepuscular hours represent important wildlife activity periods.
3. **Raptor nests.** No vehicle activities may occur within 220 feet (1 receiver station) of unoccupied raptor nests, and helicopters would avoid direct over-flights of unoccupied raptor nests to protect their structural integrity. No vehicle, drilling, or helicopter activities would be conducted within three quarter ($\frac{3}{4}$) mile or the visual horizon (whichever is closer) of active nests during the July 1st to July 31st time period, in accordance with CRA RMP ROD (Raptor Decisions). Flight corridors would be rerouted

around nest sites if they were occupied. The applicant would have surveys conducted by qualified biologists to determine the status of nests present within the project area prior to conducting any ground or aerial activities within three quarter miles of any nest location during the restricted period.

4. **Sagebrush protection.** To protect wildlife cover, vehicle traffic would, to the maximum extent practicable, avoid stands of tall sagebrush. Responsibility for this avoidance falls primarily on the survey crew. Stands of tall sagebrush are defined as areas in which the majority (more than 50%) of sagebrush plants are 18 inches or taller.
5. **Caves/cave passages.** Drilling and shooting operations would not occur within 200 meters (0.124 miles or 656 feet) of known caves and cave passages.
6. **Mountain plover and/or long-billed curlew nesting/brood rearing habitat.** No geophysical exploration operations would be conducted within one-quarter (1/4) mile of any active nests during the nesting season, April 10th through July 10th. Should activities in suitable mountain plover or long-billed curlew habitat be necessary during the period of April 10th through July 10th, the applicant would have field surveys conducted by qualified biologists to identify active nests.
7. **Prairie dog protection.** Shotholes would not be drilled within 50' of known prairie dog burrow locations or within active colonies.

2.4 HELICOPTER ACCESS ONLY ALLOWED OFF OPEN ROADS - OFF-ROAD VEHICLE USE PROHIBITED (ALTERNATIVE 3)

This alternative allows for the BLM and Forest Service to authorize Quantum Geophysical to conduct the Clark 3D geophysical exploration project starting on July 1, 2006 and completing the project within 75 days (mid-September), using only helicopter access on federal lands for drilling, layout, and support except on open roads. Wheeled vehicles used for seismic operations would be restricted to open roads. The project would still be completed in the same time period as the proposed action. The cost of the heli-portable drill method is approximately triple the cost of conventional buggy drill methods.

The intent of this alternative is to be responsive to the issue of off-road travel and associated concerns relating to potential adverse effects of off-road travel by wheeled-vehicle mounted drills and ATVs on vegetation, soils, wildlife habitat, and visuals, as well as the potential for establishing temporary access points for future unauthorized travel.

Alternative 2 is largely the same as the proposed action, relative to location of source and receiver lines and timing (summer/early fall) and duration of the project (75 days). Project scheduling would be constrained to the same time period as the proposed action, as neither the applicant nor the affected agencies desire to have operations intrude into the major hunting seasons, big-game wintering periods, or the spring period because of unacceptable impacts to land users, soils/water, and wildlife. However, this alternative differs from the proposed action in that heliportable drills would do "all" drilling on federal lands, and all recording operations (cable layout, troubleshooting, recording, and pick up operations) would be accomplished on foot with helicopter support or from vehicles restricted to open roads.

All applicable project design features listed under the proposed action would be incorporated. Operations outside of federal lands would likely remain the same except where wheeled vehicle access to BLM land is required, and there are no open roads on the BLM land.

To complete the project within the allotted time period of 75 days, 4 helicopters and 12 heli-portable drills would be required. Numerous helicopters would be working simultaneously across the entire project area. Each heliportable unit would be capable of drilling only four to five holes per day based on the substrate present within the project area.

2.5 COMPARISON OF ALTERNATIVES

This section presents a comparative summary of the effects of implementing each alternative. The effects are summarized from Chapter 3, which should be consulted for a full understanding of these and other environmental consequences. Information in the following table is focused on activities and effects where different levels of effects or outputs can be distinguished quantitatively or qualitatively among alternatives.

Table 4: Comparison of Effects of Alternatives			
Comparison Element *Figures relate to federal land only	Alternative 1 No Action Allow no geophysical exploration	Alternative 2 Proposed Action Allow geophysical exploration allowing wheeled vehicles off-road in combination with helicopters	Alternative 3 Helicopter Access Limit geophysical exploration to use of helicopter access only except on open roads
General Indicator(s):	--	--	--
Duration of project	0 days	75 days	75 days
*Total number of holes drilled and plugged	0 Shotholes	1984 Shotholes	1984 Shotholes
*Shotholes drilled by truck-mounted drills	0 Shotholes	72 Shotholes	0 Shotholes
*Shotholes drilled by buggy-mounted	0 Shotholes	1,443 Shotholes	0 Shotholes
*Shotholes drilled by heli-drills	0 Shotholes	379 Shotholes	1984 Shotholes
Vegetation/Habitat Disturbance From Drilling and Off-road Use:	--	--	--
Acres subject to impacts from drilling of holes	0 acres	1.5 acres	1.5 acre
Acres subject to potential temporary tire impacts from truck-mounted drills	0 acres	5.5 acres	0 acres off-road use
Acres subject to potential temporary tire impacts from buggy drills	0 acres	110 acres	0 acres

Table 4: Comparison of Effects of Alternatives			
Comparison Element *Figures relate to federal land only	Alternative 1 No Action Allow no geophysical exploration	Alternative 2 Proposed Action Allow geophysical exploration allowing wheeled vehicles off-road in combination with helicopters	Alternative 3 Helicopter Access Limit geophysical exploration to use of helicopter access only except on open roads
Acres subject to potential temporary tire impacts from ORV support use	0 acres	Receiver line 98 acres Source line - included in 110 acre calculation for buggy drills	0 acres
Helicopter Disturbance Time to Humans, Wildlife, and Livestock:	--	--	--
Number of helicopters required	No helicopters	1 helicopter	4 helicopters
Duration of exposure to helicopter disturbance	0 days	75 days	75 days
Magnitude of helicopter disturbance in total hours of flight time, and hours of helicopter exposure	0 hours	135 hours	540 hours
Probability of Helicopter Accident Based on Exposure Time	--	--	--
Probability of an accident	0 chance	1 in 92 chance	1 in 23 chance
Probability of a fatality	0 chance	1 in 561 chance	1 in 140 chance
Overall cost to applicant:	--	--	--
Cost per shothole	0 dollars	325 dollars	750 dollars
Overall project cost	0 dollars	Approximately 2.3 million dollars	Approximately 4 million dollars

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1 INTRODUCTION

This section summarizes the physical, biological, social, and economic environments of the affected project area and the potential changes to those environments due to implementation of the alternatives. It also presents the scientific and analytical basis for data shown in comparison of alternatives presented in **Table 4** above. All data used in this section is based on the best science and information available.

Direct effects caused by the action and occurring at the same time and place; indirect effects caused by the action but occurring later in time; and the cumulative effects of the action when it is considered in the context of past, present, and reasonably foreseeable future actions are

described in this section. Direct, indirect, and cumulative effects will be addressed in this document by resource element. In addition, the cumulative effects of this “single geophysical exploration operation” will be addressed relative to its effect in the context of its contribution to aggregate effects when considering the big picture over the long-term.

This section also presents the scientific and analytical basis for comparison of alternatives. Only resources potentially affected are identified and analyzed in detail in order to focus on the relevant resources of concern and key issues. The level of detail is commensurate with the amount of information necessary to understand the effects of the actions. The effects discussions presented in this chapter are summaries of information from the IDT resource specialists and their meeting participation and input into the document. **All effects from the proposed action and action alternatives are based on the implementation of project design features (PDFs), including the applicant-committed environmental protection measures, and other BLM and Forest Service requirements described in Section 2.0 above.** The summaries focus on the resource issues disclosed in **Section 1**.

This section describes current conditions of the Affected Environment resulting from past and present conditions, disturbances, uses, and activities. Only those aspects of the affected environment that are relevant to the understanding of the effects are described. Note that the environmental consequences of the No Action alternative on federal lands are largely the same as the Affected Environment description. The adoption of the No Action alternative, assuming the project would not be authorized on BLM-administered or National Forest System lands, would mean that the effects quantified in the analysis of the proposed action would possibly only occur on State and private lands, with the exception of archeological and biological inventories that have already been completed on federal lands. The surface area of federal lands would not be subjected to impacts associated with geophysical exploration operations (drilling, buggies, ATVs, additional pedestrians, helicopters, etc.); and no geophysical data would be obtained.

A summary of critical elements of the human environment (identified by the BLM NEPA Handbook H-1790-1), their status in the project area, and whether or not they would potentially be affected by the proposed project are listed in **Table 5** below.

Table 5: Critical Elements of the Human Environment		
Element	Status: Clark 3D	Addressed in EA
Air Quality	Minimally Affected	Yes
Areas of Critical Environmental Concern	None Present	No
Cultural Resources	Potentially Affected	Yes
Environmental Justice	Potentially Affected	Yes
Farmlands, Prime or Unique	None Present	No
Flood Plains, Wetlands, Riparian Zones	Potentially Affected	Yes
Native American Religious Concerns	Potentially Affected	Yes
Noxious/Invasive Plants	Potentially Affected	Yes
Threatened and Endangered Species	Potentially Affected	Yes
Wastes (Hazardous or Solid)	Potentially Affected	Yes
Water Quality (Surface or Ground Water)	Potentially Affected	Yes

Table 5: Critical Elements of the Human Environment

Element	Status: Clark 3D	Addressed in EA
Wild and Scenic Rivers	None Present	Yes
Wilderness	None Present	No

Elements not present within the project area and/or unaffected by the action alternatives were eliminated from analysis during the preparation of this EA. Each element that would be affected or could potentially be affected by the action alternatives that is not linked to a key issue has been addressed previously in this EA. If it is a key issue, it is addressed in the sections that follow. In addition to the above-listed critical elements, other non-critical elements that could potentially be affected by the proposed action or alternatives are also addressed previously or in this section. Elements appear in the general order of importance based on issues and/or concerns presented in **Section 1.7**.

3.2 GENERAL SETTING AND LAND USE

The project area is located just to the west and southwest of the small rural community of Clark, Wyoming. Land ownership is a mix of State, Federal, and private lands. There are presently numerous residential and seasonal homes in the Clark area, with a portion of them being located in the proposed project area. Several miles to the north of the proposed project area, subdivision and home construction is occurring on private land parcels adjacent to the Custer National Forest and on parcels interspersed with BLM and State of Montana lands. There are several producing oil wells in the general area (to the north, east, and south of the project area), and a rig is drilling within the proposed project area at present on non-federal lands in Bennett Creek. Park County operates two active gravel pits on BLM land within the project area.

The project area is located on the lower slope foothills of the east side of the Beartooth Mountains, known as the Beartooth Face, where the Beartooth geological uplift transitions into sagebrush grassland and high desert types. Elevations within the project area range from 4300' to 7300' in elevation, with the majority being below 5000'. The Clarks Fork of the Yellowstone River bisects the project area, however no portions within the project area have been designated under the Wild and Scenic Rivers Act. The project area is not directly adjacent to, nor does it include any areas designated as Wilderness or Wilderness Study Areas.

The project area does contain some lands presently classified as inventoried roadless area, and some roads do exist and are open to travel in portions of this inventoried roadless area.

The soil types, vegetation, wildlife, water resources and other relevant resources of concern within and near the project area, as well as the projected effects of the alternatives are described in the following sections.

Primary land uses in the area include farming, ranching, residential, oil/gas extraction, and varied forms of recreational uses associated primarily with public lands. The following sections describe the specific uses in much more detail.

3.3 WILDLIFE

3.3.1 INTRODUCTION

This section on wildlife is separated into several parts. **Section 3.3.2 General Wildlife - All Species**, gives an overall perspective of wildlife presence, general habitats available, and potential effects. All big game species, which are also Forest Plan Management Indicator Species (MIS), are discussed in **Section 3.3.3 Big Game Species**. All species listed as threatened or endangered under the Endangered Species Act, all of which are also MIS, are discussed under **Section 3.3.4 Threatened and Endangered Wildlife Species**. All other species analyzed are designated sensitive species (many of which are also MIS), and are discussed in **Section 3.3.5 Sensitive Wildlife Species**. **Section 3.3.6 Management Indicator Species** addresses the concept of MIS and contains a summary conclusion of effects.

Direct and indirect effects on wildlife and their habitats are discussed by species or groups of species. Cumulative effects are discussed for all wildlife species as a single entity in **Section 3.3.7 Cumulative Effects**. A biological effects evaluation was conducted for all listed threatened and endangered species, designated Region 2 sensitive wildlife species, management indicator species (MIS), and other species of local concern that could possibly be affected by this proposed action, and is contained in the project file. In addition, the BLM/FS consulted with the U.S. Fish and Wildlife Service on the project, relative to species proposed or listed under the Endangered Species Act, and their letter of concurrence is included as **Appendix D**.

All listed T&E species, Region 2 sensitive species, and Shoshone Forest Plan management indicator species, and other species of concern that are known to occur on or near the proposed project area were considered in this evaluation. To determine which species could occur within the project area or be potentially affected, habitat requirements based on the literature, as well as species occurrence records for the area, were reviewed.

The Wyoming Natural Diversity Program Data Base (Scholl et al. 2000), Shoshone National Forest Sensitive Species Survey reports, the draft Wyoming Bird Conservation Plan, Grizzly Bear Cumulative Effects Model data base, IGBC Annual Reports and flight location data, Yellowstone Wolf Project Annual Reports and flight location data, Wyoming Game & Fish Department personnel, USFWS personnel, BLM personnel, FS personnel, and other sources were consulted for species locations within the analysis area.

The habitat requirements of the species were then compared with the habitat present in the analysis area to determine potential occurrence based upon habitat relationships. The potential effects of the proposed geophysical survey on habitats or individuals of each species in relation to their habitat requirements, and a conclusion and/or determination of effects on populations of each species are displayed below.

The authors of the wildlife effects analysis are familiar with the area and have conducted a project area inspection for wildlife species and their habitat. They have completed an on-the-ground evaluation of the general habitats to determine potential occurrence, the existing habitat value, and potential habitat capability of the area. They also consulted with the agency fisheries biologists and botanists. The degree of inventory and reconnaissance was commensurate with

the risk associated with the proposed action, the degree of certainty desired, and the level of knowledge already at hand.

To determine the impacts of geophysical exploration operations on wildlife resources, the specific project components and activities were examined relative to the temporal and spatial patterns of both resident and migratory wildlife species and the current wildlife population status and trends in the general area. The primary “change agents” to terrestrial wildlife species would be direct alternation or loss of habitat; fragmentation of their habitat; disturbance and/or displacement due to seismic activity; and direct loss of individuals. The severity of impacts would depend on factors such as mobility of the species, sensitivity of the species, habitat specificity, seasonal use patterns, type and timing of project activities, and physical parameters (i.e. weather).

3.3.2 GENERAL WILDLIFE – ALL SPECIES

Affected Environment Relative to Wildlife

Habitat within and adjacent to the Clark 3D project area supports a variety of vertebrate species. The varied terrain in the area provides important habitat for many big game species including elk, mule deer, moose, pronghorn antelope, bighorn sheep, and mountain goats. Endangered Species Act listed Threatened or Endangered species include the grizzly bear, gray wolf, and bald eagle. There are also many designated sensitive species of concern including raptors, greater sage grouse, mountain plover long-billed curlew, and bats. In addition there are many other species such as jackrabbits, cottontail rabbits, porcupines, coyotes, bobcats, thirteen-lined ground squirrels, badgers, mice, mountain lions, marmots, and a variety of waterfowl and neotropical migratory birds.

The area includes many important seasonal and crucial seasonal ranges as well as seasonal activity sites. These include big game wintering and birthing habitat; nesting, roosting, and wintering habitat for birds of prey; greater sage grouse breeding display sites and nesting habitat; and mountain plover and long-billed curlew nesting and foraging habitat.

Behavior of wildlife species within and adjacent to the project area is generally comparable to other areas of federal lands. Hunted species, as well as many other species, are generally fearful of humans at close range, avoid humans whenever possible, and respond by avoidance and flight whenever encounters occur.

The primary limiting factor of hunted species at present is legal hunting and poaching. Intentional harassment and unintentional disturbance does occur, but in isolated instances outside of hunting seasons. Displacement of populations from areas of preference on federal lands does not appear to be a major factor affecting populations at present, as evidenced by the fairly constant distribution of populations and individuals within populations, and past population trends. Temporary displacement occurs during all seasons in accessible areas, especially during the hunting period.

Effects on Wildlife in General

Alternative 1 - No Action

Environmental consequences of the No Action alternative on federal lands are largely the same as the Affected Environment description. There would be no impacts to wildlife or wildlife habitat as a result of the No Action alternative.

Alternative 2 - Proposed Action

Direct and Indirect Effects

Geophysical activities would not occur during the crucial seasonal wintering period (December 1st through April 30th), therefore there would be no direct adverse effects to individuals of any wildlife species during the winter period.

Geophysical activities would also not occur during the crucial spring post emergence or birthing/nesting period (March 1st through July 10th) for most species, therefore there would generally be no direct adverse effects to individuals of these wildlife species during this birthing/post-natal period.

Those few species that may potentially be directly impacted by seismic operations during the restricted period July 1st to July 10th (raptors, sage grouse, mountain plover, and long-billed curlew) are addressed individually in **Section 3.3.5 - Sensitive Species**, and species concentrated in limited sensitive habitat during the neo-natal/nursery period (mountain goats) are addressed in **Section 3.3.3 – Big Game Species**.

Impacts to most species would consist of a temporary loss of 245 acres of habitat used for hunting/foraging, nesting/breeding, and cover; temporary disturbance and/or displacement; and direct mortality. Given the small amount of habitat impacted, the extent of similar habitats within and adjacent to the project area, and implementation of PDFs; loss of habitat is not likely to have a measurable effect on any species.

During the summer/early fall season when geophysical exploration operations would occur, the presence and noise associated with helicopter use, drilling operations, vehicle traffic, and human activity within the project area may cause individuals or small family groups of animals to seek shelter or temporarily flee the immediate area of activity and move to adjacent suitable habitat. However, wildlife displacement is expected to be brief and localized, as activities are concentrated by area 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 individuals during this period does exist; however, due to the nature of the operation and required PDFs, such disturbance would be short-term and temporary and effects on individuals would be negligible.

The potential for disturbance of huntable wildlife species also exists during the early fall hunting period (September 1st through (potentially) early October), however as animals are being hunted, disturbed, displaced, and killed during this period, this seismic project would have negligible

effect on wildlife individuals. However it would likely disrupt and disturb a few hunters, and detract from their expectations and opportunities. See **Section 3.4.3 – Hunting Seasons** for a discussion of potential impacts to hunters.

Individuals of species of small size and slow mobility such as herptiles or small mammals could potentially sustain some mortality from trucks, buggies, or ATVs. Although off-road vehicle speeds are necessarily relatively slow, injurious or fatal vehicle strikes of wildlife species could occur; however, the likelihood of occurrence is low. There is also the likelihood that avian species could be struck by helicopters. Such probabilities are immeasurable at this time, but would affect few individuals even if worst case.

No aquatic species should be impacted as a result of the proposed action when water is acquired from approved sources for drilling purposes. It is standard procedure for a screen to be placed on each intake hose to prevent aquatic life and debris from being pulled into the hose. Proposed drilling equipment combined with shallow shothole depths would require little water, if any.

The indirect effects of geophysical exploration operations on terrestrial wildlife species relates to the potential for alteration of habitat that is used primarily during the critical winter/parturition periods. More in-depth discussion on the potential for alteration of habitat is included in **Section 3.8 - Vegetation**.

Alternative 3 - Helicopter Only, Vehicle Use Off-Road Prohibited

Direct and Indirect Effects

Since implementation of this alternative would necessitate the use of increased helicopter support for all operations located off of designated open roads and trails on federal lands, there would be a much higher potential for helicopter disturbance to wildlife on federal lands (58% of the total project area). Increased numbers of helicopters (4 compared to 1) and an increased area of disturbance at any one time would likely result in more numbers of individuals being displaced for a longer distance over a longer duration. There would also be additional disturbance to wildlife on private and State lands due to the scattered ownership pattern. Additional helicopter noise simultaneously over a larger area would result in much greater overall disturbance to wildlife than would off-road vehicle traffic, which is more concentrated by area and less impacting from a noise perspective.

There would be reduced potential for chance of injuries or fatal vehicle strikes of wildlife species by wheeled vehicles on federal lands under this alternative; however, there is an increased likelihood that avian species could be struck by helicopters in the area.

3.3.3 BIG GAME SPECIES

Affected Environment Relative to Big Game Species

The project area includes portions within the BLM-designated Resource Management Unit (RMU) Bald Ridge Seasonal Closure (for critical wintering range of elk and mule deer). This RMU is closed to surface disturbing and other disruptive activities, as well as unauthorized human presence from December 15th to April 30th. Even though proposed geophysical

exploration operations are outside of this closure period, the applicant has modified the proposed action to exclude the steep terrain in the western portion of this area from any geophysical exploration operations due to the concern relative to the potential for motorized disturbance in the area.

The project area also contains habitat designated as crucial big game winter range for elk, mule deer, mountain goat, and bighorn sheep (See **Maps 4 & 5**).

Crucial winter range is dominated by sagebrush but includes sparse timbered slopes, cliff areas, and exposed grasslands that have lesser snow depths, limited access, and few human activities during winter months. Big game winter range habitat is subject to seasonal restrictions from November 15th to April 30th to minimize disturbance and impacts to the species and its habitat during harsh winter months. Although there is no potential for the proposed geophysical exploration operations to disturb wintering big game animals, because the proposed period of operations is July 1st through October 15th, the potential effects to habitat are addressed in **Section 3.8 - Vegetation**.

