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Drilling, Testing, and Monitoring of up to 12 Temperature Gradient / Passive Seismic Geothermal Exploratory Wells

Location:	Federal Geothermal Leases on the West Flank of Newberry Volcano, Deschutes County, 22 miles south of Bend, Oregon
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1.0 PURPOSE AND NEED

1.1 Introduction

The proposed project is located in central Oregon on federal geothermal leases originally issued by the BLM from 1982 to 2003. The proposed project and the associated federal leases are located on the western flank of Newberry Volcano outside the Newberry National Volcanic Monument.

This Environmental Assessment (EA) has been prepared to disclose and analyze environmental effects of drilling, testing, and monitoring up to twelve temperature gradient / passive seismic geothermal exploratory wells on federal geothermal leases, as proposed by Davenport Newberry Holdings LLC (Davenport).

The Geothermal Steam Act of 1970 gives the Secretary of the Interior the responsibility and authority to manage subsurface federal geothermal resources and associated geothermal operations for exploration and development. The Secretary has delegated this authority to the BLM.

In situations where another federal agency has ownership of surface land management or funding part of the project, BLM must coordinate activities with those agencies. This proposed project is located within the Deschutes National Forest; therefore the U.S. Forest Service is a cooperating agency for the preparation of this EA. The Department of Energy (DOE) is funding the drilling of the exploratory geothermal wells and therefore is also a cooperating agency.

An EA documents a site-specific analysis of potential impacts that could result with the implementation of a proposed action and alternatives to the proposed action. An EA also assists the BLM and DOE in project planning and ensuring compliance with the National Environmental Policy Act (NEPA), and in making a determination as to whether any "significant" impacts could result from the analyzed actions. "Significance" is defined by NEPA and is found in regulation 40 CFR 1508.27. An EA provides evidence for determining whether to prepare an Environmental Impact Statement (EIS) or a statement of "Finding of No Significant Impact" (FONSI).

If the BLM determines that this project has "significant" impacts following the analysis and documented in the EA, then an EIS would need to be prepared for the proposed project. If not, a BLM Decision Record (DR) may be signed for the EA approving the selected alternative, whether it is the proposed action or another alternative. The BLM DR, including the FONSI statement, documents the reasons why implementation of the selected alternative would not result in "significant" environmental impacts (effects). As a cooperating agency, the DOE, would make its own NEPA determination (FONSI or to prepare an EIS) as required by BLM National Environmental Policy Act Handbook H-1790-1.

1.2 Background

Geothermal energy is heat energy from deep in the earth, often circulated by water through natural processes along zones of fractured rock deep underground. At high enough temperatures, the water or steam can be harnessed to generate electricity and then recycled back underground.

Newberry Volcano has long been recognized by geologic and scientific communities for its geothermal potential. This geothermal potential was central in shaping the Congressional legislation creating the nearby Newberry National Volcanic Monument (NNVM or Monument) in 1990. Although various scientific studies and exploration activities have taken place in the past in many locations at Newberry Volcano—including in the caldera—the geothermal resource has so far been elusive and its unique characteristics have yet to be accurately depicted and understood.

Some areas of the west flank of Newberry Volcano are thought to have deep hydrothermal systems, and a number of surface and subsurface surveys and studies have occurred. Nearly two dozen exploratory holes have been drilled at depths from about 1,300 feet to nearly 12,000 feet in areas on the west flank, including 2 exploration wells drilled to about 10,000 and 11,500 feet by Davenport in 2008. Previous exploration activities located areas of high heat, and in some cases indication of hot water, demonstrating that there indeed may be a potentially viable geothermal resource in some areas at Newberry.

1.3 Summary of the Proposed Action

Davenport proposes to drill up to twelve shallow exploratory monitoring wells to acquire scientific data about the geothermal resource and the subsurface geologic structure over a portion of their leases. If approved, the project would initiate in the spring of 2010.

The proposed project is located approximately 22 miles south of Bend, on federal geothermal leases held by Davenport Newberry Holdings LLC, and within the Bend-Fort Rock Ranger District of the Deschutes National Forest. Refer to **Figure 1: Vicinity Map**. The proposed project and the associated federal leases are on the western flank of Newberry Volcano, outside the Newberry National Volcanic Monument, in areas identified as appropriate for future geothermal use during the congressional process and in the legislation that created and established the Monument.

The proposed project consists of drilling up to twelve temperature gradient / passive seismic monitoring wells, each to depths of approximately 2,500 to 3,500 feet. These wells are relatively shallow and will be of small diameter (4.5 inches or less). They are not intended to reach the geothermal resource and will not be deep enough to do so. Drilling will be done with small, truck-mounted equipment, similar to that used to drill domestic water wells. Individual drilling sites would be less than 100 feet x 100 feet in

size (less than 0.23 acres for each site), and located on or along existing spur roads. No new road construction will be needed. On some of the narrower spur roads, some trimming of vegetation will be necessary as well as some light grading in spots where the road has not been maintained. The combined total area disturbed for the entire project (12 wells) will be less than approximately 2.5 acres[1].

The wells will be "dual purpose" to minimize the number of wells needed. The wells will be used to acquire temperature gradient data (changes in temperature at different depths), and passive seismic data ("listening" to the underground geology), to help characterize the underground features and learn more about the geothermal resource.

1.4 Need for the Proposed Action

The need for the proposed action is to conduct specific scientific exploration and monitoring activities to acquire more information about the geothermal resource and underground geologic features at Newberry. This is part of on-going research and exploration efforts to collect data that can be used to help define the geothermal resource.

Leasing by the BLM vests with the lessee a non-exclusive right to future geothermal exploration within the lease area subject to existing laws, regulations, and conditions. It also vests with the lessee the "exclusive right and privilege to drill for, extract, produce, remove, utilize, sell, and dispose of geothermal steam and associated geothermal resources" ((Geothermal Steam Act of 1970 (30 U.S.C. 1001-1025) and 43 CFR subpart 3207)). To maintain this right on the leases, however, the lessee must "diligently explore the leased lands for geothermal resources until there is production in commercial quantities". Lease issuance alone does not authorize Davenport to conduct any ground-disturbing activities to explore for geothermal resources without site-specific approval for the proposed operation.

"Exploration" is a crucial first phase in the sequence of events leading to responsible use of the geothermal resource. The nature of the resource makes it inherently difficult to observe and analyze, as each geothermal field is unique and must be carefully studied—"explored"—in order to know how to best utilize it.

While it is thought that parts of Newberry Volcano have the potential for geothermal energy, it is proving to be complex and elusive. A variety of exploration techniques and scientific methods may need to be utilized by scientists and geologists in order to obtain data crucial to understanding what exists deep below the earth's surface. Exploration is an ongoing process and cannot be accomplished in one step. Sufficient exploration activities need be conducted over a period of time to provided sufficient information about the geothermal resource. There may be multiple exploration efforts before (or whether) a determination can be made regarding the geothermal resource potential of these lease areas and the best way to proceed with some type of utilization project. Any

[1] While 12 wells are proposed, one well is located on an already prepared exploration pad and therefore will not require any additional surface disturbance.

future scenarios regarding geothermal exploration or future development is dependent on drilling results and cannot be determined at this time. Future projects are beyond the scope of this EA and would be subject to a new NEPA review at the time they are proposed.

1.5 Purposes of the Proposed Action

BLM is the federal regulatory agency responsible for management and administration of our nation's geothermal resources, including leasing and subsurface geothermal exploration activities.

BLM is required to respond to proposed plans, applications, and projects submitted by a geothermal lessee (or the lessee's designated operator), under the terms of the Geothermal Steam Act and its implementing regulations. For this particular project, BLM has the responsibility to respond to the proposal by evaluating the project and making a decision of whether or not and under what terms, to allow the project to proceed. Utilization of the federal geothermal resource is dependent on the geothermal industry and commercial interests, and BLM is responsible for oversight and regulation of geothermal exploration associated with the federal leases.

BLM has a further responsibility to consider objectives from the National Energy Policy (May 2001), which includes the need "to expedite projects that will increase the production, transmission, or conservation of energy" (Section 1, Policy and Executive Order 13212). BLM must also consider objectives from the Energy Policy Act of 2005 (Public Law 109-58) of promoting the leasing and development of geothermal resources where appropriate on public lands. The current national interest in alternative renewable energy sources supports greater study and exploration of geothermal resources and requires BLM's involvement and guidance.

DOE's proposed action is to match $5 million in financial assistance to Davenport in support of utilizing innovative methods to explore for a geothermal resource and confirm the resource by drilling exploratory wells under The American Recovery and Reinvestment Act of 2009 (Stimulus Bill) for the purpose of "validation of innovative exploration technologies." The proposed action would support DOE's mission to reduce dependency on fossil fuels. By providing financial assistance to support this project, DOE would support national energy needs and the development of alternative fuel sources. Because DOE is funding part of the proposed project, DOE is listed as a cooperating agency on this EA.