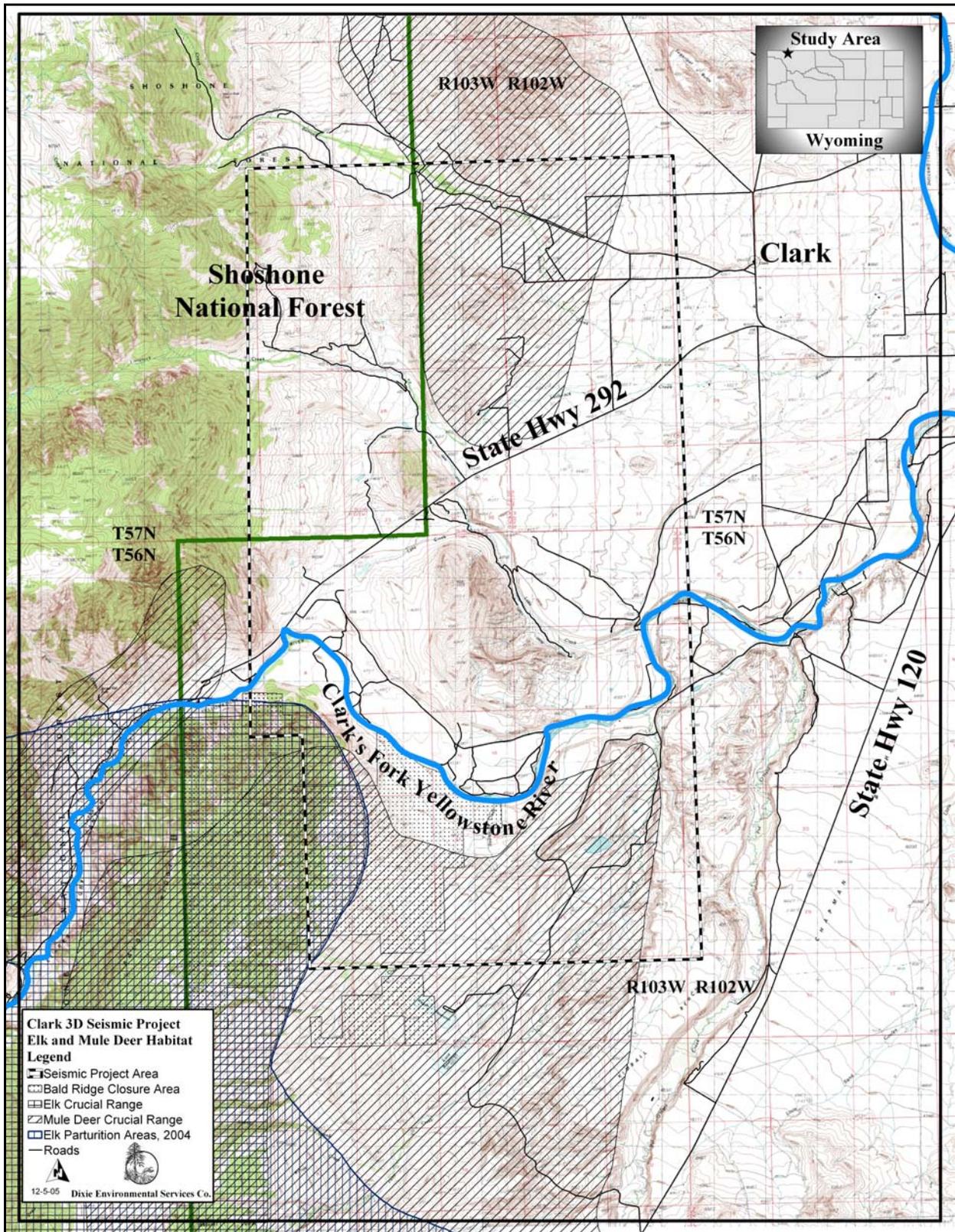
Elk use within the project area north of the Clark's Fork River has historically been quite limited, but has increased in the past 5 years. Small herds generally have moved through the area in late fall and early winter, staying for only for short periods on their way to the Robertson Draw area near the Wyoming/Montana border where most spend a majority of the winter period. A few have wintered on and near the private land in the recent past. With the residential subdivision occurring in the Robertson Draw area, traditional movement patterns may be disrupted in the future.

In addition to winter range, there is identified elk birthing area habitat located in the southwest corner of the project area, and a few elk calve in the Bennett Creek area as they move back up the mountain, especially during late springs when snow limits green-up at higher elevations. Parturition and the neonatal period immediately following it are the most critical times in the life of young animals. Birthing is a critical period because of the susceptibility of the young animal, as well as the female's conflicting needs for nutrition and providing physical protection (FS, 1984). The female's nutrition in late and early gestation is crucial to the survival of the newborn animal. In order to minimize disturbance during this time, surface use in elk birthing area habitat is prohibited from May 1st through June 30th. Again, there is no potential for the proposed geophysical exploration operations to disturb birthing big game animals, but the potential effects to habitat are addressed in the **Section 3.8 – Vegetation**.

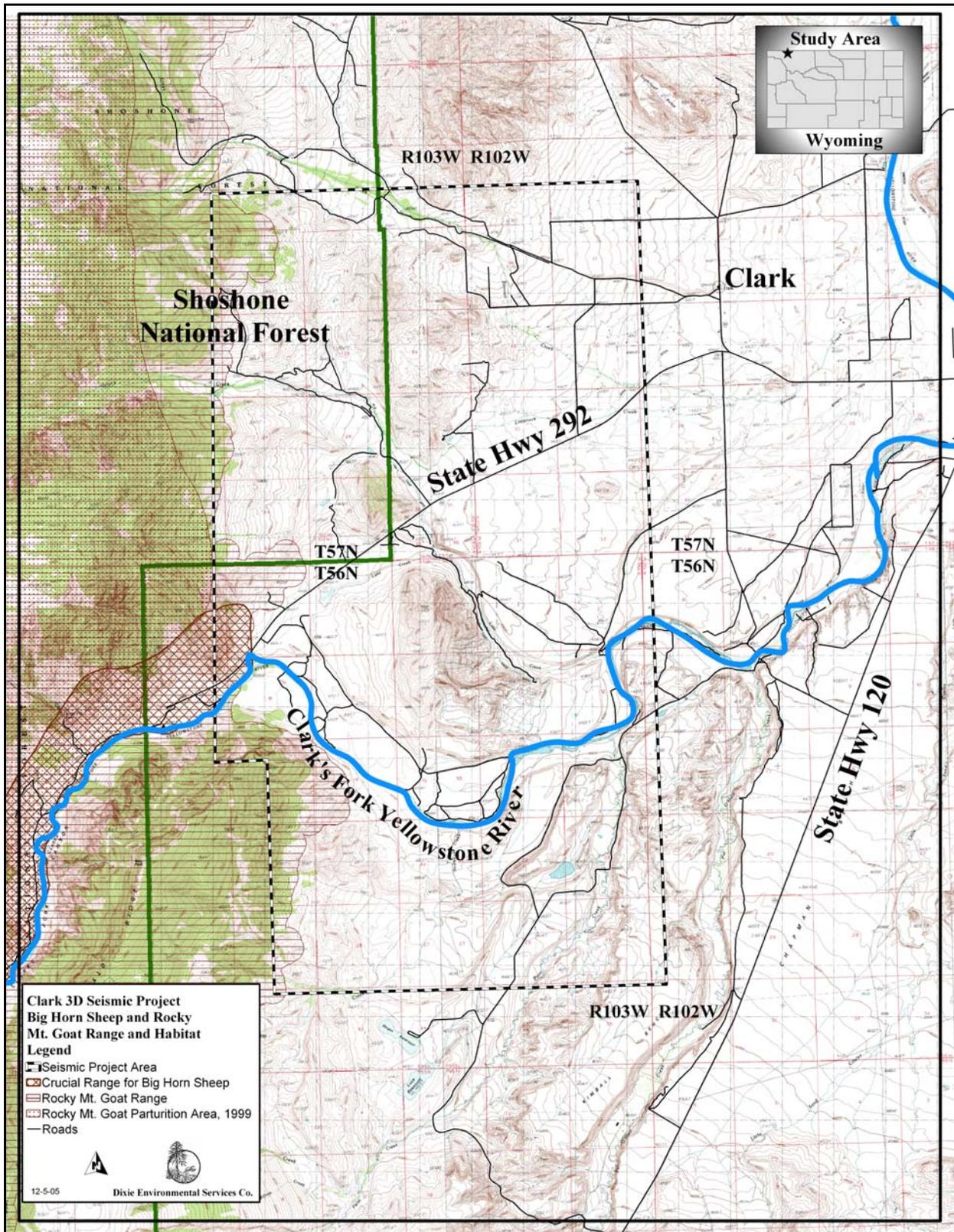
Mule deer and whitetail deer also occur, year round, within and adjacent to the project area. Deer have a much greater distribution than elk in the general area. As a general rule, deer are much more tolerant of human caused disturbance than elk.

The Clarks Fork Canyon just west of the project area contains yearlong habitat for both **bighorn sheep and mountain goat**. The area 1½ to 2 miles west of the project area contains yearlong mountain goat and bighorn sheep habitat. During the post birthing neo-natal/nursery period, one of the two largest mountain goat nursery groups (nannies and kids) in the entire Beartooth Mountain Goat Herd Unit is found on the eastern point between the Clarks Fork Canyon and Littlerock Creek, just 1½ - 2 miles west of the project area.

Map 4. Clark 3D Seismic Project Elk and Mule Deer Habitat



Map 5. Clark 3D Seismic Project Bighorn Sheep and Rocky Mountain Goat Range and Habitat



Antelope inhabit the more open terrain at lower elevations in the Clark area, and a few small herds and individuals use the project area.

Healthy viable populations of all big game species exist in the affected herd units, and population levels are sufficient to allow controlled hunting. Overall, population trends are generally stable to slightly increasing over the past few years.

Effects on Big Game Species

Alternative 1 - No Action

Environmental consequences of the No Action alternative on federal lands are largely the same as the Affected Environment description. There would be no impacts to big game or big game habitat as a result of the No Action alternative.

Alternative 2 - Proposed Action

Direct and Indirect Effects

A few individuals of **elk and deer** would likely be disturbed and displaced during the seismic operation, however the effects would be negligible on their individual well-being. Few animals would be in the area during the operating period and sufficient suitable habitat, in which they would feel secure, is nearby. Effects on habitat are discussed in **Section 3.8 – Vegetation**.

Bighorn sheep appear to be highly vulnerable to stress and most reactive to certain induced stressors. Bighorn sheep are extremely sensitive to even high fast overpasses by a helicopter when they are surprised away from good escape cover. Helicopters appear to be the most stressful intruder, based on telemetry heart monitor studies. Sheep have strong reactions to an initial overpass (100-440 yards), and subsequent overpasses exaggerate the stress condition instead of reducing the conditions that would generally be expected.

Helicopter activity near bighorn sheep elicits a displacement and avoidance response (Hook 1986, Andryk and Irby 1986, & Frid 2000) with no evidence of habituation (Bleich et al. & Bleich et al 1994). Such avoidance and displacement also reduces foraging efficiency (Stockwell 1989 & Stockwell et al. 1991). The distance that sheep fled from an approaching helicopter ranged from 110 yards to 1.9 miles and averaged two-thirds of a mile (Frid 1998). The probability of sheep fleeing decreased when a ridge visually hid the helicopter or when the helicopter approach was not direct (Frid 1998 & Frid 2000). Recommendations regarding use in bighorn sheep habitat ranged from avoidance distances of 300 yards to a little over 2 miles.

Cote (1996) found helicopter activity elicited **mountain goat** responses at distances of 1.5 kilometers (.94 miles), causing disintegration of social groups and injury in extreme cases. Population and/or fitness-enhancing behaviors such as feeding, parental care, and mating may be detrimentally impacted in response to repeated helicopter disturbance, even when overt reactions to disturbance are not visible (Bunnell & Harestad 1989, Gill & Sutherland 2000, Frid and Dill 2002). Significant effects on reproduction, survival, and population persistence may occur. Due to the sensitivity of adult female mountain goats to disturbance, and the importance of this

age/sex class to the persistence of local goat populations, restrictions on late spring and early summer helicopter activities should focus on areas occupied or likely to be occupied by nursery groups (Northern Wild Sheep and Goat Council (NWSGC) recommendations 2004).

In summary, helicopters are both startling and upsetting to sheep and goats at distances that could not be an immediate threat, and behavioral response appears to be grossly misleading as an indicator of stress. Studies have documented acute stress reaction from a helicopter over 1 mile away, which in some instances has caused panic runs of over 1 mile.

Physiological adaptations to helicopters appear unlikely if bighorns or goats are occasionally exposed to such stressors. It also appears difficult to determine a minimum altitude above which helicopters would produce no appreciable stress response in bighorn sheep or goats. It appears that the only reasonable approach to reduce impacts to sheep and goats from helicopters to an acceptable level is by the use of flight corridor and distance restrictions that limit direct approaches, not allowing any helicopter overflights, restricting helicopter activity within distances that disturb these species (1 mile or more is recommended by the NWSGC), and planning flight corridors to use terrain to visually obstruct the view of helicopters.

As helicopter use would be more than 1½ miles from any goat nursery areas, generally out of line of sight, and PDFs relating to layout of helicopter corridors and other flight restrictions would be responsive to these concerns and recommendations, adverse effects would be negligible.

Individuals and small groups of **antelope** would be disturbed and temporarily displaced during seismic operations, but sufficient suitable habitat is available throughout and adjacent to the project area, therefore effects would be negligible.

Alternative 3 - Helicopter Only, Vehicle Use Off-Road Prohibited

Direct and Indirect Effects

There is no doubt that this alternative has the potential to be much more impacting than the proposed action relative to disturbance to and displacement of individual big game animals. This is because there would be more helicopters flying at any one time (4 compared to 1) and the area of disturbance at any one time would be much greater. In addition, the total impact of helicopter disturbance measured in total flight hours (540 compared to 135) would be much greater.

This alternative could result in a higher level of stress in individuals, and result in farther displacement for a longer period of time. Impacts to habitat would be much less than the proposed action, and would be negligible.

3.3.4 THREATENED AND ENDANGERED WILDLIFE SPECIES

Affected Environment Relative to Threatened and Endangered Wildlife Species

Five federally-designated threatened, endangered, proposed, or candidate animal species are considered present or potentially present on BLM-administered public lands and Forest Service System lands within the project area. These species are listed in **Table 6**.

Table 6: Threatened and Endangered Wildlife Species with Potential for Occurrence in the Project Area Based on Habitat Requirements⁵		
Species Common Name	Scientific Name	Habitat
Gray wolf	<i>Canis lupus</i>	Related primarily to prey base, prey base exists within project area
Bald eagle	<i>Haliaeetus leucocephalus</i>	Lakes and rivers
Canada lynx	<i>Lynx canadensis</i>	Mixture of mature and young forest having snowshoe hares
Black-footed ferret	<i>Mustela nigripes</i>	Basin-prairie shrub, grasslands; obligate associate to prairie dogs
Grizzly bear	<i>Ursus arctos horribilis</i>	Variable montane forest

⁵Compiled from the USDI Fish & Wildlife Service list updated March 31, 2005

The **gray wolf** (*Canis lupus*) is currently designated as ‘threatened’ in the Western Distinct Population Segment of the U.S.A., except where it is listed as an experimental population, as is the case in northwest Wyoming. This experimental designation provides greater flexibility in the management of wolves and allows greater accommodation in land use activities. The gray wolf is present within the Clarks Fork Canyon/Beartooth Face area, as a prey base for the species is present, and wolves have been observed within the project boundaries in recent years. Because it is an experimental population and six breeding pairs have been established, no land use restrictions are required on National Forest System lands. Wolf population growth rates have remained positive toward population recovery levels (50 CFR Part 17.84(xii)(4)).

The wolf is also a Shoshone Forest Plan MIS. The population appears to be healthy, expanding in both numbers and distribution; and actions to delist the species are progressing. The major threat to the species at present is human caused mortality resulting from human/wolf conflicts

Bald eagles (*Haliaeetus leucocephalus*) are listed as federally ‘threatened’, and are also a Forest Plan MIS. The bald eagle is generally a winter resident on federal lands in the Clarks Fork River area. Although numbers are limited, the wintering population trend over the past several decades in the Clarks Fork River area has been stable to slightly upward. Potential suitable habitat exists in several locations in the Clarks Fork Canyon area, although none are classified as “key areas” in the *Pacific Bald Eagle Recovery Plan* (U.S. Fish and Wildlife Service 1986). Similarly, suitable habitat is not highlighted in a *Bald Eagle Management Plan for the Greater Yellowstone Ecosystem* (Greater Yellowstone Ecosystem Bald Eagle Working Team 1983). Large nesting trees in open water areas near large lakes and rivers that are relatively undisturbed by human activity appears to be the major limiting factor on public lands, including the project area. Suitable nesting habitat, including large trees within mature and old growth forested areas adjacent to large bodies of water or rivers, is present but very limited within the Clark 3D project

area. No Bald eagle nests or winter roost areas have been identified within a one-mile buffer radius of the Clark 3D project area, as advised by USFWS.

The **Canada lynx** (*Lynx canadensis*) is listed as ‘threatened,’ and has been documented in forested habitats in the Beartooth Mountains west of the project area. The project area does not contain suitable habitat for this species and the area is therefore not contained within any identified Lynx Analysis Unit (LAU).

Black-footed ferret (*Mustela nigripes*) is a Forest Plan MIS, listed as federally ‘endangered.’ The species is considered an obligate associate to prairie dogs, which constitute the primary food source and provide burrows for shelter. One small prairie dog colony has been documented within the project area; however, it’s size and burrow density do not provide sufficient habitat to support black-footed ferrets. Additional undocumented prairie dog colonies may exist within the project area, but it is likely that colony size and burrow density would not meet the requirements of the species. Black-footed ferrets have not been documented in or near the Clark 3D.

Grizzly bear (*Ursus arctos horribilis*) is a Forest Plan MIS and listed under the Endangered Species Act (ESA) as a ‘threatened species.’ These bears are present throughout the northern portion of the Shoshone National Forest, and have been documented within the project area on occasion. The project area (all jurisdictions) contains few habitat components preferred by bears, and as such, provides limited habitat for the species. The few riparian bottoms provide some foraging habitat and are used to some degree as travelways. Although the project is occupied habitat used occasionally by a few individual bears, it is located well out of the grizzly bear recovery zone (approximately 6 miles at the closest point) and is not considered as an area essential for recovery or management of the grizzly population. Due to the amount of human development occurring in the Clark area and the high potential for loss of bears due to human/bear conflict if they do come into the area, it is not desirable from a management perspective to encourage bear occupancy in the Clark area.

A viable population exists within the ecosystem, with a population estimate of over 500 bears (Conservation Strategy 2003). The grizzly population within the Crandall/Sunlight BMU appears to be at or approaching saturation density. Mortality, recruitment, distribution, and population trends of the grizzly bear population are closely monitored. To date, all parameters indicate that the population trend is upward on the Clarks Fork area, as well as forestwide and within the ecosystem, over the past few decades. The most current information indicates that the population of bears in the Yellowstone ecosystem is growing at approximately 3 to 4% annually, and that distribution has also increased (Conservation Strategy 2003).

The major threats to the grizzly bear in the Clarks Fork area are loss of habitat due to roading and development on private land, human-caused mortality resulting from human/bear conflicts (primarily on private lands), and permanent displacement of individuals as a result of increased human activity throughout highly developed portions of the area. Existing direction for management of National Forest System lands does not generally allow new permanent roads or new developments within the grizzly recovery area, thus habitat availability, habitat value and habitat effectiveness (secure habitat) on-forest is expected to remain relatively stable. The majority of future conflicts are expected to occur on developed areas of private lands because the

bears' distribution is expanding into previously suited bear habitat, and because there are no mandated bear protection mechanisms, such as attractant storage, in place on most non-federal lands.

It appears that management of roads and human developments, as well as bear/human conflict prevention (i.e. educations and proper attractant storage), are the most powerful tools available to balance the needs of bears and most all other wildlife with the activities of humans. The most important concerns in the conservation of the grizzly bear are to maintain secure habitat areas and to minimize opportunities for habituation of bears and associated grizzly bear/human conflicts.

To adequately address these concerns, conservation measures and recommendations contained in the *Interagency Grizzly Bear Guidelines*, *Grizzly Bear Recovery Plan*, the *Shoshone National Forest Plan*, *The Final Conservation Strategy for the Grizzly Bear In the Yellowstone Area*¹, closure orders, biological opinions, and other applicable documents have been incorporated into the design of this project, even though it is located outside the recovery area. The project design features, as displayed in the project design features section above, are intended to provide a comprehensive and integrated approach to the goal of grizzly bear conservation. This project is designed to minimize adverse effects, protect individual bears during project operations, and minimize grizzly bear/human conflicts, thus reducing the overall incidence of adverse effects on individual bears.

Effects on Threatened and Endangered Wildlife Species

Alternative 1 - No Action

Environmental consequences of the No Action alternative on federal lands are largely the same as the Affected Environment description. There would be no impacts to threatened or endangered species or their habitat as a result of the No Action alternative.

Alternative 2 - Proposed Action

Direct and Indirect Effects

Effects from the proposed action on the **gray wolf** are not expected due to project timing of activities during periods when wolves would less likely utilize habitat within the project area. During summer months, wolves generally occupy higher elevations with abundant prey species rather than the hotter and more arid habitat present in the project area. In addition, Gray wolves are highly mobile and frequently roam over large distances in short time periods. Therefore, this action would have no effect on wolves.

¹ *The Final Conservation Strategy for the Grizzly Bear in the Yellowstone Area has been completed. The strategy does not go into effect until the Grizzly Bear is delisted and it is published in the Federal Register. The strategy includes some of the most recent scientific information on management and monitoring of the grizzly bear. This information was used as part of the project design, as it was based upon the best science and data available. The habitat standard related to access management and secure habitat, incorporated within this analysis is consistent with the Final Conservation Strategy.*

As suitable habitat does not exist in the project area for **Canada lynx**, combined with the likelihood that use would be only incidental and the species is highly mobile, this action would have no effect on lynx.

Black-footed ferrets have not been documented in or near the Clark 3D project area. Documented prairie dog towns and undocumented colonies that may exist would not have the size and burrow density to provide sufficient habitat to support black-footed ferrets, supporting a minimal likelihood for the species to occur within the project area. In order to minimize potential impacts to possible undocumented prairie dog towns, and consequently black-footed ferrets, the applicant would not place shotholes directly on top of known burrow locations or within active colonies. With the utilization of this project design feature, combined with the very limited available habitat, no adverse effects from the proposed action would occur to potential habitat. As they are not known to exist in the project area, this action would have no effect on black-footed ferrets.

A No Effect determination was concluded for the listed species of gray wolf, Canada lynx, and black-footed ferret based upon the following rationale:

- The project area does not include critical, essential, or designated habitat for any of these listed species, or crucial habitat for the prey of any of these listed species,
- The occurrence of any of the species within the project area is occasional, if it is indeed present, as it is very poor quality habitat for any of the species,
- The duration of the activity is short (several months),
- The probability of disturbance is extremely low based on occurrence,
- The worst-case effect would be temporary disturbance/displacement.

No **bald eagle** nests have been documented within or adjacent to the project area. Project operations could potentially displace bald eagles from foraging habitat present within the project area; however, the displacement would be temporary and localized to the immediate area of operations. Because the timing of the project is outside of the primary use period for bald eagles (the wintering period), effects of this nature are not likely. If any undocumented nests are observed during project operations, their locations would be reported to BLM and appropriate protective measures would be taken. During operations, any bald eagles observed would be temporarily avoided and operations would be temporarily shifted to avoid disturbance to the species.

Due to the low probability of eagle presence in the project area during operations, in conjunction with required project design features, it was concluded and determined that bald eagles would not likely be adversely affected (NLAA).

Grizzly bear habitat in the project area is classified as “occupied habitat”, not “recovery habitat,” and it receives only occasional use by individual bears. Should Grizzly bears be present within the proposed project area, no impacts other than temporary displacement are expected to occur.

Standard Project Design Features relative to operations in occupied Grizzly habitat would be implemented (i.e. attractant storage, education, liability, etc.) for the protection of the species and safety of crew members. It was therefore concluded and determined that grizzly bears would not likely be adversely affected (NLAA).

Alternative 3 - Helicopter Only, Vehicle Use Off-Road Prohibited

Direct and Indirect Effects

This alternative has the potential to be much more impacting than the proposed action relative to disturbance to and displacement of individuals of threatened or endangered species. This is because of the increased exposure to noise from helicopters. There would be more helicopters flying at any one time (4 compared to 1) and the area of disturbance at any one time would be much greater. In addition, the total impact of helicopter disturbance measured in total flight hours (540 compared to 135) would be much greater.

This alternative could result in a higher level of stress in individuals, and result in increased and farther displacement for a longer period of time. Impacts to habitat would be much less than the proposed action, and would be negligible.

3.3.5 SENSITIVE WILDLIFE SPECIES

Affected Environment Relative to Sensitive Wildlife Species

Agencies have designated some wildlife species as sensitive because population viability is a concern due to trends in numbers, density, and/or trends in habitat distribution or availability. Species designated as sensitive require an in-depth look during project design and analysis. Sensitive wildlife species potentially present in the Clark 3D, along with the habitat in which they are found, are listed in **Table 7**. Sensitive species are listed by the Forest Service (R2 2005), and in the *BLM Wyoming Sensitive Species Policy and List* (September, 2002) for potential occurrence within the Cody field office area; however, suitable habitat only exists within the Clark 3D for those species contained in **Table 7**.

Greater sage grouse nesting habitat, identified raptor nest sites, potential peregrine falcon nesting habitat, and long-billed curlew and mountain plover nesting habitat are known to occur within or adjacent to the project boundaries. Habitat also exists for prairie dogs as well as for the other birds on the list, and most of the species use the area at least seasonally. Yellowstone cutthroat trout are found within the project area and although riparian streamside habitat is very limited, sensitive amphibians likely use these portions of the project area.

Table 7: Sensitive Wildlife Species with Potential for Occurrence in the Project Area Based on Habitat Requirements⁷

Species Common Name	Scientific Name	Habitat⁸
MAMMALS		
White Tailed Prairie Dog	<i>Cynomys leucurus</i>	Basin-prairie shrub, grasslands
Townsend's Big-Eared Bat	<i>Corynorhinus townsendii</i>	Forests, basin-prairie shrub, caves and mines
Spotted Bat	<i>Euderma maculatum</i>	Cliffs over perennial water, basin prairie shrub
Long-Eared Myotis	<i>Myotis evotis</i>	Conifer and deciduous forests, caves and mines
Fringed myotis	<i>Myotis thysanodes pahasapensis</i>	Cave dweller near forest edges
Swift Fox	<i>Vulpes velox</i>	Grasslands
BIRDS		
Short-eared owl	<i>Asio flammeus</i>	Prairie, marsh and tundra
Burrowing Owl	<i>Athene cunicularia</i>	Grasslands, basin-prairie shrub
Grasshopper sparrow	<i>Ammodramus savannarum</i>	Grassland, prairie, hayfields
Baird's Sparrow	<i>Ammodramus bairdii</i>	Grasslands, weedy fields
Sage Sparrow	<i>Amphispiza belli</i>	Basin-prairie shrub, mountain-foothill shrub
Brewer's Sparrow	<i>Spizella breweri</i>	Basin-prairie shrub
Ferruginous Hawk	<i>Buteo Regalis</i>	Basin-prairie shrub, grassland, rock outcrops
Greater Sage-Grouse	<i>Centrocercus urophasianus</i>	Basin-prairie shrub, mountain-foothill shrub
Mountain Plover	<i>Charadrius montanus</i>	Sparsely vegetated grasslands, Basin-prairie
Northern harrier	<i>Circus cyaneus</i>	Marshes, fields, prairie
Peregrine Falcon	<i>Falco peregrinus</i>	Tall cliffs
Loggerhead Shrike	<i>Lanius ludovicianus</i>	Basin-prairie shrub, mountain-foothill shrub
Long-Billed Curlew	<i>Numenius americanus</i>	Grasslands, plains, foothills, wet meadows
Sage Thrasher	<i>Oreoscoptes montanus</i>	Basin-prairie shrub, mountain-foothill shrub
FISH		
Yellowstone Cutthroat Trout	<i>Oncorhynchus clarki bouvieri</i>	Yellowstone drainage, small mountain streams and large rivers

Table 7: Sensitive Wildlife Species with Potential for Occurrence in the Project Area Based on Habitat Requirements⁷

Species Common Name	Scientific Name	Habitat ⁸
AMPHIBIANS		
Boreal Toad	<i>Bufo boreas</i>	Pond margins, wet meadows, riparian
Northern Leopard Frog	<i>Rana pipiens</i>	Beaver ponds, permanent water in plains and foothills
Spotted Frog	<i>Rana pretiosa (lutiventris)</i>	Ponds, sloughs, small streams

⁷Compiled from the BLM Wyoming Sensitive Species Policy and List (2002) for the Cody Field Office and the USDA Forest Service Sensitive Species List (2005) for the Region 2 Office

⁸Species that do not occur within project habitat have been omitted

Among the sensitive species, raptors, greater sage grouse (*Centrocercus urophasianus*), mountain plover (*Charadrius montanus*), and long-billed curlew (*Numenius americanus*) are notable in that they are protected via seasonal restrictions. Three (3) greater sage grouse leks and four (4) raptor nest sites have been identified within or adjacent to the Clark 3D project area. Estimated locations of each of these, based on BLM information, can be found in **Map 6**.

Suitable mountain plover nesting habitat within the project area is limited, indicating a low probability for occurrence of the species, based on necessary requirements. Long-billed curlews have been observed nesting within the project area in past years on benches along the Clark’s Fork River. There are no Greater sage grouse leks, raptor nests, areas of Mountain plover or Long-billed curlew habitat, prairie dog colonies, or other sensitive species locations identified on National Forest System lands within the project area. Should any be identified, all seasonal restrictions for the protection of the species in question would be observed.

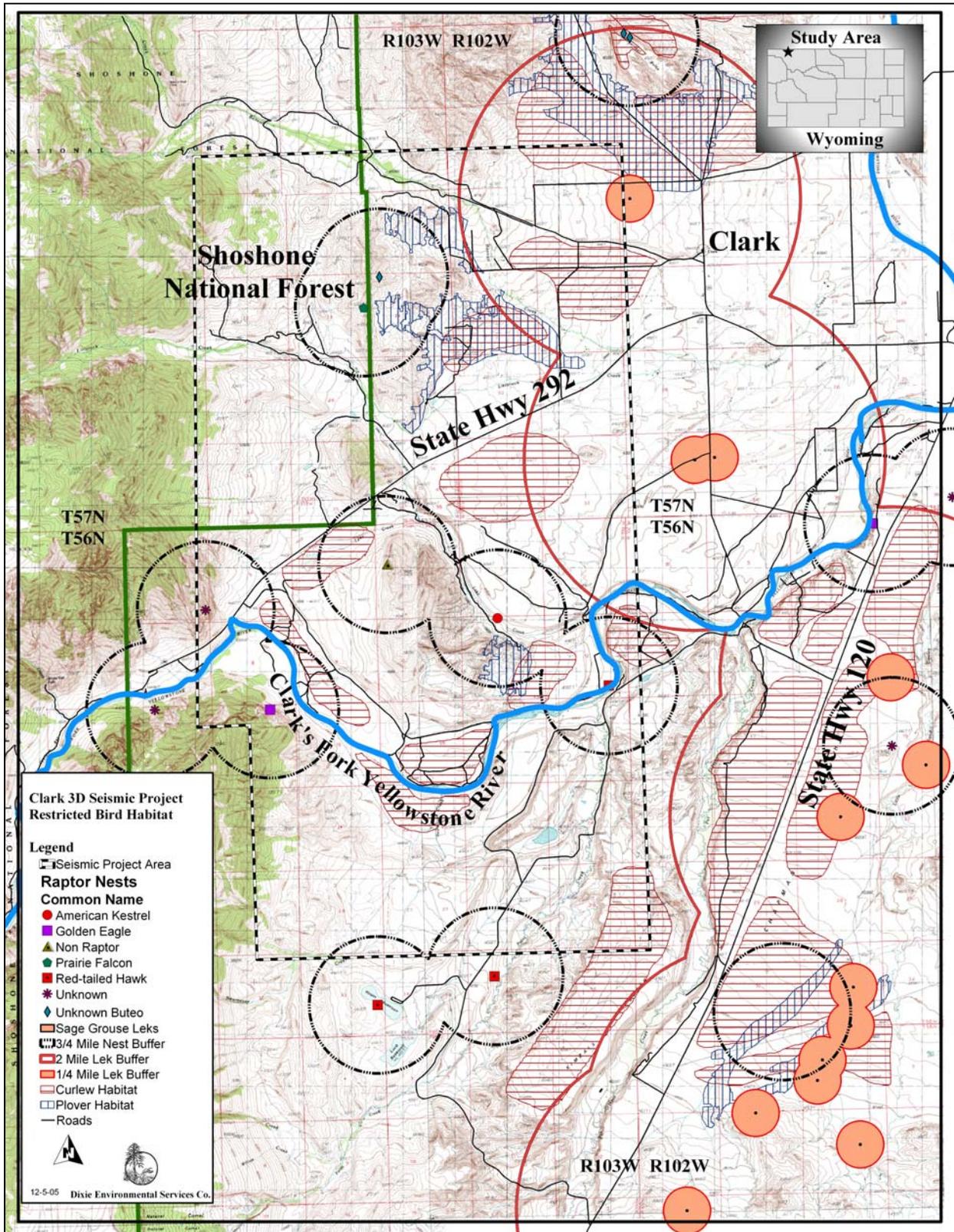
Townsend’s big-eared bat (*Corynorhinus townsenii*), Long-eared Myotis (*Myotis evotis*), and Fringed myotis (*Myotis thysanodes pahasapersis*) could potentially be present in caves within the project area. There are two known cave locations in the project area on BLM lands, and there is potential for additional cave resources to be identified on either BLM-administered or National Forest System lands. Significant caves on federal lands are protected by the federal Cave Resources Protection Act of 1988, which prohibits disclosure of exact cave locations.

Effects on Sensitive Wildlife Species

Alternative 1 - No Action

Environmental consequences of the No Action alternative on federal lands are largely the same as the Affected Environment description. There would be no impacts to sensitive species or their habitat as a result of the No Action alternative.

Map 6. Clark 3D Seismic Project Restricted Bird Habitat



Alternative 2 - Proposed Action

Direct and Indirect Effects

Due to project scheduling, off-road vehicular activity would not adversely affect greater sage grouse strutting, nesting, and/or brood rearing activities, as operations would not occur during this critical March 1st to June 15th period.

Due to PDFs, effects to raptor nests or nesting raptors would be negligible. To protect established raptor nests and to avoid potentially disturbing nesting raptors during the period between July 1st and July 31st:

- No vehicle activities would occur within 220 feet (1 receiver station) of established unoccupied raptor nests.
- Direct helicopter overflights of unoccupied nests would not be permitted.
- No vehicle, drilling, or helicopter activities would be permitted within three quarter (3/4) miles or the visual horizon (whichever is closer) of active nests during this time period, in accordance with CRA RMP ROD (Raptor Decisions).
- Flight corridors would be rerouted around nest sites if they were occupied.
- The applicant would have surveys conducted by qualified biologists to determine the status of nests present within the project area prior to conducting any ground or aerial activities within three quarter miles of any nest location during the restricted period.

Proposed activities would not effect mountain plover and/or long-billed curlew nesting and rearing activities, as no activity would be conducted within one-quarter mile of any active nests during the nesting season, July 1st through July 10th. If activities in suitable mountain plover or long-billed curlew habitat were necessary prior to July 10th, the applicant would have field surveys conducted by qualified biologists to identify active nests.

A broad-based but minor and temporary reduction in woody brush would occur in the sagebrush-dominated portions of the project area as a consequence of project off-road vehicular activity, potentially affecting Greater sage grouse nesting habitat and habitat for other birds that use sagebrush (sage sparrow, Baird's sparrow, and Brewer's sparrow). Findings of similar past projects in Wyoming indicate that grass remains, and younger more succulent forbs and brush plants begin to reoccupy the travel paths in which woody brush plants are killed by vehicular traffic within a few years. For sagebrush plants in the affected swaths to reestablish to the currently existing size and cover percentage may take 30 years (Connelly et al 2000). Grouse breeding/nesting habitat/early brood-rearing habitat should be managed to support 15 - 25% canopy cover of sagebrush (Connelly et al 2000). However, under the proposed action impacts on nesting birds are expected to be negligible as the action would not occur until after July 1st and the tall sagebrush avoidance measures prescribed in the project design features will be implemented.

Prairie dogs and owls that live in burrows could potentially be affected by subsurface blasting, however as PDFs require drill holes to be more than 50 feet away from prairie dog burrows adverse impacts are negated.

Since drilling and shooting operations would not occur within 200 meters (0.124 miles or 656 feet) of known caves and cave passages, potential adverse effects to sensitive bat species would be minimized. Cave resources would also be protected by slope restrictions.

As ground disturbing activities are not permitted within 500 feet of the Clarks Fork River or 150 feet of other water sources, there would be no impact to amphibians or fish species.

A No Impact determination or a determination that this action may adversely impact individuals, but is not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing or a loss of species viability range-wide, was concluded from an effects analysis conducted by the Forest Service for all sensitive species based upon the following rationale:

- Protective PDFs are in place
- The duration of the activity is of short duration (several months),
- The probability of disturbance is extremely low based on occurrence,
- Effects on individuals or species are immeasurable, negligible, and discountable,
- The worst case adverse effect of mobile species would be temporary displacement

The USFWS concurred with the findings of the effects analysis in a letter dated June 2005 (**Appendix D**).

Alternative 3 - Helicopter Only, Vehicle Use Off-Road Prohibited

Direct and Indirect Effects

This alternative has the potential to be much more impacting than the proposed action relative to disturbance to and displacement of individuals of sensitive species. This is because of the increased exposure to noise from helicopters. There would be more helicopters flying at any one time (4 compared to 1) and the area of disturbance at any one time would be much greater. In addition, the total impact of helicopter disturbance measured in total flight hours (540 compared to 135) would be much greater.

This alternative could result in a higher level of stress in individuals, and result in increased and farther displacement for a longer period. Impacts to habitat would be much less than the proposed action, and would be negligible.

3.3.6 MANAGEMENT INDICATOR SPECIES

Affected Environment Relative to MIS

Management indicator species (MIS) are wildlife species that are used as planning tools to promote more effective management of diversity and wildlife habitats on National Forest System lands. MIS can provide a focus for evaluating and managing viability and diversity with regard to National Forest plan implementation. As most MIS are also either big game, threatened, endangered, or sensitive, they were addressed in the previous sections.

Seventeen wildlife species, in addition to game trout, were selected during the forest planning process to be management indicators. These species include: elk (*Cervus elaphus*), mule deer (*Odocoileus hemionus*), bighorn sheep (*Ovis canadensis*), moose (*Alces alces*), mountain goat (*Oreamnos americanus*), bald eagle (*Haliaeetus eucocephalus*), peregrine falcon (*Falco peregrinus*), black-footed ferret (*Mustela nigripes*), gray wolf (*Canis lupus irremotus*), grizzly bear (*Ursus arctos horribilis*), pine marten (*Martes americana*), northern goshawk (*Accipiter gentilis*), Brewer's sparrow (*Spizella breweri*), hairy woodpecker (*Picoides villosus*), beaver (*Caster canadensis*), blue grouse (*Dendragapus obscurus*), and ruffed grouse (*Bonasa umbellus*). It is very unlikely that black-footed ferret and pine marten could be present based upon habitat relationships, and use of the project area by goshawk, blue grouse, and ruffed grouse would be very limited if indeed they are present.

The needs of all MIS that occur in the analysis area, or whose habitat is present within the analysis area, or MIS that may be affected by this proposed action, were considered and addressed in analysis of the proposed action and alternatives relative to potential effects, Forest Plan direction, and monitoring. The effects of the proposed action and alternatives on the amount and quality of habitat within the project area; habitat distribution and trends within the analysis area and forest-wide; individuals within the project and analysis area; and population status, abundance, trends, and viability forest-wide for each MIS were reviewed and evaluated, as was overall diversity.

Effects on MIS

All management indicator species that could be affected by this action are either big game species, listed as threatened or endangered, or sensitive species. See the previous sections for specific discussion of those species.

A summary of the effects conclusions of this evaluation for MIS is that this action may have minor short-term adverse effects on individuals or habitat of some management indicator species, but is not expected to have any measurable effect on forest-wide population trends or viability of any management indicator species.

3.3.7 CUMULATIVE EFFECTS OF ACTION ALTERNATIVES ON WILDLIFE HABITAT AND POPULATIONS (ALL LISTED, SENSITIVE, AND MIS)

Projection of cumulative effects to wildlife over time was limited to that future time period during which identified major threats or potential changes from all sources could result in detectable or measurable changes in trends of essential habitat components, populations, or subpopulations (including local populations) of the species over time.

The major changes or threats to sustainable wildlife habitat conditions in the analysis area are:

- Loss of crucial habitat due to conversion of private land to development (subdivision, housing, roads, utility lines, etc.)
- Loss of habitat effectiveness due to land conversion, increased motorized access, increased roading, increased human use, and a corresponding decrease in secure habitat

- Decrease in habitat value below identified minimum requirements as a result of an imbalance in diversity (variety, abundance, distribution, interspersed and juxtaposition) of essential habitat components caused by natural disturbance events or management actions

The major direct threats to individuals or populations of wildlife species are:

- Human-wildlife conflicts that result in direct or indirect mortality due to illegal taking or management control actions
- Limited population recruitment due to excessive predation caused by an imbalance in predator/prey numbers, or due to a major disease outbreak (i.e. chronic wasting disease).

Past land management actions and activities both on and off federal lands that have had adverse influence on wildlife habitat and populations in the Clark area include roading, site development, fire suppression, and high levels of recreation use.

Most development and roading on National Forest System lands occurred decades ago, and wildlife acclimated and adapted use patterns accordingly. Present activities on National Forest System lands that can potentially influence wildlife are primarily a reflection of historical activity. No additional permanent roading or new developments are foreseen in the future on the majority of National Forest System lands due to terrain, special land designations such as Wild River or Wilderness, constraining Forest Plan mandates such as the “no net increase in roads” policy, and the Grizzly Bear Conservation Strategy that limits development and maintains secure habitat areas. The number of developments, the acreage affected by development, and the total amount of permanent roading on National Forest System lands has been curtailed, and is not expected to change significantly, although some new roads may result from legally permitted uses such as access for minerals development.