1.6 Conformance with Land Use Plans

The proposed project is located on federal lands managed by the Forest Service under the Federal Land Policy and Management Act (FLPMA) of 1976. The Deschutes National Forest Land and Resource Management Plan, as amended, (LRMP) directs the resource uses in this area. The LRMP addresses and guides all Deschutes National Forest management and activities, including geothermal exploration. The LRMP specifically

addresses the potential for geothermal exploration activity, as well as development, in this area. Geothermal exploration is one of the recognized multiple uses on the Deschutes National Forest.

Forest management goals from the LRMP include the provision, "Provide for exploration, development, and production of energy resources on the Forest while maintaining compatibility with other resource values."

According to the LRMP, the desired future condition of the Forest for energy resources predicts the potential importance of the geothermal resource and states, "Large areas of the Forest have become prime targets for the exploration and development of geothermal energy. If the supply of electricity in the western states slips from surplus to deficit, geothermal energy development will become increasingly attractive." Further anticipating geothermal exploration and development, the desired future conditions also predict, "Geothermal leases and permits have been issued in a timely way. Drill pads, pipelines, power plants, and electrical transmission lines, to the extent possible, are designed and located to minimize impacts on other resources, particularly visual quality." In terms of projected outputs, the LRMP estimates that in the 2nd decade (year 2000-2009) the plan is in effect, there would be 150 megawatts of geothermal developed power plants on the Forest, and up to 200 megawatts by the 5th decade.

Forest-wide standards and guidelines in the LRMP, which provide overall Forest direction, state that "The notices and stipulations in leases issued prior to implementation of this Plan take precedent over standards/guidelines developed in this Plan. These existing leases will continue and have prior rights. Proposals to explore develop, and produce electricity on all leases, past and future will be evaluated through the NEPA process. To the extent possible, consistent with existing lease rights, standards/guidelines will be followed." The leases where activities will occur in this proposed action were all issued between 1982 and 2003.

The proposed action and alternatives described in this EA and any approved geothermal activities would be guided by the 1990 LRMP. The specific LRMP management allocations are shown in Table 1.

Forest-wide standards and guidelines in the Energy Resources section of the LRMP provide direction for mitigating effects and protecting resource values within the management areas (EN-7) and places seasonal restrictions in management areas when necessary to protect wildlife, scenic, and recreation areas (EN-8). These standards and guidelines make specific reference to management areas.

Drill site locations are either in General Forest or Scenic Views. Both allocations have Standards and Guidelines that specifically allow for geothermal uses:

S&G M8-17 (General Forest). "Geothermal leases will be issued. Conditional Surface Use and Seasonal Restrictions Stipulations will be used to protect wildlife habitat and recreation areas that are included in the General Forest Area."

S&G M9-83 (Scenic Views). "Mineral developments … may be located in these areas if the facilities and associated improvements are located, designed, and maintained to blend with the characteristic landscape.
S&G M9-84 (Scenic Views). "Trees may be removed within the Scenic Views Management Area where necessary to permit access to geothermal sites …".

1.7 Relationship to Statutes, Regulations, or Other Plans and Projects

Newberry National Volcanic Monument Act (Public Law 101-522), November 1990. In 1990, over 50,000 acres were designated as the Newberry National Volcanic Monument. This federal designation restricts geothermal development within the NNVM itself but provides for geothermal operations to occur outside the Monument's boundaries. There actually are several areas within the NNVM that allow for exploration and development under specific conditions.

The initiative for a national monument grew out of local concerns about the possibility of geothermal development in and around the Newberry caldera. The legislation was the culmination of a local grassroots effort to address the probable conflict in and around the caldera between developing the geothermal resource and the preserving the unique values and scenic features of the same area. A 30-member "Monument Citizens' Committee" representing a wide range of interests with a common vision came to a consensus for establishing a boundary and identifying management goals and objectives for this area. The solid work of the committee, which included representatives from environmental groups, geothermal interests, timber industry, local and federal governments, elected officials, and recreation enthusiasts, resulted in congressional action to create the Newberry National Volcanic Monument on November 5, 1990.

There is nothing in the Monument Act that prohibits geothermal exploration activities outside the boundary, and there are no protective perimeters or buffer zones established outside the NNVM. "The fact that activities or uses outside the Monument and Special Management Area can be seen, heard, measured, or otherwise perceived from within the Monument and Special Management Area shall not, of themselves, limit, restrict, or preclude such activities or uses up to the boundary of the Monument and the Special Management Area" (Sec. 8(a), Public Law 101-522).