Development and roading on BLM administered lands is also a reflection of historical activity, except for providing legal access to private inholdings. Again development is not expected to change significantly, except as a result of legally permitted uses such as minerals development, and such use would be closely controlled.

The largest past influence off federal lands that has been adverse to many wildlife species has been the conversion of natural land to residential development. Present activity off-Forest is related primarily to land conversion and residential development that is occurring at an ever-accelerating rate adjacent to federal lands, with crucial wildlife habitat being impacted and conflicts with wildlife routinely occurring. These are very real threats that contribute to direct loss of crucial habitat, fragmentation of habitat, loss of individuals, and possible loss of local population segments dependent on these lands. Private land development has reached the “impact threshold” and some areas can no longer be considered effective wildlife habitat for some species. Impact threshold is that level of activity, development, or disturbance that impairs key habitats’ ability to function as effective habitat by directly eliminating habitat, by disrupting access to habitat, by causing avoidance of the habitat, or by causing chronic stress.

Reasonably foreseeable future land management actions and activities in the Clark area that have the potential to have major adverse influence on wildlife habitat and populations are continuation of land conversion and subdivision of private lands, increased motorized use of existing access, non-authorized off-road motorized use, and increased dispersed recreation use on both private and public lands.

Habitat effectiveness is being reduced by a number of activities in the area. The activities that are contributing, and will continue to have more of a long-term adverse cumulative impact on habitat effectiveness, are the increased development and use on private land and increased disturbance associated with additional motorized recreation (both authorized and unauthorized use).

Increases in human presence and recreational activities on both private and public lands, would likely result in additional wildlife/human conflicts, especially with bears. In areas of high human activity, bears can become human-habituated and food-conditioned which would lead to increases in bear/human conflicts, particularly as bears increase in numbers and distribution. Additional wildlife/livestock/pets conflicts can be expected due to the increase in the number of livestock and pets in developed areas. Depredation on horses, dogs, cats, etc. by bears, wolves, lions, coyotes, etc. would likely increase, and property and fence damage would result in loss of wildlife individuals. Without a doubt, development and habitat fragmentation off-Forest, and mortality resulting from conflicts on private land pose the greatest threat to individuals of many species of wildlife in the Clark area.

In conclusion, wildlife species are directly impacted by changes in vegetation conditions. Species react differently to vegetation changes based on their individual needs. When considering all the past, present, future, and proposed actions affecting habitat components (primarily vegetation) on federal lands, their cumulative impact on wildlife habitat conditions in general is negligible when considered in the context of ongoing natural disturbances (insects, wildfire, drought, etc.), and the loss of habitat and habitat effectiveness associated with development on private land.

Either of the action alternatives would not contribute in any additive manner over time to causing increased adverse effects on wildlife resources or reducing threats to those resources, therefore the action is generally neutral relative to its contribution to cumulative effects. Either action alternative would contribute a small degree to a decrease in habitat effectiveness within the project area during the period of operations due to disturbance/displacement resulting from vehicle use (especially helicopter use) and human activity. However neither action alternative would negate projected long-term decreases in habitat or habitat effectiveness resulting from increased development of private lands and increased use on both public and private lands.

3.4 HUMANS – RESIDENTIAL/RECREATIONAL/EMPLOYEES

3.4.1 Introduction

This section on humans, human uses and activities is separated into several sections. **Section 3.4.2 Residential/Recreational**, gives an overall perspective of residential and recreational

opportunities, uses, and potential effects of seismic activities, including noise. This section also addresses the safety risk associated with employee exposure to helicopters. Hunting seasons are discussed separately in **Section 3.4.3 – Hunting Seasons**, and cumulative effects of this action on humans are discussed in **Section 3.4.4 – Cumulative Effects on Residents and Recreationists**.

3.4.2 Residential/Recreational

Affected Environment Relative to Residents/Recreationists/Employees

Residential. There are several dozen farms, ranches and residences within and immediately adjacent to the project area. Some residents are long-term residents, and others are newcomers having moved to the area for the quality of life offered by the location and settings.

Recreational activity within the project area and adjacent lands is focused predominantly on fall big game hunting seasons on and adjacent to federal lands, and recreation uses associated with the Clarks Fork Canyon corridor. For a majority of users, experience satisfaction levels are directly related to the physical opportunities related to the use; however, the intrinsic wildland, visual, and historical settings, as well as spiritual values, are also very important. The intrinsic values are related to the unique landscape and geology, the semi-primitive/rural wildland setting, the ecological and wildlife components, and the historical and cultural background of the area.

Visitors often camp in the area and enjoy the aesthetically pleasing atmosphere that it offers. In addition, surface waters in the area provide recreation for numerous fishermen and other recreationists. ORVs and bicyclists use the primitive Morrison Jeep Road up the Clarks Fork Canyon during the summer and fall, and viewing for wildlife and scenery occurs yearlong. There are eight BLM Fishing Access Sites and two Wyoming Game and Fish Access Sites located along the Clark's Fork of the Yellowstone River, and individuals utilize the river for canoeing and river rafting. Commercial outfitting and guiding authorizations exist on federal lands for big game hunting, river rafting, and fishing. In addition to the above-mentioned recreational opportunities, foot and/or horseback trails are present in and adjacent to the project area. Neither Congressionally-designated Wilderness nor Wilderness Study Areas (WSAs) are located within or near the Clark 3D project area.

Noise. Concerns relating to actual disturbance to humans were directed primarily toward the effects of noise on residents and recreationists as a result of helicopter use, drilling, and detonation of explosives. Primary sources of human-caused noise within the project area at this time are occasional jet aircraft traffic over-flights at high altitudes, residential and oil field road related traffic, and sounds associated with normal human habitation. In addition to human-induced noise, the project area is subject to a great deal of wind noise, as it is located in a high wind area. The topography and natural landscape do not offer many breaks from the wind, as the majority of the project area exhibits gentle slopes and very sparse vegetation. These noise sources currently create only modest sound disturbances within the area.

Loud noises may reduce peoples' opportunity to enjoy solitude, and noise disturbance can annoy people to differing degrees dependent on magnitude and duration of the noise, the activity they are pursuing, and the time of day.

Helicopter noise. Tests by the FAA (Helicopter Noise Definition Report (PB 82-207341)) 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. Background noise in areas of sparse conifer vegetation on the Shoshone Forest is typically between 30-40 dBA most summer days. For purposes of this analysis (and there is evidence to support this assumption), it is assumed that a given acoustic impact from helicopters will be considered to equally affect the listeners with which we are most concerned; humans, big game animals, and livestock. (FS 1984)

Drill noise. Noise levels from drills are affected by many factors including terrain and wind direction. As a general rule, noise from drilling rigs can be heard from a distance approximately ¼ mile.

Explosives noise. Explosive detonations occur under the ground and therefore produce little aboveground noise. If one is within one hundred feet of the detonation, one would hear and more likely feel a “thump” sensation.

Human safety relating to helicopter use relates primarily to the risk of an injurious or fatal accident for workers exposed to helicopters. Increased use of helicopters increases the risk of an injurious or fatal accident. The Helicopter Association International has reported the following accident statistics: 1) average accident total for years 2000 and 2001 was 194 which equates to a probability of a 1 in 44 chance of an accident over 285 hours of flight time; and 2) average fatal accident total for the same years was 32, which equates to a probability of a 1 in 266 chance of a fatal accident over the same 285 hours of flight time. Numbers and probabilities of minor injuries, serous injuries, and fatal injuries fall in between the above referenced statistics. (BLM 2005)

Effects on Residents, Recreationists, and Employees

Alternative 1 - No Action

Environmental consequences of the No Action alternative on residents and recreationists on federal lands are largely the same as the Affected Environment description. There would be no impacts to residential inhabitants, recreationists, recreation settings, recreation opportunities, or recreation experience satisfaction levels from geophysical exploration; and there would be no safety risks to employees from helicopter exposure as a result of the No Action alternative.

Alternative 2 - Proposed Action

Direct and Indirect Effects

Noise. Seismic-related activities, including drill engine noise, the sound of detonation of explosives in shotholes, helicopters, and support traffic would create sound disturbance within and adjacent to the project area. The primary source of noise would be a result of helicopter use.

Noise levels would be temporarily elevated in localized areas, within flight corridors, and in areas where work is being conducted for short periods of time over a period of approximately 2.5 months. These impacts would be transient, as project operations proceed across the 45.8 square mile area and would occur for the duration of the project.

Noise associated with helicopters and other seismic activities during the period of operations, particularly helicopter usage, could disrupt both residents and recreationists. Daily activities of residents could be disrupted, and the quality of dispersed recreation activities, such as camping, fishing, or hunting could be disrupted by seismic operations visibly and audibly intruding on recreational users. Their perception, reaction, and annoyance level to the seismic activity noise would be highly variable, dependent on their personal feelings and opinions toward management of the area and oil/gas exploration in general, the magnitude of the noise (related primarily to distance from the noise), and the number and duration of disturbances over a given time period.

For residents or recreational users not having a negative perception of oil and gas exploration in the area, noise would likely become the major focal point of their attention for only a very short period, and not result in much annoyance. For residents or recreationists having a negative perception toward oil/gas exploration in this area, noise from seismic operations would likely increase their attention span and cause greater annoyance. Residents have the potential for greater annoyance due to the long-term exposure to such noise.

With implementation of project design features regarding helicopter use (i.e. avoidance areas, flight corridors, restrictions on operating periods, etc.), as well as private land and public safety (avoidance and notification), there should be minimal disruption of residents and recreationists as a result of the proposed action. PDFs require that the applicant avoid working in the immediate vicinity of residential areas, hunters, fishermen, other recreationists, and other land users. In addition, as crewmembers and operations would be highly visible to recreationists in the field (crewmembers are required to wear bright orange/yellow safety vests), recreationists could choose to recreate in some other location to avoid impacts to their recreation experience.

With implementation of the 500-foot offset from the Clark's Fork of the Yellowstone River, and 150-foot offsets from other live waters within the project area, neither water quality nor fisheries would be negatively affected. Anglers could potentially be minimally disturbed by project activities for brief periods of time during cable deployment operations. Cables would be deployed across waterways along receiver lines within the project area to allow for accurate data collection. Each cable would be weighted and staked to keep it from floating up from the bottom of the waterway in order to help insure that it does not interfere with recreational use. This being the case, the deployment of cable for operations should not interfere with fisherman and/or individuals floating the river.

Because of the relatively remote location of much of the proposed activity, disruption caused by the added noise would primarily affect ranchers and residents living in and immediately adjacent to the project area, oilfield workers, hunters, fishermen, and campers.

Use of helicopters increases exposure time of the applicant's employees to helicopters, and increases the probability of an injurious or fatal accident to the employees. Total projected exposure time with this alternative is 135 hours.

In summary, overall project noise elevation is expected to be of moderate level, localized and transient. Drill noise is expected to be of little impact unless one is near the drill, and explosive noise is not a relevant concern, as only seismic workers would be in close enough proximity of the detonation to be affected. Helicopter noise is the biggest noise generator, and project design features (see **Section 2.3.2**) would keep noise disturbance to a minimum. Noise-related effects, consisting of temporary annoyance to residents or recreational visitors in the immediate vicinity of seismic operations are expected to be minor, and the impact is not expected to be harmful or detrimental to people. Helicopter exposure potential is 135 hours, which using the probabilities in **the human safety section above**, computes to 1 in 92 chance of a helicopter accident, and a 1 in 561 chance of a fatal accident over the same 135 hours of flight time.

Alternative 3 - Helicopter Only, Vehicle Use Off-Road Prohibited

Under this alternative, increased numbers of helicopters and increased amount of helicopter activity would create increased levels and numbers of disturbance to residents and recreationists utilizing the area because helicopters generate greater noise levels than any other types of equipment proposed for use on the project. Disturbance and annoyance to humans would be of greater magnitude and affect larger numbers of people because of the increased number of helicopters working simultaneously over a larger area. Residents and recreationists who visit the area to enjoy its serenity, would likely be disturbed by noise levels for a longer duration due to the increased amount of helicopter activity. Noise-related effects, consisting of temporary annoyance to residents or recreational visitors in the immediate vicinity of seismic operations are expected to be minor, and the impact is not expected to be harmful or detrimental to people.

Expanded use of helicopters also increases exposure time of the applicant's employees to helicopters, and increases the probability of an injurious or fatal accident to the employees. Helicopter exposure potential is 540 hours, which using the probabilities in **the human safety section above**, computes to 1 in 23 chance of a helicopter accident, and a 1 in 140 chance of a fatal accident over the same 540 hours of flight time.

3.4.3 Hunting Seasons

Affected Environment Relative to Hunting

2005 fall big game hunting seasons within and adjacent to the project area are as follows: Elk hunting season falls between September 1st and December 19th. Fifteen (15) archery only licenses are available in hunt unit 50, north of the Clarks Fork River, during the September 1st to September 30th season; however, most of these hunters have historically hunted at higher elevations on the Beartooth Plateau. The general elk season opens October 1st and runs until October 21st. Again, the majority of these hunters will be hunting to the west of the project area. Limited quota seasons for an additional 65 hunters run from November 16th through December 19th. Some of these late seasons will likely hunt the western edge of the project area.

Elk hunting seasons in hunt unit 54, south of the Clarks Fork River, usually follow the same general patterns, with the exception that during the September 1st to September 30th period there are 25 antlerless licenses for antlerless elk, valid only in that portion of unit 54 off National Forest System lands. These permits are primarily on the Two-Dot Ranch and attempt to deal with depredation problems. The majority of this hunting will likely occur outside the project area.

Deer hunting (hunt unit 105) is allowed between October 15th and November 15th. This is a general season, and this is the period having the highest density of hunters within and immediately adjacent to the project area.

Antelope hunting season (hunt unit 80) is September 1st through September 30th. Seventy-five (75) licenses are available in the total hunt area, and an additional 25 doe/fawn licenses are available west of Wyoming Highway 120. It is estimated that the project area comprises well less than 5% of the total hunt unit, and contains less than 20% of the suitable antelope habitat west of the highway. Only a very small segment of permitted hunters are likely to hunt within the project area.

Sheep and goat hunting seasons open for rifle hunting on September 1st; however, it is very unlikely that individuals of these species would be within the project area, and hunting of these species within the project area has historically, with few exceptions, not occurred.

Bird hunting in the area is very limited, with mountain grouse season opening September 1, sage grouse and partridge hunting season opening September 24th, and waterfowl season opening October 1st. As mountain grouse in the project area are very limited, and the other seasons open after the planned project period, there is little opportunity for conflict.

Environmental Effects on Hunters/Hunting

Alternative 1 - No Action

Environmental consequences of the No Action alternative on hunter opportunities and hunters on federal lands are largely the same as the Affected Environment description. There would be no impacts to hunters, hunting opportunities, or hunter satisfaction levels as a result of the No Action alternative.

Alternative 2 - Proposed Action

Direct and Indirect Effects

Project operations, as proposed, would likely extend into the beginning of the early fall hunting seasons. A greater number of hunters use the project area for hunting in the later part of the season than at the beginning; therefore, geophysical exploration operations would not be present during prime hunting periods.

Increased noise levels could cause game animals to flee the vicinity of operations, impacting the experience and opportunities of hunters in the area. Due to project timing outside of most hunting seasons, the low densities of huntable animals during the operating period (resulting in

minimal number of animals displaced), and PDFs relating to notification of activities, disturbance to huntable game animals and annoyance of hunters during the hunting season would likely affect few, if any, hunters.

There would be little potential for conflict with elk hunters in hunt unit 50, north of the Clarks Fork River, as most hunters (and most elk) would be located to the west of the project area prior to late September.

As recording operations are planned to be initiated in mid-August, and progress for recording can be from south to north, or north to south, there are discretionary opportunities to reduce disturbance to hunters during the September 1st to September 30th early elk depredation season in unit 54 (south of the Clarks Fork River), based on scheduling. If recording progresses from south to north, all operations on the southern end of the project area would likely be completed prior to September 1st.

Based upon the above-described factors, impacts to hunters and huntable species during hunting seasons are expected to be negligible.

Alternative 3 - Helicopter Only, Vehicle Use Off-Road Prohibited

Under this alternative, increased helicopter activity has the potential to create increased and more prolonged noise disturbance to hunters utilizing the area. However, due to the scheduling of seismic operations, the distribution of game animals, and criteria described in the proposed action, impacts to hunters and huntable species during hunting seasons are expected to be negligible.

3.4.4 Cumulative Effects on Residents and Recreationists

Cumulative effects on human perceptions, opportunities, expectations, and general feelings of well-being take into consideration past and present activities and attitudes, and potential additive causes of annoyance and stress resulting from seismic operations. The proposed action may contribute in an additive manner over time to causing increased adverse feelings of well-being on some individual residents and recreationists. Other individuals may view this as an opportunity to benefit themselves and society in general by contributing to energy independence; resulting in enhanced feelings of well-being.

3.5 VISUAL SETTING AND OBSERVER PERCEPTIONS

Affected Environment for Visual Setting

Unmodified, natural scenes are common in the area of federal lands west of Clark, with human modifications including oil and gas wells, bladed and two-track roads, power lines, water impoundments, fences, and grazing cattle comprising relatively minor components of the overall project area landscape. Residential development, minerals development, and associated upgraded access roads are common in the vicinity to the east and north of the project area, and there are a few short former seismic line scars and two-track roads that exist, as well. Portions of

the project area are visible from Highway 120, a major highway east of the project area; and project activities would be apparent from the county road accessing the Clarks Fork Canyon, which bisects the project area, and other county roads just to the east of the project area. However, the project activity would not be visible from any other major viewing points.

The project area is designated with a Class II Visual Resource Management (VRM) rating, which means “changes in any of the basic elements caused by management activity should not be evident in the character landscape” (BLM VRM Management Classes). Vehicular use on BLM-administered public lands (approximately 42 % of project area) is limited to designated roads and trails in Class II VRM areas, unless adverse impacts can be mitigated or avoided (RMP Visual Resource Management Decisions). The off-road vehicle (ORV) designation on BLM-managed public lands in the project area is “limited to designated roads and trails;” however, since this decision has not been implemented on-the-ground, the default designation is “limited to existing roads and trails.” Motorized cross-country travel may be allowed on a case-by-case basis for certain pre-permit activities, permitted uses, and administrative uses, as defined in 43 CFR 8340.0-5(a).

In addition, the National Forest viewshed in which the project is located has a Visual Quality Objective (VQO) of retention and partial retention, and the county road accessing the Clarks Fork Canyon is a Sensitive Level 1 travel route. Any ground disturbance or structure should remain visually subordinate to the landscape. The FS Forest Plan prohibits off-road use on National Forest System lands within the project area except by permit (i.e. to install livestock water facility or mend fences) and for administrative use unless they are analyzed under a separate analysis, such as this one.

Environmental Effects on Visual Setting and Observer Perceptions

Alternative 1 - No Action

Environmental consequences of the No Action alternative on visual settings on federal lands are largely the same as the Affected Environment description. There would be no impact to background visual settings and there would be no seismic activities evident. There would be no visible vehicle tracks caused by seismic operations, no presence of seismic helicopters or other vehicles, and there would be no authorized off-road use on federal lands by seismic operations to encourage future unauthorized ORV/ATV off-road travel as a result of the No Action alternative.

Alternative 2 - Proposed Action

Direct and Indirect Effects

Survey lines, drilling equipment, vehicles, helicopters, receiver line equipment, and a recording vehicle would be visible to many recreationists and some residents utilizing open roads, trails, and waterways on federal lands within the area during the period of operations. Visual resource concerns may be subject to brief conflicts, when equipment is physically in view. However, major vehicle activity (especially helicopters) would, in most cases, become the major focal point of observers for only short periods of time for the following reasons: 1.) no structures are proposed, 2.) major objects of visual concerns (vehicle activity) are temporary only and quite literally move hour by hour in most cases, and 3.) viewing distances and the observer’s

perception/attitude toward the activity would vary. Adverse effects on users visual perceptions and satisfaction levels are generally short-lived unless directly affected at a very close distance (i.e. helicopter fly-by at close range or being delayed by seismic traffic on a single lane road).

Viewing of helicopters and other seismic activities during the period of operations may detract temporarily from observers' viewing of the background viewshed. Their perception of the seismic activity and viewing satisfaction levels would be highly variable, dependent on their visual expectations and their personal feelings and opinions toward management of the area and oil/gas exploration in general. For residents or recreationists having a negative perception toward oil/gas exploration in this area, viewing of seismic operations would likely focus their attention for a longer duration, detracting from their visual perception and causing great annoyance. For residents or recreation users not having a negative perception of oil and gas exploration in the area, helicopters would likely become the major focal point of their attention for only a very short period. For many first time observers that are just traveling by and not directly impacted or disturbed by the operation, there is generally much curiosity and interest on what is occurring, especially with helicopter operations. Many would view this as a learning and photo opportunity, and such an exposure may even contribute in a beneficial manner to their overall experience associated with their use of public lands.

Under the proposed action, buggy and ORV use would be permitted on federal lands within the project area that have less than 25% slopes and rolling terrain suitable to such use. In areas where equipment and support vehicles are traveling and working, the visual quality experience of users could be impacted for the duration of operations in the area; however, for most observers the visual effect would be of very short duration. Soil compaction and/or displacement, tire tracks, and crushed vegetation that could degrade the viewing experience should be minimal due to the fact that weight distribution of all off-road vehicles proposed for use allows for exertion of a low bearing pressure on the substrate. Large low-pressure flotation tires distribute the weight of the vehicles equally, minimizing impacts.

For the past decade, federal projects in Wyoming have required that geophysical projects off-set their vehicle operations such that the tires of one vehicle do not follow in the path of another in order to avoid linear visual obtrusions, reduce soil compaction, and lessen the degree of vegetation loss. The approach has been successful and long, linear two-tracks are not being created on geophysical projects.

With this vehicle offsetting procedure and use of low-pressure tires (see project design features in **Section 2.3.2**), visual impacts from wheeled vehicles are expected to be short term and very minimal.

With implementation of offset vehicle travel paths, slope restrictions, and restrictions prohibiting work in saturated soils, impacts from off-road vehicle use would not be evident in the character landscape except on a temporary basis in the short term. Post-project monitoring of several seismic projects conducted in similar habitat indicates that seismic lines are generally no longer visible after a short period of time, especially in areas containing extremely hard substrates and sparse vegetation, such as that present within the proposed project area.

A BLM compliance review of a 2D seismic project (BLM Vernal Field Office EA No. UT-080-2001-475) reported that buggy drills and heli-portable drilling methods caused minimal effects on soils and concluded that soils would be normal in appearance after the next spring's rain. In areas of heli-portable drilling, it was difficult to locate where work had been performed approximately one week after drilling, and then only at extremely close range. All that was noticeable were footprints by workers and small areas (less than 3 feet in diameter) of subsurface cuttings where drilling occurred.

The drilling of shot points to depths of 30 feet results in drill cuttings being deposited around the opening of the hole. These cuttings build up in an area with an approximate 3-foot radius immediately surrounding the hole, providing modification to the natural landscape. Limited disturbance from boring a 4½-inch hole and depositing cuttings on the soil surface would affect a little over 1½ acres of federal land.

Project design features incorporated by the applicant, including proper hole plugging, and spreading and raking of drill cuttings would minimize the appearance of the holes, making them almost invisible in the character landscape after only a short period of time.

Cumulative Effects

Cumulative effects on visual resources take into consideration past, present, and potential future adjacent land uses, trends of increased recreational use and rural development, and natural processes. The proposed action would not contribute in any additive manner over time to causing increased adverse effects on visual resources.

Alternative 3 - Helicopter Only, Vehicle Use Off-Road Prohibited

Direct and Indirect Effects

No crushed vegetation, no vehicle tracks, and therefore no travel routes resulting from authorized off-road vehicle would be visible on federal lands. The natural visual setting of the landforms, structures, and historical uses (i.e. livestock grazing) would not be affected from the ground by this alternative, as there would be no detectable disturbance of natural resource components from major travel routes or major viewing points. Drill hole cuttings would be evident from each drill site and from an aerial view, possibly until the following season (most likely much less).

However, viewing of more helicopters during the period of operations may detract temporarily from observers' view of the background viewshed. As in the proposed action, their perception of the seismic activity and viewing satisfaction levels would be highly variable dependent on their visual expectations and their personal feelings and opinions toward management of the area and oil/gas exploration in general. For residents or recreationists having a negative perception toward oil/gas exploration in this area, more helicopters would likely focus their attention for a longer duration, detracting from their visual perception and causing great annoyance. For residents or recreational users not having a negative perception of oil and gas exploration in the area, helicopters would likely become the major focal point of their attention for only a very short period. For many first time observers that are just traveling by and not directly impacted or disturbed by the operation, there is generally much curiosity and interest on what is occurring, especially with helicopter operations. Many would view this as a learning and photo

opportunity, and such an exposure may even contribute in a beneficial manner to their overall experience associated with their use of public lands.

Cumulative Effects

Cumulative effects on visual resources would be the same as the proposed action.

3.6 LIVESTOCK / RANGE

Affected Environment for Livestock/Range

Lessees and grazing allotments that exist in the proposed project area are listed in **Table 8**.

Table 8: Lessees/Grazing Allotments within the Proposed Project Area		
Affected Lessee	Grazing Allotment	Allotment #
Don Tolman	BLM Stateline West Allotment	03007
Sally Martin/Bill Lamdin	BLM Clark Allotment	01076
Rodney Crosby	BLM Stateline Allotment	01003
Rock Creek Ranch Inc (Judy Donaldson)	FS Little Rock Allotment	1017
Tolman Livestock Co (Don Tolman) Bennett Ck Sheep Co (Buster Tolman)	FS Face of Mtn Allotment	1005

Cattle grazing in the Clark 3D project area could occur at any time, and livestock are expected to be present in the area during project operations. Improvements associated with these BLM-administered and National Forest System allotments include water wells, stock water ponds or reservoirs, and fences.

The project area is currently subject to drought conditions, and has been for several years now. This being said, a shortened growing season, decrease in current year forage production, continued stress on shrubs, and lack of water are major concerns (BLM, 2004). It is possible that livestock may have to be removed in areas where drought conditions are severe in order to protect the long-term health of rangeland vegetation, watershed stability, site productivity, and wildlife habitat. On BLM-administered public lands, this determination would be made in accordance with guidelines contained within the document *Managing Drought Conditions on the Rangelands*. Should drought conditions warrant the removal of livestock from any given lease within the project area, the BLM would have to more closely evaluate the effects of the proposed action to determine if additional mitigative measures would be necessary to comply with rangeland health standards.

Effects on Livestock/Range

Alternative 1 - No Action

Environmental consequences of the No Action alternative on livestock, livestock grazing, and livestock range on federal lands are largely the same as the Affected Environment description. There would be no impact to livestock/range as a result of the No Action alternative.

Alternative 2 - Proposed Action

Direct and Indirect Effects

The proposed action could initially startle and temporarily disturb or displace domestic livestock in localized areas where operations are being conducted. Initially, loud noises generated by equipment, particularly helicopters, may frighten animals, causing them to flee from one area into adjacent suitable range. However, based on past experience with seismic activity, livestock typically adapt and become accustomed to new noises after only a short period of time. With implementation of project design features, adverse impacts to individuals and groups of domestic livestock are expected to be short-term and localized for the first few exposures to project activity; and effects are expected to become nondetectable once individuals acclimate.

Project operations may involve fence crossings. Project design features require use of gates and immediate repair of fence crossings; therefore, potential adverse effects would be avoided. In order to minimize the likelihood of livestock moving between pastures, from private to public land or vice versa, and herd mixing, no fences would be left down or gates left open. There should be no unauthorized grazing, overgrazing or increased livestock operator cost (associated with sorting mixed herds) as a result of the proposed action.

The proposed action would have no impact to livestock watering facilities such as wells, spring, impoundments, or pipelines, as no operations would be conducted in close proximity to these features.

The potential does exist for damage to cattle guards from heavy equipment used during operations. If damage to cattle guards does occur, project design features require the applicant to repair or replace the damaged structure to original condition.

The proposed action would result in short-term adverse effects on range forage within the project area caused by flattening of grasses/forbs by vehicle tires, and by the potential loss of forage around drill holes. Worst-case loss of forage around drill holes would be 1½ acres, but this is unlikely, as many drill locations would not contain suitable forage. Longer-term, vehicle induced disturbance would result in mortality of some mature shrubs and possibly some forbs in the tire paths (147 acres). This mortality would likely cause a slight change of composition resulting in conversion to grasses and younger age class shrubs and forbs. Existing grass plants, most preferred to domestic stock, would not be directly affected to a measurable degree. While species and age make-up of plants in the tire paths would change, available palatable livestock forage would not be appreciably affected and may increase an immeasurable amount. With PDFs in **Section 2.3.2**, effects on livestock forage are expected to be negligible.

Cumulative Effects

The proposed action would not contribute in any additive manner over time, either adversely or beneficially, to cumulative effects on livestock/range.

Alternative 3 - Helicopter Only, Vehicle Use Off-Road Prohibited

Direct and Indirect Effects

Environmental consequences relative to disturbance of livestock would be similar to the proposed action except that the initial disturbance would occur over a larger area due to the increased use of helicopters. Livestock would still likely acclimate to helicopter use. There would be no effects on fencing or fence crossings as no wheeled vehicles would be in use. As with the proposed action, there would be no effects on watering sources or facilities due to offsets and avoidance. The only potential impacts to forage would be around drill holes (1½ acre).

Cumulative Effects

This helicopter only alternative would not contribute in any additive manner over time to cumulative effects on livestock/range either adversely or beneficially.

3.7 SOILS

Affected Environment Relative to Soils

Naturally, soils in the project area occur as a complex mosaic, resulting from the interaction of many factors including parent material chemistry and composition, topographic setting, and deposition type. Soil data obtained from the Wyoming Geographic Information Science Center (WGISC) shows that the 3D project area falls within six large-scale surface soil units. A description of each unit is presented in **Table 9**, below.

TABLE 9: SOIL MAPPING UNITS AND DESCRIPTIONS AT 1:500,000 SCALE FOUND IN PROJECT AREA	
Soil Mapping Units (SMUs)²	Soil Descriptions
WY09	Typic Haplargids and Typic Haplocalcids, fine-loamy over sandy or sandy-skeletal, mesic and Typic Torriorthents, fine-loamy and coarse-loamy, mesic. Aridisols occur on colluvial and alluvial landscapes while Entisols occur on residual landscapes.
WY12	Typic Torriorthents, loamy, mesic and Rock Outcrop. These soils form in a variety of sedimentary parent materials, which are exposed along the perimeter of the basin. Soils are shallow or moderately deep to soft bedrock.

TABLE 9: SOIL MAPPING UNITS AND DESCRIPTIONS AT 1:500,000 SCALE FOUND IN PROJECT AREA	
Soil Mapping Units (SMUs)²	Soil Descriptions
WY13	Typic Torriorthents, fine, mesic and Rock Outcrop. These soils form over fine textured Cretaceous bedrock. Outcrops of shale occur as small badlands; outcrops of coarser textured rock support long, narrow ridges with finer textured soils along the flanks.
WY14	Typic Haplargids and Typic Natrargids, fine-loamy or coarse-loamy, mesic. These soils occur on low gradient colluvial slopes (less than 15%) and reflect the texture of the underlying bedrock as well as the effects of slope processes.
WY15	Typic Torrifluvents, sandy-skeletal, mesic and Typic Haplocambids, fine-loamy over sandy or sandy- skeletal, mesic. These soils occur on Holocene age terraces and slopes along small streams. The Torrifluvents occupy the first and second terraces above the modern channel.
WY42	Typic Hapludolls and Typic Hapludalfs, loamy-skeletal, mixed, frigid. They occur in foothills along the margin of the Powder River Basin.

²Munn and Arneson, 1998, WY: Wyoming State Soils

Most of the project area appears to fall under the WK15 and WY14 soil types, indicating a majority of loamy soils and nearly level surfaces for seismic operations. Fragile soils are reported to be within the project area (Draft of the Cody RMP/EIS). Shallowness, steep slopes, high erodibility, susceptibility to compaction and crusting, and low reclamation potential characterize fragile soils (CRMP EIS draft).

Effects on Soils

Alternative 1 - No Action

Environmental consequences of the No Action alternative on soils on federal lands are largely the same as the Affected Environment description. There would be no impact to soils as a result of the No Action alternative. There would be no visible vehicle tracks or the visible presence of authorized off-road use to encourage future unauthorized ORV/ATV off-road travel as a result of the No Action alternative.

Alternative 2 - Proposed Action

Direct and Indirect Effects

Direct effects on soils as a result of drilling operations would result in disturbance of approximately 1½ acres of federal land on a temporary basis. Regardless of the type of drilling equipment utilized, vegetation would be uprooted within an approximate 3-foot radius of the drill hole during the drilling process. As PDFs require excess drill cuttings to be mixed with topsoil, spread over the area, and raked; long-term effects on soils would be negligible. Should any detonated explosive blow the plug and/or the drill cuttings out of the hole (a blowout), the

limited disturbance to the surface would be repaired as part of the line restoration/reclamation, including re-plugging and replacing the hole packing materials with drill cuttings and soil materials that were expelled by the blast from the hole. Based on experience in similar geologic settings, blowouts are unlikely to occur.

Truck and buggy-mounted drill traffic and ATVs would have the potential to disturb approximately 147 acres² of soil along source lines on federal lands. The primary potential impacts of this authorized off-road use associated with proposed action would be 1) soil compaction, 2) vegetation removal which would cause soil destabilization, 3) damage to soils on slopes which are especially susceptible to gully erosion, and increased wind erosion induced by off-road vehicle travel. ATV use is included in this acreage figure for source lines. ATV use along receiver lines could potentially disturb an additional 98 acres³. This figure is well above the actual potential because the majority of the area can be accessed easily by ATV or on foot from existing roads and two-track trails (**Map 7**). Even so, based on observation of ATV tracks in the project area as a result of survey/staking and inventory work, such tracks are not evident after just a few weeks.

The potential for soil impacts would generally be higher on steeper slopes and heavily incised terrain. Low-impact buggy drills would be required on moderate slopes and non-incised terrain, and heliportable drills would be used on steeper slopes and heavily incised terrain to minimize damage to these sensitive areas that are more susceptible to erosion.

PDFs call for avoidance of areas containing wet soils in order to minimize the potential of surface rutting. With implementation of the saturated soil restriction, the project should cause no adverse impact in this regard.

In areas where buggy drill rigs and ATVs would complete seismic exploration, there would generally be only one pass, but there could be two passes or more by some sort of vehicle along each line. The degree and extent of soil compaction would be dependent upon the amount of surface rock present, slope, and the amount of soil moisture in the ground at the time of disturbance. Moderate compaction of soils could be created by the proposed off-road heavy vehicle traffic. Compaction reduces capacity for soils to absorb moisture, and can also result in reduction of soil productivity due to the loss of soil structure, increased erosion risk and decreased infiltration of precipitation. Soil compaction could subsequently result in increased surface runoff, erosion, and sediment production; decreased filtration, and corresponding increased surface runoff, erosion, and sediment production; decreased seed germination, root expansion and growth.

² Distance between shot points would be 220 feet which is multiplied by a factor of 2.5 to account for tortuosity of the route between source points, multiple passes, and travel between lines; width of maximum possible disturbance for passage of buggy drill vehicle would be six feet; surface disturbance at a shot point would be kept within the disturbance area for buggy drill activity; 220 feet x 2.5 x 6' x 1942 (number of shot points on federal land)/43,560 square feet per acre = 147 (number of acres). Or 139.5 total miles (736,560') x 58% (% on federal land) = 81 miles (427,680') x 2.5 x 6'/43,560 (sq ft/acre) = 147 acres.

³ 279 total miles x 58% (% on federal land) = 162 miles x 5,280' mile = 855,360' x 2.5 tortuosity = 2,138,400 x 2' (width of tire tracks) = 4,276,800/43,560 (sq ft/acre) = 98 acres

In addition, the vehicle traffic along each seismic line is expected to leave temporary tire imprints/depressions, with the degree of imprint depending upon the number of vehicle passes over the same track, the density of vegetation, and the amount of soil moisture present in the ground at the time of the disturbance. Use of vehicles and the resulting tire tracks on slopes over 25 percent have the potential to lead to formation of rills and new flow patterns during precipitation events.

The PDFs would serve to minimize vegetation damage and removal, and subsequent soil destabilization leading to gully erosion. As the majority of the project area contains gentle terrain with much surface rock; the project area is in a rain shadow zone with little precipitation and low soil moisture during the proposed operating period; buggies and ATVs are equipped with high-flotation or low pressure tires; heli-portable drills would be used on steeper slopes; and PDFs require offsetting vehicles drive paths if multiple passes are required, impacts to soils from tire tracks would be temporary and negligible.

BLM compliance reviews of recent seismic projects in the Vernal Field Office reported that buggy mounted drills, ATVs, and heli-portable drilling methods caused little soil disturbance. In areas of heli-portable drilling, BLM compliance reports indicated that it was difficult to locate where heli-portable seismic work had been performed approximately one week after drilling, and such activity was only visible at extremely close range. In some cases, BLM inspectors were unable to find evidence of heli-portable seismic activity. The compliance reports also cite that only footprints of workers and small areas (less than 3 feet in diameter) of subsurface soil cuttings where drilling occurred were noticeable (See **Photos 4, 5, and 6**, BLM 2005).

The final compliance inspection report for work done under the Horse Point EA (BLM 2003) reported that there were no significant impacts to soils; that anticipated impacts identified in the Horse Point EA were overestimated; and that no significant erosion had occurred. Soil compaction appeared to be a non-issue.

Indirect effects of development of visible two-track imprints from vehicle use on the seismic lines might result in subsequent unauthorized recreational ATV/ORV use, where the two-tracks are noticeable and where the apparent route takes the ORV user to an area of interest. If unauthorized ATV/ORV use occurs on seismic tracks over time, continued use of these tracks could result in compaction of soils, loss of vegetation along the tracks, erosion on steep slopes, introduction and/or spread of noxious and invasive weeds, and the potential development of ruts resulting from use during periods of saturated soil conditions. On steeper terrain, these ruts could deepen and eventually develop into gullies, and generally begin to erode upslope. With these developed gullies draining into channels, the increased sediment from the gullies could result in localized areas of degradation. As two-track ruts become deeper, ATV/ORV users might avoid the actual ruts and thereby, expand the width of the two-track trails compounding the soil disturbance.



Photo 4. Buggy drilled shothole. Arrow points to hole where yellow wires protrude. The remainder of the disturbance is drill cuttings only.



Photo 5. The light gray cuttings and tire tracks of a Buggy-Mounted Drill



Photo 6. A Heliportable drilled hole. Light yellow cuttings in a compact circle are visible on top of gray cuttings. Arrow points to yellow wires protruding from hole that will be used to detonate explosives and thereafter removed.

Based on observation of the existing historical two-track roads in the project area that have been used by wheeled vehicles for decades, there is little evidence of compaction, rutting, gullies, or erosion. This is due primary to the gentle terrain, rocky content of the soil, and the low soil moisture.

Although the use of the buggy two-tracks by future unauthorized ATV users is possible, the wide tracks created by the buggy drills are too wide to be used by most recreational four-wheelers, and the ATVs used in the seismic operation leave few visible tracks due to their light weight and low pressure tires. In addition, PDFs require buggy drill operators to approach road and trail crossing at reduced angles to make tracks less noticeable to recreationists, and if tread imprints are highly visible, they will be raked. In the event that tracks are highly visible from open roads, road closure signs would be posted.

Because of the gentle terrain, rocky soils, sparseness of taller vegetation, and PDFs requiring avoidance of tall sagebrush, no cutting of trees, off-setting vehicle paths, installation of road closure signs if necessary, etc., establishment of visible tracks that encourage unauthorized use is expected to be negligible, and the visibility by the average passer-by is expected to be short-term only.

Cumulative Effects

Cumulative effects on soils take into consideration existing public land uses, adjacent land uses, vehicle travel, livestock grazing, increasing recreational use trends, potential future development, and natural processes such as wildfire and wind/water erosion. Inspection of past projects has indicated that seismic projects do not result in any significant changes to soils. The amount of

compaction or erosion resulting from past authorized off-road vehicle travel is not detectable because areas tend to recover quickly, as the project area lies within a highly dynamic system, where soil resources are highly impacted by natural disturbance such as wind.

The proposed action would not contribute in any additive manner over time to causing increased adverse effects on soils resources; therefore the action is neutral relative to its contribution to cumulative effects.

Alternative 3 - Helicopter Only, Vehicle Use Off-Road Prohibited

Direct and Indirect Effects

With heliportable drilling, impacts to project area soils on federal lands would be approximately 1½ acre, and when considered in the context of the size of the project area and other ongoing disturbance factors (vehicle use, livestock grazing, camping, wildfire, natural wind and water, etc.), the effects would be negligible. See **Photo 6**.

3.8 VEGETATION

3.8.1 Introduction

This section on vegetation is separated into several parts. **Section 3.8.2 General Vegetation** gives an overall perspective of vegetation types, plant occurrence, and potential effects. Noxious and invasive species are discussed in **Section 3.8.3 Noxious/Invasive Plants**. All species listed as threatened or endangered under the Endangered Species Act, and all sensitive plant species are discussed under **Section 3.8.4 Threatened, Endangered, and Sensitive Plant Species**. Trees and timber are discussed in **Section 3.8.5 Trees and Timber**.

Direct and indirect effects on vegetation are discussed by the groupings of species stated above. Cumulative effects are discussed for all vegetation as a single entity in **Section 3.8.6 Cumulative Effects**. A biological effect evaluation was conducted to address threatened and endangered plant species, sensitive plant species, and other species of local concern that could possibly be affected by this proposed action. The biological evaluation is contained in the project file.

3.8.2 General Vegetation

Affected Environment Relative to Vegetation

The vegetation within the project area is variable, with the majority of the acreage being of the shrub/grassland type. The dominant plant community types indicated by the Wyoming GAP Analysis (1996) are Wyoming big sagebrush (*Artemisia tridentata* ssp. *Wyomingensis*), approximately 50%, and mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), approximately 40%. Other common sagebrush types that occur in the project area are basin big sagebrush (*Artemisia tridentata tridentata*) in lower elevations, as well as black sage (*Artemisia nova*) and fringed sage (*Artemisia frigida*).

The Wyoming big sagebrush community type occurs at lower elevations (generally less than 7,500 feet) on shallow, well-drained soils in low precipitation areas (>12”). This community type varies from areas of dense homogenous patches, to sparsely vegetated, arid areas where it is the dominant shrub, to patches that are found mixed with grasses. In areas with mixed grasses, the area is classified as Wyoming big sagebrush if the sagebrush patches occupy more than 50% of the total ground cover. This is the dominant sagebrush species within the lower elevations of the project area.

The Mountain big sagebrush community type is found in higher elevations on deep, well-drained soils, and having higher precipitation levels. It is the dominant sagebrush species on the higher elevations of the National Forest.