Newberry National Volcanic Monument Comprehensive Management Plan, August 1994. As mandated in the Monument Act, a Comprehensive Management Plan (CMP) was prepared for the NNVM to establish programmatic direction for management of the National Forest lands within the newly created Monument. While the CMP was not intended to address geothermal exploration outside the NNVM boundary, it provides direction for surface lands and resources for four specially designated areas (Special Management Area, Transferal Area Adjacent, Transferal Area, and Transferal Corridor), within the Monument boundary. These areas may be conditionally used for geothermal exploration and development under certain circumstances.

Consistent with the Monument Act, the CMP and the Environmental Impact Statement on which it is based, recognize that there are valid existing geothermal lease rights outside the Monument boundary and geothermal development adjacent to the Monument is anticipated. One of the basic goals for managing the Monument is "To manage the surface of the Special Management Area and of the Transferal Area Adjacent as part of the Monument, while allowing subsurface exploration for and development of geothermal resources."

Programmatic Environmental Impact Statement for Geothermal Leasing in the Western US, December 2008. One of the goals of this document is to facilitate geothermal leasing decisions in the western US. The Programmatic Environmental Impact Statement (PEIS) included a comprehensive list of stipulations, best management practices, and procedures to serve as consistent guidance for geothermal exploration and development. This EA is consistent with the PEIS, and incorporates by reference effects already analyzed and addressed in the PEIS and Record of Decision.

The National Energy Policy (May 2001) and Executive Order 13212 applies to this and other energy-related projects and directs federal agencies (including BLM, Forest Service and DOE) "to expedite projects that will increase the production, transmission, or conservation of energy", and "expedite their review of permits or take other action as necessary to accelerate the completion of such projects".

The Energy Policy Act of 2005 (Public Law 109-58) applies to BLM, Forest Service and DOE in that it addresses promoting the leasing and development of geothermal resources where appropriate on public lands.

Under the terms of the Geothermal Steam Act of 1970 (Public Law 91-581) and its implementing regulations, BLM is required to respond to proposed plans, applications, and programs submitted by a lessee or the lessee's designated operator.

This EA has been prepared in accordance with the National Environmental Policy Act of 1969 and the Council of Environmental Quality (CEQ) regulations (40 Code of Federal Regulations [CFR] 1500-1508) implementing NEPA, and the Federal Land Policy and Management Act (FLPMA) of 1976. This EA has also been prepared in accordance with The BLM National Environmental Policy Act Handbook H-1790-1, January 2008.

1994 Newberry Geothermal Pilot Project Final EIS and Record of Decision. In 1994, the Deschutes National Forest, the Prineville District BLM, and the Bonneville Power Administration analyzed potential effects of a federal pilot project for geothermal exploration, development, and production of electrical power on federal leases near those currently held by Davenport. The project was approved and implemented in 1994 and several exploration wells were drilled; however, the exploration results were not conclusive and the project was suspended in 1996. The leases now belong to another company who continues to maintain the project area in accordance with BLM and Forest Service direction and oversight

2007 Newberry Geothermal Exploration Project EA and Decision Record (OR-050-075). The 2007 EA and Decision Record issued by BLM are also incorporated by reference in this EA. The 2007 EA analyzed a project that involved drilling deep geothermal exploration wells (10,000 feet deep or more) on three well pads each approximately 5 acres in size. The well pads were constructed and to date two wells have been drilled and are presently being monitored and evaluated. Although that project differs from the current proposal being analyzed in that it involved much larger well pads and deeper wells designed to reach the geothermal resource, it occurred on leases in the same general area, involved similar issues, and evaluated similar surface resources making many aspects of the analysis and decision suitable for incorporation by reference.

1.8 Scoping and Identification of Issues

In October 2009, scoping letters were mailed to more than 400 individuals, organizations, agencies, and central Oregon Tribes to notify potentially interested parties about the proposed action and to provide an opportunity for them to submit comments to be considered in the environmental analysis. Mailing lists from Prineville BLM, the Deschutes National Forest, and Davenport were combined for use during scoping efforts to ensure that the greatest amount of interested and potentially interested parties would be reached. Additionally, on November 4, 2009 the local Bend Bulletin newspaper included an article about the opportunity to submit scoping comments

Also in October 2009, Davenport emailed an informational update, which provided information about the upcoming project proposal to approximately 250 recipients on their electronic mailing list.