Some smaller portions of the project area include Saltbrush fans and flats as well as Desert shrub. Less common species include Gardener’s saltbush (*Atriplex nuttallii*), Mat saltbrush (*Atriplex corrugate*), and Castle valley clover saltbush (*Atriplex cuneata*). Douglas fir, limber pine, juniper, lodgepole pine, and subalpine meadow vegetation types cover very small portions of the project area on the western and higher elevation boundary. Vegetation in the project area provides habitat, nutrition, and cover for several species of wildlife.

South-facing slopes provide a harsher microenvironment than those on north-facing slopes because they receive more sunlight and usually have slightly higher temperatures, more evapotranspiration, and less available water in the soil. Therefore vegetation located on the south-facing slopes is more susceptible to damage, as it takes more resources to grow in these locations.

Effects on Vegetation in General

Alternative 1 - No Action

Environmental consequences of the No Action alternative on vegetation on federal lands are largely the same as the Affected Environment description. There would be no impact to vegetation in general as a result of the No Action alternative.

Alternative 2 - Proposed Action

Direct and Indirect Effects

Drill hole impacts. Regardless of the type of drilling equipment utilized, vegetation would be uprooted within an approximate 3-foot radius of the drill hole during the drilling process. Drill hole tailings have the potential to adversely affect approximately 1½ acre of vegetation on federal land. As many drill holes would be located in areas of sparse vegetation; excess drill cuttings would be mixed with topsoil, spread over the area, and raked; and long-term effects would be negligible.

ATV impacts. ATVs used in the seismic operation have the potential to leave visible tire tracks on 147 acres of source lines (ATV use is included in the drill buggy impact figure for source lines). ATV use along receiver lines could potentially disturb an additional 98 acres. This

figure is well above the actual potential because the majority of the area can be accessed easily by ATV or on foot from existing roads and two-track trails (**Map 7**). However due to their light weight, low-pressure tires, and inability and undesirability to traverse taller vegetation, the potential of ATVs to disturb vegetation is limited primarily to the flattening of low-lying vegetation such as grasses and small sagebrush. Based on observation of ATV tracks in the project area as a result of survey/staking and inventory work, such tracks are not evident after just a few weeks. Highly visible tracks generally occur as a result of repeated use of the same tracks. Due to the PDFs requiring the minimum number of passes and the offsetting of tracks, impacts to vegetation and visibility of tracks are expected to be temporary only and negligible.

Drill buggy impacts. Portions of federal land subject to drill buggy operations would receive the most vegetative impact. As the drill buggies travel cross-country on the shothole source lines, they can break down brush and crush other vegetation, leaving the appearance of two-track trails. Surface disturbance from each buggy drill rig would typically consist of two, 3-foot wide tracks (total disturbance of six feet per buggy drill rig) from the flotation tire-equipped, 10-foot wide buggy drill rigs.

Vegetation beneath the tires would be compressed. Perennial grasses and herbaceous species would be flattened, but tend to recover more quickly from vehicle disturbance. They would typically re-sprout from their established root systems and recover within the current or next growing season.

More woody species such as sagebrush may be damaged, particularly the older, more brittle stems, but the younger more flexible parts of the plant would likely bend under the pressure and typically recover within the current or next growing season. For the smaller shrubs (i.e. sagebrush) crushing of these plants could lead to a decline in vigor and growth, and some plant mortality. It would likely take up to 5 years for shrub species to recover.

Potential vegetation disturbance from drill buggies would occur on approximately 110 acres of federal land. Total surface disturbance from the buggy drill rigs was multiplied by a factor of 2.5 to account for average tortuosity (i.e. winding and bending) of travel corridors, number of passes, and travel between lines.

Truck-mounted drill impacts. There will be very limited use of truck-mounted drills on federal lands. Approximately 72 holes within the project area are planned for drilling with truck-mounted drills in areas with suitable access containing hard, level substrate that can easily support the weight of the vehicles. This type of drill will not be used on National Forest System lands. Truck-mounted drill operations have potential of resulting in vegetative impact, as these vehicles are heavier than other types of drilling equipment proposed. As the truck-mounted drills travel off-road, they can break down brush and crush other vegetation in their paths, leaving the appearance of two-track trails. Surface disturbance from each truck-mounted drill would typically consist of two, 2-foot to 3-foot wide tracks (total disturbance of four to six feet per drill).

Vegetation would be impacted in the same manner as that described under drill buggy impacts; however, potential vegetation disturbance would occur on approximately 5.5 acres of federal

land. Total surface disturbance from the truck-mounted drills was multiplied by a factor of 2.5 to account for average tortuosity (i.e. winding and bending) of travel corridors, number of passes, and travel between lines.

It has been observed on previous geophysical projects that the woody brush plants are sometimes severely affected, but that the more herbaceous and resilient grasses and forbs survive and continue to vegetate the vehicle paths. Brush kill is a function of multiple factors including brush type, amount of traffic, time of year, and moisture conditions. Based on observation of past 3D projects in environments elsewhere in Wyoming, where relatively low-growing Wyoming big sage, low sage, or black sage predominates, up to 30% of the sagebrush plants driven over might be killed, and up to another 20% of plants directly driven on might be partially killed and/or damaged (Bill Lanning, BLM Pinedale F.O. Natural Resource Specialist, personal communication). The remaining 50% of plants driven on would remain visibly unaffected. Based on observations of past geophysical operations conducted in western Wyoming; however, damage to vegetation is not easily detected one year following field operations, due in part to the relative sparseness of brush plants.



Photo 7. Seismic line (created by buggy-mounted drill). Traverses from where photographer is standing to horizon. Impacts were negligible.



Photo 8. Seismic track (by buggy) through sagebrush. Sagebrush branches broken by tires, but remains tall and healthy between tracks.

The final compliance inspection report for work done under the Horse Point EA (BLM 2003) reports “The most obvious, but short term and insignificant impact of the project was the crushed brush ... which will be a short term adverse impact on visual resources for some individuals” and “physical access to buggy drilled holes caused the crushing of brush and the associated visual impact. This was most visible in areas of sagebrush and mountain browse species over 2’ high.” Comments on impacts to vegetation in the area covered by the Veritas EA (BLM 2002) repeatedly commented on the “crushed sagebrush.” Most sagebrush was not killed, and overall, disturbance was negligible, would not be noticed by the casual observer or passers-by, and would not encourage ORV use in the future (see **Photo 8**). With implementation of project design features (see **Section 2.3.2**), impacts to vegetation are expected to minimal, short-term, and localized.

Alternative 3 - Helicopter Only, Vehicle Use Off-Road Prohibited

Direct and Indirect Effects

Areas impacted by the heliportable unit would consist of only the 50-foot radius immediately surrounding the shothole, as there would not be any off-road vehicle travel between shotholes. Impacts would be in the form of crushed or killed vegetation immediately under the drill or support basket, and that resulting from foot traffic in the immediate area.

With heliportable drilling and support, impacts to project area vegetation that would be obvious after a several week period would be limited to the area of drill tailing (approximately 2½ acres over the total project area, including all jurisdictions or approximate 1½ acres of public lands).

3.8.3 Noxious/Invasive Plants

Affected Environment Relative to Noxious/Invasive Plants

Invasive weeds, which include noxious species of weeds, are of concern in Wyoming and have a much higher probability of occurrence in areas of soil disturbance. The spread of invasive, non-native plant species contributes to the loss of rangeland productivity, increased soil erosion, reduced water quantity and quality, reduced structural and species diversity, and loss of wildlife habitat (BLM 2003). Because invasive and noxious weeds are very aggressive, special management is required to prevent the introduction of weed seed from outside sources. Noxious and invasive species with the potential for occurrence within the project area include, but are not limited to the following: Russian knapweed (*Acroptilon repens* (L.) DC.), diffuse knapweed (*Centaurea diffusa* Lam.), musk thistle (*Cardus nutans* L.), Canada thistle (*Cirsium arvense* (L.) Scop.), common cocklebur (*Xanthium strumarium* L.), downey brome or cheatgrass (*Bromus tectorum*), houndstongue (*Cynoglossum officinale*), leafy spurge (*Euphorbia esula* L.), and cheatgrass (*Bromus tectorum*).

Existing uses such as livestock grazing, wildlife use, horseback riding, hiking, ATV use, wheeled vehicle use, and natural disturbance such as wildfire, water runoff, and wind presently contribute to the introduction and spread of these species. There is presently no livestock quarantine requirements, vehicle washing requirement, or other mandated preventative controls in place except the requirement of the use of certified hay on federal lands and country requirements relating to transport of hay. Control programs are in place for all jurisdictions, however such efforts are not adequate to control the spread of species such as cheat grass.

Effects on Noxious/Invasive Plant Species

Alternative 1 - No Action

Environmental consequences of the No Action alternative on federal lands are largely the same as the Affected Environment description. There would be no impact to noxious/invasive plants from geophysical exploration as a result of the No Action alternative.

Alternative 2 - Proposed Action

Direct and Indirect Effects

Power washing of vehicles and equipment prior to entering the project area would substantially reduce the threat of introducing noxious/invasive species to the project area. However, low levels of infestation already occur on federal lands primarily along waterways in drainage bottoms and along existing roads. As such, travel through these areas could lead to the transport of weed seeds throughout the project area. Similarly, pull-offs onto road edges with equipment and vehicles, or parking on existing disturbed areas in route to the project area could pick up seeds and transport them to seismic lines. Existing locations off federal lands, such as the staging areas, could harbor weed seeds. Thus, equipment stored at these sites could potentially be transported by helicopter, which could also lead to seed dispersal.

With implementation of the vehicle washing project design feature in **Section 2.3.2**, there would be little chance that noxious weeds would be introduced to the area by infested equipment. Provided reclamation and reseeding is undertaken promptly in any areas of (unexpected) surface disturbance, as prescribed in **Section 2.3.2**; weeds should not invade, spread, or take hold in these areas. The potential effects of introduction/spread of noxious/invasive plants by seismic operations are negligible when considered in the context of the occurrence and magnitude of other presently occurring activities and uses in the area (i.e. grazing, vehicle use, etc.) that contribute to infestation, spread, and naturally occurring spread mechanisms (wildlife, fire, wind, etc.).

Alternative 3 - Helicopter Only, Vehicle Use Off-Road Prohibited

Direct and Indirect Effects

This alternative would have considerably less potential to spread noxious/invasive plants than the proposed action because the potential for wheeled vehicles spreading such seeds into new areas is not present. Again effects are negligible.

3.8.4 Threatened, Endangered, and Sensitive Plant Species

Affected Environment Relative to Threatened, Endangered, and Sensitive Plant Species

No federally or state-listed plant species are known to occur within the project area; however, eight plant species potentially present within the project area have been designated as “sensitive species” by the BLM and/or the Forest Service. These species and habitat types in which they are found are listed in **Table 10**.

Table 10: Sensitive Vegetative Species with Potential for Occurrence in the Project Area Based on Habitat Requirements³		
Species Common Name	Scientific Name	Habitat⁴
Evert’s Wafer Parsnip	<i>Cymopterus evertii</i>	Course volcanic soils or sandstone outcrops dominated by cushion plants or sparse shrublands in openings with juniper at 5,900-10,900 feet
Hall’s Fescue	<i>Festuca hallii</i>	Montane grasslands within calcareous soils
Absaroka Beardtongue	<i>Penstemon absarokensis</i>	Sparsely vegetated openings on steep slopes of loose volcanic rubble or dry volcanic rock outcrops 5,920-10,000 ft
Entire-Leaf Goldenweed	<i>Pyrrcoma integrifolia</i>	Montane meadows within calcareous soils
Absaroka Goldenweed	<i>Pyrrcoma carthamoides</i> var. <i>subsquarrosa</i>	Montane meadows grasslands in calcareous or volcanic soils

Table 10: Sensitive Vegetative Species with Potential for Occurrence in the Project Area Based on Habitat Requirements³		
Species Common Name	Scientific Name	Habitat⁴
Persistent Sepal Yellowcress	<i>Rorippa calycina</i>	Riverbanks and shorelines, usually on sandy soils near high water lines
Shoshonea	<i>Shoshonea pulvinata</i>	Shallow, stony calcareous soils of exposed limestone outcrops, ridgetops, and talus slopes at 5,900-9,200 feet
North Fork Easter Daisy	<i>Townsendia condensate</i> var. <i>anomala</i>	Rocky slopes and ridges within volcanic soils

³Compiled from the BLM Wyoming Sensitive Species Policy and List (2002) for the Cody Field Office and the USDA Forest Service Sensitive Species List (2004) for the Region 2 Office

⁴Species that do not occur within project habitat have been omitted

Review of the documented habitat requirements of each of these species suggests that limited potential habitat for each of the species is contained within the Clark 3D project area. Much of the potential habitat that may be present would be avoided with implementation of slope restrictions and offsets from waterways and wetland/riparian areas described in **Section 2.3.2**.

Effects on Threatened, Endangered, and Sensitive Plant Species

Alternative 1 - No Action

Environmental consequences of the No Action alternative on threatened, endangered, or sensitive plants on federal lands are largely the same as the Affected Environment description. There would be no impact to threatened, endangered or sensitive plant species as a result of the No Action alternative.

Alternative 2 - Proposed Action

Direct and Indirect Effects

A biological effects evaluation was conducted for all listed threatened and endangered species, designated sensitive plant species, and other plant species of local concern that could possibly be affected by this proposed action. This is contained in the project file. These species require an in-depth look during project design and analysis. The effects evaluation helped to identify the likely effects of the proposed action on plant species; to insure that listed species, sensitive species, and other species of local concern, as well as their habitats, received full consideration in the decision-making process; to insure that the proposed action would not contribute to loss of viability of any species or contribute to a trend towards federal listing under the Endangered Species Act; and to incorporate concerns for these species throughout the planning process by identifying opportunities for enhancement and reducing any potential negative impacts.

A No Impact determination or a determination that this action may adversely impact individuals, but is not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing or a loss of species viability range-wide was concluded from the effects analysis for all sensitive plant species, based upon the following rationale:

- The duration of the activity is of short duration (several months),
- The probability of disturbance is extremely low based on occurrence,
- Effects on individuals or species are immeasurable, negligible, and discountable.

Alternative 3 - Helicopter Only, Vehicle Use Off-Road Prohibited

The environmental consequences would be largely the same as those discussed under the proposed action.

3.8.5 Trees and Timber

Affected Environment Relative to Timber/Trees

The dominant land cover type on federal lands within the boundary is sagebrush/grassland although there are some small areas of meadow and scattered conifer in areas of higher elevation.

Effects on Trees and Timber

Alternative 1 - No Action

Environmental consequences of the No Action alternative on trees and timber on federal lands are largely the same as the Affected Environment description. There would be no impact to trees or timber as a result of the No Action alternative.

Alternative 2 - Proposed Action

Direct and Indirect Effects

Impacts to forested habitat within the project area would be minimal, as the tree stands that exist are mostly small and trees are scattered. In occasional instances, tree limbs may be removed to allow passage of drill buggies and to prevent additional damage to the affected tree. No trees would be cut for access, and shot points would be offset away from trees, as indicated in the project design features.

Alternative 3 - Helicopter Only, Vehicle Use Off-Road Prohibited

Direct and Indirect Effects

The environmental consequences on trees and timber would be largely the same as those discussed under the proposed action.

3.8.6 Cumulative Effects on Vegetation

Alternative 1 - No Action

Environmental consequences of the No Action alternative on vegetation on federal lands are largely the same as the Affected Environment description. There would be no cumulative effects on vegetation as a result of the No Action alternative.

Alternative 2 - Proposed Action

Cumulative effects on vegetation resources take into consideration adjacent land uses, off-road vehicle travel, potential future development, and natural processes. The Clark 3D project area overlaps three previous geophysical exploration efforts. Inspection of past seismic projects has indicated that 3D seismic projects do not result in major vegetative changes. In addition, the implementation of protective measures proposed would minimize impacts. The amount or percentage of sagebrush actually killed in vehicle paths is negligible when considered in the context of the total project area, and damaged vegetation begins to regenerate after short periods of time.

The proposed action would not contribute in any additive manner over time to causing increased adverse effects on vegetation resources.

Alternative 3 - Helicopter Only, Vehicle Use Off-Road Prohibited

This alternative would not contribute in any additive manner over time to causing increased adverse effects on vegetation resources.

3.9 OVERALL CUMULATIVE EFFECTS OF THIS GEOPHYSICAL EXPLORATION OPERATION

Introduction

Pursuant to NEPA, federal agencies must consider the cumulative effects of the proposed action in conjunction with other activities. Cumulative impact is the impact on the environment, which results from the 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 summary disclosure of cumulative effects of this geophysical exploration operation by alternative relative to each resource is disclosed in the previous sections. This section addresses how this single project, in its entirety, contributes to the overall cumulative effects when added to past, present, and reasonably foreseeable future actions within all jurisdictions.

In order to get a general perspective of how this single action relates to overall cumulative effects, it is imperative to assess how this single action contributes to potential threats or changes from all sources in an area over the long-term. Could the additive effects of this action be of such magnitude that it could have significant influence on resource abundance, productivity, condition, or trend over a large area well into the future? Does the action contribute significantly to making things worse (adverse)? Does it have little bearing or no detectable influence on changes or threats to the resource (neutral)? Does it contribute significantly to making things better (beneficial)? Although cumulative effects analysis required in this analysis 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.

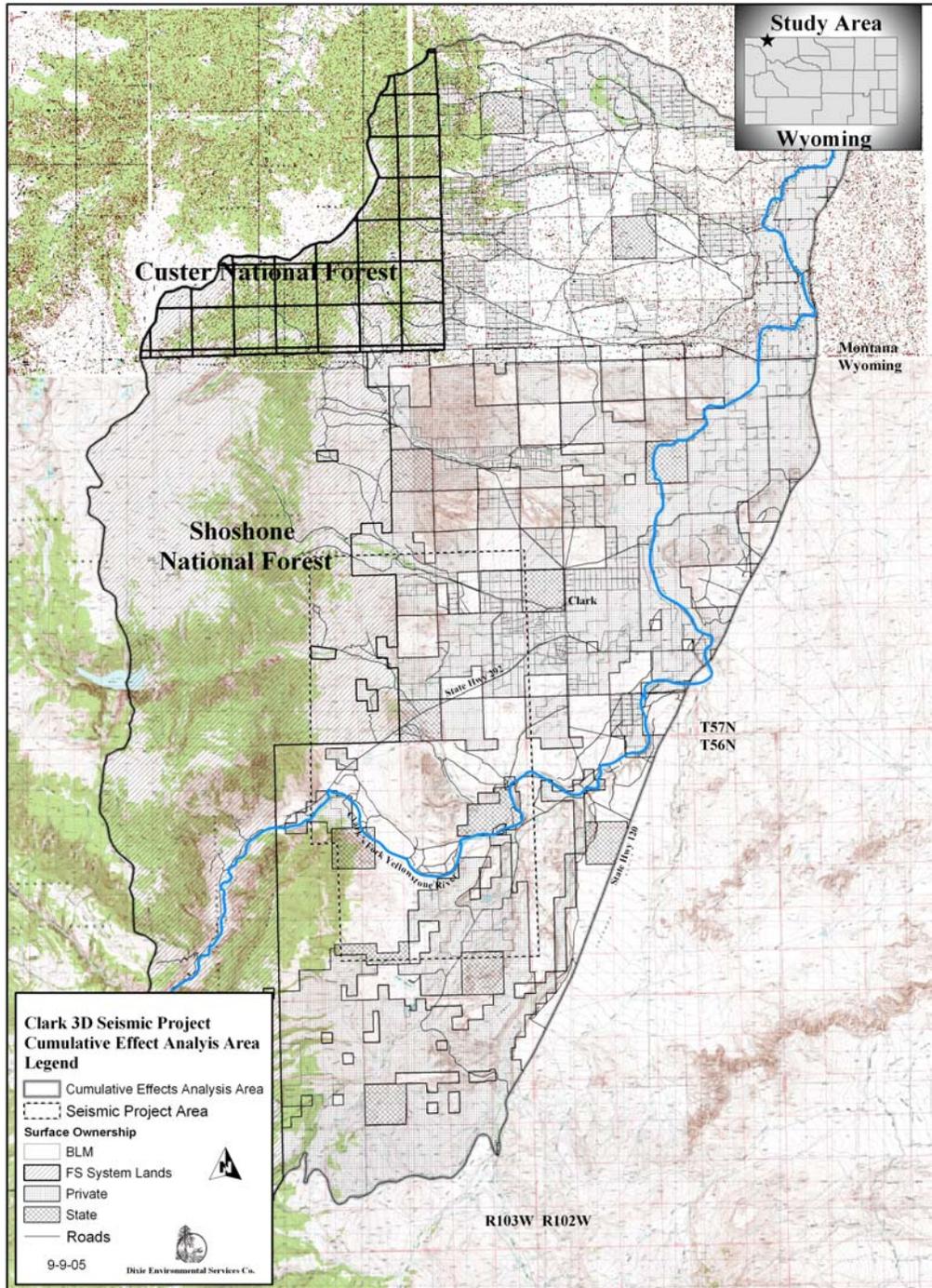
The effects analysis documented here examined the cumulative or incremental effects of this single geophysical exploration action when added to past, present, and reasonably foreseeable future actions/activities that likely would occur in or adjacent to the project area. Cumulative effects were bounded temporally and spatially for this analysis, thus defining the duration for projection of effects, as well as the analysis area boundary.

Projection of effects over time was limited to that reasonably foreseeable future time period, during which the identified major threats or changes to forest resources and/or associated social/economic values could result in a substantial change. The time period within which cumulative effects were bounded is roughly from the 1970s through 20 years from project initiation, or about 2026. This is related to the time over which this analysis is conducted, the decision made, and potential follow-up actions that would be implemented and completed.

The analysis area boundary was based on the land area beyond which project effects would no longer have the potential of resulting in a measurable or detectable influence on federal resources or associated values. The area used for cumulative effects analysis was the project area and adjacent lands in proximity to the Clark area (see **Map 7**). That area is roughly the area west of Highway 120, north of the Chief Joseph Highway 296, including the Grove Creek drainage into Montana, and the eastern face of the Beartooth Mountains (approximately five miles west of the proposed project area).

The cumulative effects discussion that follows summarizes the effects of those actions or activities that have had or will have the potential to contribute a substantial degree to cumulative effects.

Map 7. Cumulative Effects Analysis Area



Past and Present Actions Relevant to This Analysis

Minerals Activities

- Previous seismic activities have occurred in the general area including portions of the proposed project area
- Several non-producing oil wells were drilled previously, several producing wells are located in areas immediately adjacent to the proposed project area, and a rig is drilling on non-federal lands within the proposed project area at present
- Two active county gravel pits are located on BLM land within the project area

Vegetation Management

- Some natural areas on private lands have been converted to agriculture or improved pasture, and irrigation facilities and water diversions are in place
- Prescribed burn actions have occurred on federal and private lands
- Commercial livestock grazing has been permitted and has occurred on all ownerships
- Weed infestations and invasive weed control efforts have occurred in all ownerships
- A fire suppression strategy 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 private land, State land, and portions of BLM land to allow better access for public land users and development of private residences and minerals facilities.

Recreation

- Motorized recreation use (including ATVs and snowmobiles), as well as nonmotorized recreation use, has and is occurring
- Outfitting/guiding has been permitted and historically occurred

Wildlife

- Hunting and fishing use has and is occurring
- Introduction of exotic fish species, and stocking of native fish populations has occurred
- Peregrine falcons and wolves have been reintroduced and are prospering
- Poisoning and hunting of grizzly bear ceased, bear baiting was prohibited, bear numbers are increasing, bear distribution is expanding, and human/bear conflicts are increasing
- Bear attractant storage order was implemented on National Forest System lands

Private Land Development and Use

- Residential and summer homes have been constructed
- Human use in the area has increased
- Roads, power lines, telephone lines, etc. have been constructed
- Water wells have been drilled, springs have been developed, water diversions have occurred, and irrigation facilities have been constructed

State Land Development and Use

- Oil wells have been drilled and several are producing
- Roads have been constructed
- Additional ancillary facilities have been constructed

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

Additional oil/gas development is likely to occur in the Clark area, as some leases have been secured, a compressor station is being planned on non-federal land, an application for ROW across parcels of BLM lands for an oil/gas pipeline has been submitted, and a drilling rig is in operation within the proposed project area in Bennett Creek. Based upon existing trends, dispersed motorized and non-motorized recreation use, including ATV use, will likely increase on public lands.

Additional residential development of private land will likely occur in the Clark area, as well as in the Robertson Draw area north of the project area. Several hundred homes already exist in the Clark area, and over 60 subdivision parcels are or will be developed in the Robertson Draw, Gold Creek, and Meeteetse Trail areas just across the Wyoming/Montana border, a few miles north of the project area.

Cumulative Effects of the Geophysical Exploration When Added to Past, Present, and Reasonably Foreseeable Future Actions

To date, no significant impacts to resources or uses on federal lands within or adjacent to the project area have been identified in NEPA documents prepared for previous actions in or adjacent to the project area. An application for rights-of-way to construct an oil/gas pipeline from the Line Creek area to Little Elk Basin across parcels of BLM lands has been submitted, and the decision is pending. Presently, there are no other proposals of development of any kind on federal lands, including mineral exploration, except for this seismic exploration proposal. No other Notices of Intent have been filed, no Applications for Permit to Drill (APD) have been filed, and no other applications for special-use permits have been received. Some additional requests for leasing of parcels for oil/gas have been received.

Little or no analysis of environmental effects was completed or documented for past actions on State of Wyoming or private lands. Many of these past actions (land conversion to agriculture, residential development, roads, irrigation facilities, etc.) have significantly altered the landscape, uses, and activities, having both adverse and beneficial effects depending on one's perspective.

3D geophysical exploration with either action alternative would not contribute in any appreciable manner incrementally to long-term changes or conditions in "critical elements" of the human environment; recreation settings, opportunities, or expectations; visual settings; or the transportation system and access management. In addition, neither of the action alternatives would have any bearing on the character, status, or classification of Wilderness areas, inventoried roadless areas, or the Clarks Fork River.

Any potential adverse long-term cumulative effects of the proposed action have been adequately mitigated through project design to such a degree that can be considered negligible.

The 3D geophysical exploration operation does, however, have the potential for contributing in a beneficial manner to reducing adverse effects on resources over the long-term if future oil/gas exploration and/or development would occur. While no data is available for a success ratio within the project area, fewer exploratory wells would be drilled if applicants have access to good seismic data processed with today's 3D technology. Likewise, development wells would have considerably higher success ratios with 3D seismic data. Fewer "dry holes" would result in fewer potential disturbances to resources, activities, and users from abandoned drill pads, roads, and other ancillary facilities over the long-term.

Although this action is neutral from a cumulative effects aspect, this 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.

3.10 ENVIRONMENTAL JUSTICE

Presidential Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" was issued in February 1994. This directed federal agencies to consider, as part of the NEPA analysis process, how their proposed actions or projects might affect human health and environmental conditions on minority and/or low-income communities. Two fundamental questions are posed by the CEQ (Council of Environmental Quality) to help agencies address these and related factors: 1) "Does the potentially affected community include minority and/or low-income populations?" and, 2) "Are the environmental impacts likely to fall disproportionately on minority and/or low-income members of the community and/or tribal resources?"

In answering the first question we used 1990 census data to examine the minority and low-income populations in Park County, the county where the proposed action occurs. The minority populations for Park County represent less than 2.5% of the total population for the county. This compares to 5.8% minority populations for the whole of Wyoming. CEQ guidance identifies a minority population as one where either: a) the minority population of the affected area exceeds 50 percent or b) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population. For this analysis the affected area is identified as Park County and the state of Wyoming is used as the geographic reference for the general population. Park County meets neither of the above conditions, so there are no minority populations identified.

The percentage of persons below the poverty level for Park County is 9.5 percent as compared to 11.9 percent for Wyoming. Those persons are generally dispersed throughout Park County and there are no specific communities that are predominately low income. For this analysis no low-income populations were identified. Given that no minority or low-income populations are identified in the affected area there is no disproportionate effect from any alternative on such populations regarding environmental justice concerns or factors.

4.0 CONSULTATION AND COORDINATION

Dixie Environmental Services Co. (DESCO) prepared this Environmental Assessment in cooperation with the BLM and Forest Service under the direction of Mr. Don Ogaard, BLM Project Manager. Although a private consultant was involved in its preparation, this is a BLM/FS NEPA document, and the BLM and Forest Service are totally responsible for the included analysis and content. Individuals involved in preparation or review of this report, or consulted during the preparation of the report are listed in **Table 11**.

Table 11: Individuals Consulted During EA Preparation	
Name	Title
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Donald Ogaard	BLM-WFO Environmental Protection Specialist
Dennis Saville	BLM-CFO Wildlife Biologist
Vic Seefeldt	BLM-CYFO Physical Scientist
Jim Chase	BLM-CYFO Archeologist
Stephanie Valentine	BLM-CYFO Outdoor Recreation Planner/NEPA
Gretchen Hurley	BLM-CYFO Geologist
Monte Barker	Forest Service, North Zone Wildlife Biologist
Dave Cawrse	Forest Service, Forest Minerals Staff Officer
Melody Holm	Forest Service, Regional Program Manager, Energy Resources/Leasable Minerals
Allen Madril	Forest Service-SNF Forest Archeologist
Diana Menapace	Forest Service, Regional Environmental Coordinator
David Myers	Forest Service-SNF North Zone District Ranger
Marty Sharp	Forest Service-SNF North Zone NEPA Coordinator
Tom Williams	Forest Service, Regional Leasable Energy Specialist
Bruce Fulker	Quantum Geophysical, HSE Supervisor
Richard Dolecek	Discovery Exploration Incorporated, President
Gary Kowalski	DESCO Operations Manager
Tanya Matherne	DESCO-President
Arthur Perkins	DESCO Senior Biologist/Ecologist
Justin Rowland	DESCO Biologist/Ecologist
Jacqueline Smith	DESCO Biologist/Ecologist
Kenneth King	Licensed Geologist and Geophysicist
Mark Bruscano	Wyoming Game & Fish Department, Grizzly Specialist
Kevin Hurley	Wyoming Game & Fish Department, Wildlife Biologist
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APPENDIX A

GLOSSARY

Glossary of Terms Used in the Clark 3D Environmental Assessment

Acoustic - operated by or utilizing sound waves

Artesian well or spring- a well or spring in which water is under pressure; *especially* one in which the water flows to the surface naturally

Aquifer - water-bearing stratum of permeable rock, sand, or gravel

Cache bags – secure bags used to store and transport equipment

Cairn - a heap of stones piled up as a memorial or as a landmark

Colluvium - rock detritus and soil accumulated at the foot of a slope

Cumulative effects (impacts)- are effects that increase on successive addition or incrementally by a series of actions

Data collectors- pieces of seismic equipment that are placed at certain receiver points with cables and geophones connected to them, that record and store data (electrical impulses) from the geophones

Decision Record- a document that records the decision on a site specific project made by the BLM relating to the management of public land surfaces and federal mineral estates administered by the BLM when there is a finding of no significant impact

Decision Notice- a document that records the decision on a site specific project made by the Forest Service relating to the management of National Forest System lands when there is a finding of no significant impact

Direct effects (impacts)- effects caused by the action and occur at the same time and place

Discountable- extremely unlikely to occur

Dominant- prevailing or controlling characteristics or features used to define or describe an ecosystem or landscape. Wyoming Big sagebrush is a dominant vegetative species within the project area.

Elements of the human environment-basic characteristics of the natural and physical environment and the relationship of people and that environment (i.e. air, water, wildlife, vegetation, etc.) as defined by NEPA

Emission - substances discharged into the air

Endangered species- any species in danger of becoming extinct throughout all or a significant portion of its range identified by the USFWS as threatened under provisions of the Endangered Species Act of 1973, as amended

Energy Source- the method, equipment or material used to create acoustic seismic waves, which are recorded and analyzed during geophysical investigations

Ephemeral waters- intermittent drainages, where water flow is only present after significant rain events or seasonal snow and/or ice melt.

Evapotranspiration- loss of water from the soil both by evaporation and by transpiration from the plants growing thereon

Fault - a fracture in the crust of a planet (as the earth) or moon accompanied by a displacement of one side of the fracture with respect to the other usually in a direction parallel to the fracture

Floodplains- level land that may be submerged by floodwaters, usually external of the normal banks of a river or creek

Fold- to be multiplied by

Forbs - herbs other than grass

Geophones- instruments placed in the ground at each receiver point that convert seismic energy to electrical signals.

Ground water- water found below the surface and within the earth that supplies wells and springs

Grouse leks- areas where grouse congregate during breeding season for the purpose of displays and breeding

Hazardous violation- a serious violation of permit stipulations, conditions of approval or other conditional criteria under which an action takes place; when major safety violations that pose a threat to life, property or resources exist

Helicopter flight corridor- a designated route that limits where helicopter flights can occur

Helicopter operating corridor- a flight corridor between staging areas and the seismic line being worked

Helicopter travel corridor- a flight corridor between operational staging areas and overnight parking locations

Hydrocarbon reserves- underground pockets, veins or reservoirs of oil, gas, coal or other organic petroleum compounds

Indirect effects (impacts)- effects caused by the action later in time or farther removed in distance

Interdisciplinary Team- the team of diverse professionals who participated in the development of the Environmental Assessment through the public comment and scoping processes

Live water – water body containing flowing water

Microenvironment- small or relatively small usually distinctly specialized and effectively isolated habitat or environment (i.e. forest canopy, under a rock or eddy pool in a stream)

Misfires- a condition where a loaded explosive charge fails to detonate

Mitigation- the offset or lessening of real or potential impacts or effects through the application of additional controls or actions, counter measures employed to reduce or eliminate undesirable or unwanted results. Measures that avoid, minimize, rectify, reduce, eliminate, or compensate for adverse impacts (40 CFR 6508.20).

Negligible- insignificant, immeasurable, or non-detectable

Non-attainment area- areas of the country where air pollution levels persistently exceed the national ambient air quality standards as required by the Clean Air Act

Noxious - physically harmful or destructive to living organisms

Obligate associate- ecological relationship where one species requires the presence of another species for habitat or prey

Offsets- something that serves to counterbalance or to compensate for something else, a protective distance put in place from an area or structure

Parturition habitat- area or habitat used for giving birth

Perennial waters- creeks, streams and other drainages that have water present during all seasons of the year

Plant community- an association of vegetative species commonly found in the same area

Raptor- bird of prey (i.e. eagles, hawks, falcons and owls)

Receiver points- points on the geophysical exploration project grid where geophones are placed, as well as other seismic recording equipment (i.e. data collectors, cables, batteries, etc...)

Recorder- the truck and associated equipment where recording seismic data occurs and control of project activities takes place

Remediation- the act or process of correcting an impact

Reservoir - an artificial lake where water is collected and kept in quantity for use

Resolution - the process or capability of making distinguishable the individual parts of an object or closely adjacent optical images

Riparian areas- lands adjacent to streams, lakes, and other bodies of water and which are characterized by vegetation requiring free or unbound water

Seismicity - the relative frequency and distribution of earthquakes

Seismograph - an apparatus to measure and record vibrations within the earth and of the ground

Shothole- (hole drilled for an explosive charge) source point location where a 30-foot hole would be drilled, loaded with a 10-pound Seis-Gel explosive charge, and then plugged with bentonite. Also called drill holes or source points.

Socio-economics - of, relating to, or involving a combination of social and economic factors

Soil compaction- an increase in the density of soil by compacting the upper layers with heavy machinery and thereby decreasing soil productivity

Source points- see shot hole description

Species of special concern- species that is not endangered or threatened, but is extremely uncommon, or has unique or highly specific habitat requirements and deserves careful monitoring of its status. Species on the periphery of their range that are not listed as threatened may be included in this category along with those species that were once threatened or endangered but now have increasing or protected, stable populations

Stratigraphy- an analysis of the sequence, spacing, and spatial distribution of rock strata

Subsurface geological features- distinguishable structures within the earth's crust (i.e. bed rock, faults, anticlines, aquifers, hydrocarbon reservoirs, etc...)

Surface water- water found above the surface of the earth (i.e. ponds, lakes, rivers, streams, ocean, bays, etc...)

Threatened species- plant or animal species likely to become endangered within the foreseeable future throughout all or a significant portion of its range identified by the USFWS as threatened under provisions of the Endangered Species Act of 1973, as amended

Tomographic - a method of producing a three-dimensional image of the internal structures of a solid object (as the human body or the earth) by the observation and recording of the differences in the effects on the passage of waves of energy impinging on those structures

Tortuosity - something winding or twisted

Total maximum daily loads (TMDL)- calculation of the maximum amount of a pollutant that a water body can receive and still meet water quality standards, and an allocation of that amount to the pollutant's sources

Transient- remaining in a place only a brief time

Tremor anomalies – deviations in small movements following or preceding major seismic events

Turbidity- level of muddiness in water created by stirring up sediment or having foreign particles suspended

Velocity - rate of occurrence or action

Wetlands- areas that are permanently wet, or intermittently water covered, such as swamps, marshes, bogs, muskegs, potholes, swales, glades, and overflow land of river valleys. Large open lakes are commonly excluded, but many kinds of pools, ponds, sloughs, holes, and bayous may be included.

APPENDIX B

NOTICE OF INTENT

Form 3150-4
(July 1993)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

FORM APPROVED
OMB NO. 1004-0162
Expires: April 30, 1996

NOTICE OF INTENT TO CONDUCT OIL AND GAS
GEOPHYSICAL EXPLORATION OPERATIONS

BLM Case No.
State Case No.

Company Name Windsor Wyoming LLC		Project Name Clark 3-D	
Address 14213 N. May Ste 100		Type of Bond	Amount
City Oklahoma City	State OK	Bond Number/Where Filed	
Zip Code 73134	Phone No. (Include area code) 405 246 8807	Crew Number	

LOCAL INFORMATION

Contractor/Cient Quantum Geophysical		Crew Chief	
Address 1 Riverway Ste 2100		Address	
City Houston	State TX	City	State
Zip Code 77056	Phone No. (Include area code) 713 782 1234	Zip Code	Phone No. (Include area code)

I hereby file this Notice of Intent to Conduct Oil and Gas Geophysical Exploration Operations across and upon Public Lands (give description of lands by Town, Ranges(s), and Section(s)): A map shall be furnished showing the approximate location of the lines to be used on Public Lands. The map shall be of a minimum of one-half inch to the mile for the general location, and should be at least two and one-half inches to the mile for specific project location to accompany the No Completion. Area of Survey T56 R57 N R 102 E 103 W - Actual survey outline shown on attached map. 2-25 area total approximately 46 sq. mi.

Approximate Date of Commencement of Operations **May 1 2004 (Surveying/Arch)**
The type of operation to be conducted is:

- | | |
|--|--|
| TECHNIQUE | METHOD |
| <input checked="" type="checkbox"/> Shothole | <input type="checkbox"/> Surface shot |
| <input type="checkbox"/> Vibroseis | <input type="checkbox"/> Truck Mounted |
| <input type="checkbox"/> Other (explain) | <input checked="" type="checkbox"/> Portable |
| | <input checked="" type="checkbox"/> Buggy |

04 APR - 7 AM 8:36

Type and amount of Explosive: **10 # Gel or Pentaltic**

Shotpoint pattern: **Single hole - 30' shot depth**

Shothole Depth: **30'**

No. Source Points/Mile: **Source Points per sq mile = 75**

Provide diagram if multi-hole pattern:

The undersigned agrees that the oil and gas exploration operations shall be conducted in compliance with all Federal, State and local laws, ordinances or regulations that are applicable. Federal regulations are contained in 43 CFR 3150. The Crew Chief, Party Manager, or other responsible representative shall attend a pre-conference prior to entering onto the public land to sign the general terms and conditions relative to this project, and any site specific special conditions developed by local Authorized Officer.

Richard D. Dolereck
(Signature of Appropriate Geophysical Representative)

(Signature of Bureau of Land Management Authorized Officer)

President Discovery Expl/Consultant Windsor Energy LLC
(Title)

(Title)

2/23/04
(Date)

(Date)

(Date)

(Continued on reverse)

APPENDIX C

PRELIMINARY SCOPING CONTENT ANALYSIS

Preliminary Scoping Content Analysis

Clark's Fork 3D Project

General issues and concerns

Expresses general support for the proposed action. (12 occurrences)

- Domestic energy production should be encouraged.
- Low-impact helicopter operations cause little environmental damage.
- Geophysical exploration results in fewer dry exploratory wells.
- The Cody RMP allocates the public lands in the project area as open to oil and gas exploration.
- Mitigation and monitoring minimizes impacts.
- Impacts are dispersed and short-term.
- Previous surveys caused no damage to wells or aquifers.

Expresses general opposition to the proposed action. (2 occurrences)

- Oil and gas development should be stopped in the area.
- Under what conditions would the permit be disapproved?

Requests for extensions of the scoping period or other delays in BLM action. (11 occurrences)

- A time extension would allow for water well testing.

The applicant should be required to provide prior notice to landowners. (4 occurrences)

- Notice should be provided of unexploded material near private property.
- Landowners should be provided written notice prior to the commencement of operations.
- Landowners should be provided current updates on the progress of operations.

The applicant should be required to post an increased bond, and fully compensate landowners for any damage. (17 occurrences)

- Who would monitor for damage and how would disputes be resolved?
- The financial/bankruptcy history of the company should be disclosed.
- Domestic animals and livestock could be harmed.
- There is a buried plastic irrigation line that could be damaged.
- Private roads could be damaged by the proposed operations.

Geophysical operations would cause noise pollution. (4 occurrences)

- Noise from geophysical operations could cause domestic animals to harm themselves.

The EA must analyze the cumulative impacts of this project and previous geophysical exploration operation. (2 occurrences)

Will the applicant be required to negotiate agreements with the private landowners? (8 occurrences)

- What happens if a landowner refuses access?
- What recourse would landowners have for damage/improper cleanup on private lands?
- The federal decision is a decision in principle regarding the other lands involved.
- Local residents' desires should be given more weight in decisionmaking.

Concerns related to air quality

Wind erosion would cause an increase in particulate concentrations. (2 occurrences)

Concerns related to cultural resources

Cultural and paleontological resources in the area should be inventoried and protected. (8 occurrences)

Activities could impact the Nez Perce National Historic Trail. (1 occurrence)

Concerns related to fire management

Operations could start wildfires in this high-wind area. (1 occurrence)

Concerns related to hydrology (subsurface)

The proposed geophysical operations could affect springs and domestic water wells in the area. (30 occurrences)

- Residents are completely dependant on wells for domestic water.
- The water wells are dependant on a shale layer 90' below the surface.
- The current drought intensifies the potential for impact.
- BLM should require testing by the applicant prior to approval.
- The setback from water wells should be 0.5 miles throughout the project area, as per FS.
- The setback from developed springs should be 2 miles.
- There is a need for additional baseline data on the wells in the area.
- Is there any indication that previous surveys caused damage to water wells?
- Liquid wastes should not be disposed of on-site.

The proposed geophysical operations could degrade subsurface water quality. (12 occurrences)

- Shotholes that are not properly plugged can allow surface contaminants to reach groundwater.
- Chemical residue from explosives could degrade subsurface water quality.

Impacts to water quality could affect a nearby fish hatchery. (3 occurrences)

- Springs in the Bennett Creek drainage supply the hatchery.

Concerns related to hydrology (surface)

The proposed geophysical operations could degrade surface water quality. (6 occurrences)

- The Clarks Fork Yellowstone Watershed is classified as an impaired waterbody segment by the EPA.
- The impacts to reservoirs and ponds should be disclosed.
- Erosion from devegetated sites could cause an increase in sediment load
- Chemical residues from explosives could contaminate surface water
- Use should not be permitted within 500 feet of surface water or riparian areas

Concerns related to land use planning

The Cody RMP is 14 years old and no longer valid. (10 occurrences)

- Rapid population growth has changed the character of the Clark area.
- Since the RMP is outdated, an EIS should be prepared for this action
- The area should be closed to oil and gas operations until a new RMP is written.

BLM must justify operations in areas designated NSO in the RMP, since the proposed operations would not be "casual use." (1 occurrence)

- Use should not be permitted in the designated "Game and Fish Access Area."
- Use should not be permitted in the visual horizon of the Nez Perce Historic Trail.

Concerns related to minerals

Concerns related to eventual exploratory drilling or field development. (4 occurrences)

- Open pits could damage aquifers
- Water disposal could damage surface water.
- Land values could be adversely affected

Alternative methodologies should be considered. (10 occurrences)

- Data from previous surveys should be used instead of a new survey.
- Exploration should be shifted to unpopulated areas.
- Passive seismic technology should be used.

Concerns related to recreation

There is a potential to impact the Wild and Scenic portion of the Clarks Fork River. (8 occurrences)

- No action should be permitted which would impair the suitability of the Clarks Fork for Wild and Scenic designation on the BLM portion.
- Any permitted uses must be in conformance with the SRMA activity plan.

Concerns regarding increased vehicle use.

- BLM prohibits off-road vehicle use by others. Allowing use for seismic operations is inconsistent.
- Opening of new access would cause an increase in vehicle use in the area.

There is a potential for conflict with big game hunting in the area. (3 occurrences)

Activities could impact important fisheries in the area. (1 occurrence)

- Activity near the Clark's Fork River could impact a Class 3 fishery.
- Activities could impact three Class 4 fisheries.
- Activities could disturb anglers.

Concerns related to socioeconomics

The project, and possible resulting development, would have a beneficial effect on the local economy. (2 occurrences)

- Private mineral owners in the area have a right to develop.

Interest in oil development would cause property values to decline. (5 occurrences)

Concerns related to soils

Wind erosion would be severe in this area. (1 occurrence)

Concerns related to vegetation

Revegetation would likely be ineffective due to soils/moisture/winds/drought. (11 occurrences)

- No operations should be allowed on slopes of 25% or greater
- High-intensity storm events occur in the project area, which would impede successful revegetation.

Concerns related to VRM

The proposed geophysical operations could cause lasting visual impacts. (9 occurrences)

- Class II VRM rules should be enforced.
- Only "designated" roads should be used, to preserve Class II VRM status.
- Mounds of earth could be left near the shotholes.

Concerns related to wilderness

No use should be permitted in the FS South Beartooth Highway Roadless Area. (3 occurrences)

Concerns related to wildlife/T&E

The proposed geophysical operations could cause impacts to wildlife. (18 occurrences)

- The potential for impact is increased by drought conditions.
- The proposed project area includes critical elk, mule deer, and bighorn sheep winter habitat.
- A complete inventory of species is needed.
- The project area contains elk parturition habitat.
- RMP restrictions related to sage grouse must be followed.
- BLM must comply with the national Sage-Grouse Habitat Conservation Strategy.
- The proposed project area contains yearlong mountain goat habitat.
- Activity should not be permitted from November 15 to July 15.

There is a potential for impact to T&E species, including wolf, grizzly bear, peregrine falcon, and bald eagles. (6 occurrences)

- There is a bald eagle nest within 2.5 miles of the proposed activity.
- The project area is within the ten-mile buffer for the grizzly bear recovery zone.

APPENDIX D

**CONCURRENCE LETTER
FROM
U.S. FISH & WILDLIFE SERVICE**



United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
4000 Airport Parkway
Cheyenne, Wyoming 82001

JUN 24 2005

In Reply Refer To: ES-
61411W.02/WY9520

Memorandum

To: Michael J. Blymyer, Field Manager, Bureau of Land Management, Cody
Field
Office, Cody, Wyoming

From: Brian T. Kelly, Field Supervisor, U.S. Fish and Wildlife Service, Wyoming
Field Office, Cheyenne, Wyoming

Subject: Review of Environmental Assessment (EA) WY -020-EA04-131 for the
Proposed Clark 3D Geophysical Survey Project

Thank you for your April 13, 2005 letter and enclosed Environmental Assessment (EA; which includes the Biological Evaluation [BE]) for the Proposed Clark 3D Geophysical Survey Project (Project). Your letter and EA were received in our Cheyenne U.S. Fish and Wildlife Service (Service) Office on May 19, 2005. In your letter you requested Service concurrence, pursuant to section 7(a)(2) of the Endangered Species Act of 1973 (Act), as amended (50 CFR §402.13), on your determinations of "not likely to adversely affect" grizzly bear (*Ursus arctos*, threatened) and bald eagle (*Haliaeetus leucocephalus*, threatened) and "no effect" to black-footed ferret (*Mustela nigripes*, endangered), Canada lynx (*Lynx canadensis*, threatened), and gray wolf (*Canis lupus*, experimental non-essential). Raptors and sensitive species were also addressed. This Project was discussed during a Northwest Levell Meeting on November 9, 2004 and in subsequent telephone conversations with BLM and Forest biologists. The proposed Project is located in portions of the following: Townships 56 and 57 North, Ranges 102 and 103 West, in Park County, Wyoming.

Under Alternative 1, the Proposed Action, Quantum Geophysical, Inc. is proposing to conduct a 3-dimensional geophysical seismic survey on approximately 47.5 square miles (31,000 acres) of lands within The Bureau of Land Management (BLM) Cody Field Office (13,117 acres or 42 percent), Shoshone National Forest (Forest) Wapiti Ranger District (5,134 acres or 17 percent), State of Wyoming (2,135 acres or 7 percent), and private lands (10,435 acres or 34 percent). The results of the survey are expected to provide a high-resolution image of potential hydrocarbonbearing reservoirs underlying the Project area. This Project overlaps three previous geophysical exploration efforts in the area and will enable the applicant to consolidate that data. The Project is anticipated to occur from May through October within a one-year period.

The survey activity involves collection of seismic reflection energy from the subsurface using dynamite in 3,420 30-foot deep shothole points (detonated one at a time) and 7,018 receiver points. Shot holes will be drilled primarily by buggy-mounted combination drills and some

truck-mounted combination and heli-portable drills, depending on terrain and access. Water used for drilling will either be brought in by helicopter or pumped from a nearby, approved source, using appropriate filters. Two staging areas, one approximately 200 by 200 feet in size to be used for equipment deployment and the other approximately 8 by 6 by 10 feet for explosive magazine, will be set up on private lands. Both all-terrain vehicles (ATV) and helicopters will be used to shuttle crews and equipment. If multiple ATV passes along receiver lines become necessary, paths will be offset to minimize impacts.

Project Design Features (PDFs) have been integrated into the Proposed Action in order to avoid, minimize, or compensate for potential Project impacts to resources. PDFs address numerous resources, including wildlife and grizzly bears in particular, wetlands and riparian zones, helicopter operations, vegetation, and clean-up and are included in the EA on pages 22 through 33. In addition to PDFs, the BLM and Forest will conduct regular compliance inspections to monitor environmental concerns and adherence to PDFs and a post-Project assessment to identify potential mitigation/rehabilitation concerns.

The EA indicated "no effect" determinations for the following reasons: (1) Black-footed ferret: they have not been documented in or near the Project area and known prairie dog (*Cynomys spp.*) towns do not have the size and burrow density in this area to provide sufficient habitat for ferrets; (2) Canada lynx: there is a lack of quality habitat in the Project area, the area is not within a lynx analysis unit, and lynx are highly mobile and would not likely be displaced by survey activities; and (3) gray wolf: Project activities will occur during the summer when wolves generally occupy higher elevations with abundant prey species, they're highly mobile and roam over large distances and would not likely be displaced, and there are no known den sites in the vicinity. Service concurrence for "no effect" determinations is not required under the Act; however we agree with your assessments and appreciate the information.

Grizzly Bear: The EA indicated that although there is no grizzly bear recovery habitat within the Project area, there is occupied habitat. There are some nut and berry-producing trees and plants available to bears and they occasionally use or move through the Project area, primarily along the riparian corridors. There are also no known den sites in or near the Project area. If grizzly bears are present during Project activities, no other impacts other than temporary displacement are anticipated. In addition, PDFs indicated that all Project participants will be required to complete grizzly bear awareness training, all food, beverages and garbage will be properly handled, stored and disposed of to make it totally unavailable to bears. Based on information provided in the EA and PDFs, the Service concurs with your "may affect, but is not likely to adversely affect" determination for grizzly bear.

Bald eagle: The EA indicated that no bald eagle nests or winter roost areas within a one-mile radius of the Project site have been documented. Foraging habitat along the Clarks Fork River is present and suitable nesting habitat, including large trees, is also present but very limited. The Project will occur outside of the winter period when bald eagles would most likely forage for food along the river. Project activities could potentially displace bald eagles foraging in the area but displacement would likely be temporary and localized and surface-disturbing activities (including vehicular use and drilling) are prohibited within 150 feet of the high water mark of any perennial body of water on BLM and Forest lands. Based on information provided in the EA and PDFs, the Service concurs with your "may affect, but is not likely to adversely affect" determination for bald eagle.

Raptors and sensitive species: The EA also addressed potential impacts to raptors, sage-grouse (*Centrocercus urophasianus*) and mountain plover (*Charadrius montanus*). There are four known raptor nests and three known sage-grouse lek sites within or adjacent to the Project area. PDFs include no vehicle activities within 220 feet of active raptor nests, restricting surfacedisturbing activities within 0.75 mile or the visual horizon (whichever is closer) of active raptor nests between February 1 through July 3, restricting surface occupancy or use within 0.25 mile of sage-grouse dancing grounds, and restricting surface-disturbing activities within a two-mile radius of active sage-grouse lek sites between March 1 and June 15. Suitable mountain plover nesting habitat within the Project area is limited, indicating a low probability for occurrence. If a nest is found, surface-disturbing activities will not occur within 0.25 mile of any plover nest between April 10 and July 10.

This concludes informal consultation pursuant to the regulations implementing the Act. The Clark 3D Geophysical Survey Project should be re-analyzed if new information reveals effects of the action may affect listed or proposed species or designated or proposed critical habitat in a manner or to an extent not considered in this consultation, if the action is subsequently modified in a manner that causes an effect to a listed or proposed species or designated or proposed critical habitat that was not considered in this consultation, and/or if a new species is listed or critical habitat is designated that may be affected by these projects.

The Service appreciates the BLM's and Forest's continued efforts in the conservation of federally-listed species in Wyoming. If you have any questions regarding this letter or your responsibilities under the Act, please contact Ann Belleman of my staff at (307) 578-5942.

cc: USFS, Shoshone NF, District Ranger, Wapiti Ranger District, Cody, WY (D. Myers) WGFD, Statewide Habitat Protection Coordinator, Cheyenne, WY (V. Stelter) WGFD, Non-Game Coordinator, Lander, WY (B. Oakleaf)

APPENDIX E

ADMINISTRATION OF SEISMIC PERMITS

APPENDIX-E

ADMINISTRATION OF SEISMIC PERMITS

(Adapted from *Geophysical Investigations in Non-Wilderness and Non-Primitive Areas of the Shoshone National Forest, 1984*)

This section discusses administration of seismic permits on the federal lands. This section identifies what is included in the total job of administration and defines what is meant by adequate administration.

The federal agencies receive, evaluate, and respond to applications for geophysical exploration activities as required by law, regulation, and policy. Congress appropriates funds to the federal agencies for administration of these permits and other minerals activities on federal lands.

Because of environmental constraints and project design features that have been implemented most geophysical exploration activities tend to occur during a relatively brief period in the summer and early fall period. The geophysical exploration companies attempt to conduct their exploration activities as rapidly as possible because of the high daily cost of these operations. This results in a very concentrated and intense period of permit issuance, administration, compliance, and inspection.

In general, each seismic exploration company may employ 20-30 people and have up to 15 to 30 support ground vehicles depending upon the size of the project. It averages 45-90 days to complete permitted operations on the ground. Surveying and doing inventories takes several weeks. It usually takes 4 to 5 days to mobilize equipment and personnel, test and calibrate equipment. Drilling/loading of source points, layout of receiver lines, and recording of data may take several months depending on the size of the project.

An analysis of the administrative duties for geophysical exploration shows that three distinct levels of administration and funding exist. These three levels are described below:

1. **Minimum Administrative Level**

No problems are anticipated. Operations would be conducted away from residential areas, recreation corridors, and sensitive wildlife habitat. Usually remote non-timbered roadless locations accessed from staging areas away from human activity. Not adjacent to wilderness boundaries or forest boundaries. Geophysical company conducting work has established record of doing satisfactory work and complying with operating stipulations. Inspections are infrequent and final inspections are done on 50 percent of the total length of seismic lines. All minimum requirements of law, regulation, and policy are met. Usually applied to all non-seismic methods such as magnetic, gravity, electromagnetic, etc., but this level of administration is often adequate on low impact portable shothole permits.

2. Moderate Administrative Level

Operations may cross recreation corridors. May include timbered locations during periods of low to moderate fire danger. Work locations may be visible from local forest roads and adjacent to Forest boundary. Geophysical company conducting work is new to area. Regular scheduled inspections are frequent and final inspections are done on 75 percent of the total length of seismic lines. Permit compliance insured by issuing of warning notices and/or violation notices infrequently. Usually applied to all non-explosive seismic operations such as thumper or vibroseis and some shothole operations.

3. High Administrative Level

Extensive project evaluation may be needed to identify potential problem areas and agree on needed modifications prior to issuance of Permit. Operations would cross heavy use recreation corridors, inhabited or residential areas, private lands, and/or sensitive wildlife habitat. May include timbered areas during periods of high to extreme fire danger. Staging areas are adjacent to or near areas of human activity such as roads, campgrounds, trailheads, private dwellings, etc. or flight paths are near occupied dwellings. Work areas are adjacent to wilderness boundary and/or forest boundary.

High profile projects adjacent to private lands where high-level public scrutiny and potential for conflicts is high. Full-time on-site inspector usually required and final inspections are done on 100 percent of the total length of seismic lines. Permit enforcement (36CFR 251. 50 to 251. 64) may be substantial to resolve permit violations. Permit violations may be handled in magistrate or District court depending upon magnitude. Usually applied to most portable shothole.

See table below for a general tabular comparison of person-hours and costs between the three levels of administration.

GEOPHYSICAL EXPLORATION LEVELS OF ADMINISTRATION

PROCEDURE	PERSON-HOURS					
	MIN. LEVEL		MOD. LEVEL		MAX. LEVEL	
	GS-11	GS 5	GS-11	GS-5	GS-11	GS-5
Initial project evaluation	1	-	2	-	4	-
Permit preparation	10	2	14	2	16	2
Pework conference	2	-	3	3	4	4
Permit Inspection	12	-	4	24	24	100
Final inspections 1/	16	-	4	16	8	32
Compliance Activities	4	-	8		16	16

(law enforcement, etc.)

Documentation	2	2	6	6	6	12
Closing of Permit	2	1	2	1	2	1
Training			8	8	8	8
Total Man Hours	49	5	51	64	88	175
Total Cost (2005 updated) 2/		\$1900		\$2910		\$5490

1/ Final inspections of seismic lines average two hours per mile due to adverse terrain that must usually be traversed to follow the locations of the lines

2/ Additional federal agency costs may be incurred for vehicles and helicopter flight time.

As with many authorized activities that occur on federal lands, geophysical exploration has the potential to result in problems or incidents that require adequate oversight, correction, and possible law enforcement action. The following table shows the most common problems or violations associated with past geophysical activity, and classify them into three categories of severity. When violations occur, additional administrative duties are required such as gathering evidence, preparing case reports, and appearing in court to pursue civil and/or criminal penalties.

Common Violations of Seismic Permit Conditions Rated by Severity

VIOLATION RATING

	<u>Minor*</u>	<u>Major**</u>	<u>Hazardous***</u>
1. Harassment of Wildlife (by aircraft)		X	
2. Using explosives within 150 feet of a live stream		X	
3. Final shot point map not submitted with 5 working days	X		
4. Not using designated flight corridors and minimum distances from ground; or overflying occupied areas			X
5. Using unauthorized landing, loading, and staging areas.		X	
6. Not using required observers		X	
7. Failure to use warning devices when operations are conducted on or near open roads			X
8. Failure to make daily overflights when necessary	X		
9. Not using warning signs on trails		X	
10. Leaving prima cord reels (empty) on the forest	X		
11. Abandoning explosives and not maintaining proper inventory control			X
12. Leaving cap wires exposed above ground for shotholes		X	
13. No qualified personnel in attendance when explosives are used			X
14. Unauthorized cutting of trees		X	
15. Failure to plug shotholes according to oil and gas commission rules		X	

- | | | |
|--|---|---|
| 16. Failure to clean-up seismic debris | X | |
| 17. Conducting operations in areas not authorized by permit | | X |
| 18. Not having a copy of the permitting authorization on work location | | X |

*Minor violation would result in issuance of Warning Notice or Violation Notice as appropriate

**Major violation would result in Violation Notice w/ option of mandatory appearance & possible suspension

***Hazardous or repetitive violation relating to major safety violation (explosives, aircraft), threat to life, property, or resources would result in suspension of operation

APPENDIX F

LAND AND REALTY AUTHORIZATIONS

APPENDIX F: LAND AND REALTY AUTHORIZATIONS

Existing Land and Realty authorizations within the proposed Clark 3D project area are included in the table below.

It is not expected that the proposed Clark 3D project would produce any adverse effects relating to existing land and realty rights. Shotholes would be offset at industry accepted distances from rights-of-way, as set forth by the International Association of Geophysical Contractors to avoid disturbance to utility, access road, canal/drainage, and other land and realty features.

Existing Land and Realty Rights Within Proposed Project Area		
Identification Number	Location	Description
W4350	T57N, R102W, sec. 20	Canal/Drainage (25' ROW)
W18239	T56N, R103W, secs. 5,8	Power Transmission Line (10' ROW)
W56403	T57N, R102W, sec. 30	County Road (30' ROW)
W56389	T57N, R102W, sec. 20	Improved Dirt Road (30' ROW)
W81688	T56N, R103W, secs. 12,13	Improved Dirt Road (30' ROW)
W81693	T57N, R102W, sec. 30	Improved Dirt Road (30' ROW)
W81694	T56N, R103W, sec. 1 T57N, R102W, sec. 32	Improved Dirt Road (30' ROW)
W84621	T56N, R103W, secs. 8,12,13,16,21,27,28	Power Transmission Line (VAR' ROW)
W84641	T56N, R103W, secs. 1,12,13 T57N, R102W, secs. 8,30	Telephone Line (10' ROW)
W84702	T56N, R103W, secs. 1,12	Access Road (15' ROW)
W89606	T56N, R103W, secs. 13,23,24,26,27	Canal/Drainage (15' ROW)
W140078	T57N, R102W, sec. 32	Improved Dirt Road (20' ROW)
W1040067	T57N, R102W, sec. 18	Power Transmission Line (10' ROW)
WYW108380	T56N, R103W, secs. 12,13,14,23	Improved Dirt Road (VAR' ROW)
WYW111996	T56N, R103W, secs. 4,5 T57N, R102W, sec. 30	Highway-Hard Surfaced (VAR' ROW)
WYW120857	T56N, R103W, sec. 22	Water Pipeline (25' ROW)
WYW127004	T57N, R102W, sec. 18	Improved Dirt Road (20' ROW)

Existing Land and Realty Rights Within Proposed Project Area		
WYW134029	T57N, R102W, sec. 18	Improved Dirt Road (20' ROW)
WYW134035	T57N, R102W, sec. 18	Improved Dirt Road (30' ROW)
WYW140065	T57N, R102W, sec. 18	Improved Dirt Road (VAR' ROW)
WYW141778	T57N, R102W, sec. 18	Improved Dirt Road (8' ROW)
WYW141797	T57N, R102W, sec. 18	Improved Dirt Road (20' ROW)
WYW143746	T57N, R103W, sec. 24	Irrigation Pivot Tower Crossing (5' ROW)
WYW143749	T56N, R103W, secs. 5,8	Telephone Line (20' ROW)
WYW148679	T57N, R102W, sec. 18	Improved Dirt Road (20' ROW)
WYW148681	T57N, R102W, sec. 18	Improved Dirt Road (20' ROW)
WYW149425	T57N, R102W, sec. 18	Improved Dirt Road (20' ROW)
WYW151425	T57N, R102W, sec. 18	Improved Dirt Road (20' ROW)
WYW152453	T57N, R102W, sec. 18	Improved Dirt Road (20' ROW)
WYW155545	T56N, R103W, secs. 28,29	Country Road (10' BLM ROW)
WYW158677	T57N, R102W, sec. 18	Improved Dirt Road (20' ROW)