Print and internet media coverage has also been extensive since late 2008. More than a dozen articles regarding continued exploration efforts, particularly planning for the current temperature gradient and monitoring wells, have appeared in major local print and online publications, including *The Bulletin*, *The Source*, and the *Cascade Business News* from Bend, La Pine's *Newberry Eagle*, and the *Sunriver Scene*. Coverage has also occurred regionally and statewide in *The Oregonian*, Roseburg's *News-Review*, and Eugene's *Register-Guard*. Since late 2008, total local, statewide, and regional media coverage events likely exceeded 4 to 5 dozen in number as other outlets pick up published articles or stories.

The BLM and Deschutes National Forest have continued consultation with the Confederated Tribes of the Warm Springs Reservation, the Klamath Tribes, and the Burns Paiute Tribes, and will continue consultation throughout the NEPA process.

The Klamath Tribe received return receipt invitations to consult with the BLM on this project.

Refer also to Chapter 5, Consultation and Coordination, for additional contacts.

As a result of scoping efforts, four written responses were received from the public and considered during the EA process. The response letters were reviewed and analyzed, and all substantive and relevant comments were considered and addressed. The four written responses are summarized below.

One letter from a local chapter of a national environmental group expressed concerns about impacts from a large geothermal energy production plant, violations of the National Environmental Policy Act (NEPA) regarding piecemeal analysis and the need for an EIS, cumulative impacts, the role of the NNVM legislation in geothermal development, and induced small earthquakes or seismic activity.

A second letter from a statewide environmental group expressed concerns about a number of topics, including the proximity to the NNVM, lack of a comprehensive national energy policy, large scale geothermal energy development, discovery of a dry steam geothermal resource, riparian areas, roadless areas, old growth forests, removing trees, scenic views, hydrology or thermal character of NNVM and National Forest, water and water rights, wildlife habitat, hunting opportunities, and roads.

A third letter from an member of Oregon's congressional delegation expressed concerns about visual and water resources, local Indian tribes, abandonment of wells, large scale power plant development (including transmission lines) in this area, hot dry rock techniques, impacts to the Monument, and the congressional intent of the Monument legislation.

The fourth letter was from a local citizen who expressed support for the proposed project.

Issues are developed by agency specialists and are essentially an effect on a particular resource or resource component that is relevant to the analyses. As issues are identified for evaluation in the effects analysis, the specialists also carefully consider concerns expressed by the public during scoping. If an expressed concern is determined to not be relevant, then it is dismissed and will not be carried forward into the effects analysis.

In some cases, expressed concerns reflect topics that are resolved but merit some clarification and can briefly be mentioned indirectly within the EA. Other expressed concerns are beyond the scope of analysis and will not be considered further in the EA process.

Relevant issues to be carried forward, addressed, and analyzed in Chapters 3 and 4 include the potential for the following effects:

1. Wildlife and Wildlife Habitat
   - Disruption of nesting or removal of nesting, foraging, and fledgling habitat within 0.25 miles of drilling activity
   - Disturbance of nesting sites during breeding season for bald eagle, osprey, goshawk
   - Removal of tree cover within wildlife travel corridors

- Noise disturbance over an extended period of time to render the travel corridor less effective during the season of use

2. Visual Quality
   - Visibility of new created openings and vegetation removal as seen from designated scenic viewpoints
3. Timber Resources
   - Removal of vegetation from established tree plantations and managed timber stands
   - Volume and type of trees to be removed

Many other issues and concerns were expressed by the public. Please refer to Appendix A for the list of issues outside the scope of this analysis and reasons these additional issues were not analyzed.

1.9 Summary

This chapter has presented the purpose and need of the proposed project, as well as the relevant issues, i.e., those elements of the human environment that could be affected by the implementation of the proposed project. In order to meet the purpose and need of the proposed project in a way that resolves the issues, BLM and DOE have considered the no action alternative. The potential environmental impacts or consequences resulting from the implementation of the proposed project and the no action alternative are analyzed in Chapter 4 for each of the identified issues.

2.0 DESCRIPTION OF ALTERNATIVES, INCLUDING PROPOSED ACTION

2.1 Introduction:

Two alternatives were analyzed for the purpose of this EA: the proposed action and the no action alternatives. One other alternative was considered but not further analyzed. That alternative had 3 alternate pad locations, but the locations of these alternate sites were not suitable for answering the scientific questions related to exploration evaluation of this area and therefore would not meet the Purpose and Need of the project. The proposed locations were carefully selected on existing leases in order to test previously acquired geophysical data. The drill sites were chosen with a preference for open areas in the surrounding canopy and in areas with younger reproduction in plantations of trees.

2.2 Alternative A - Proposed Project:

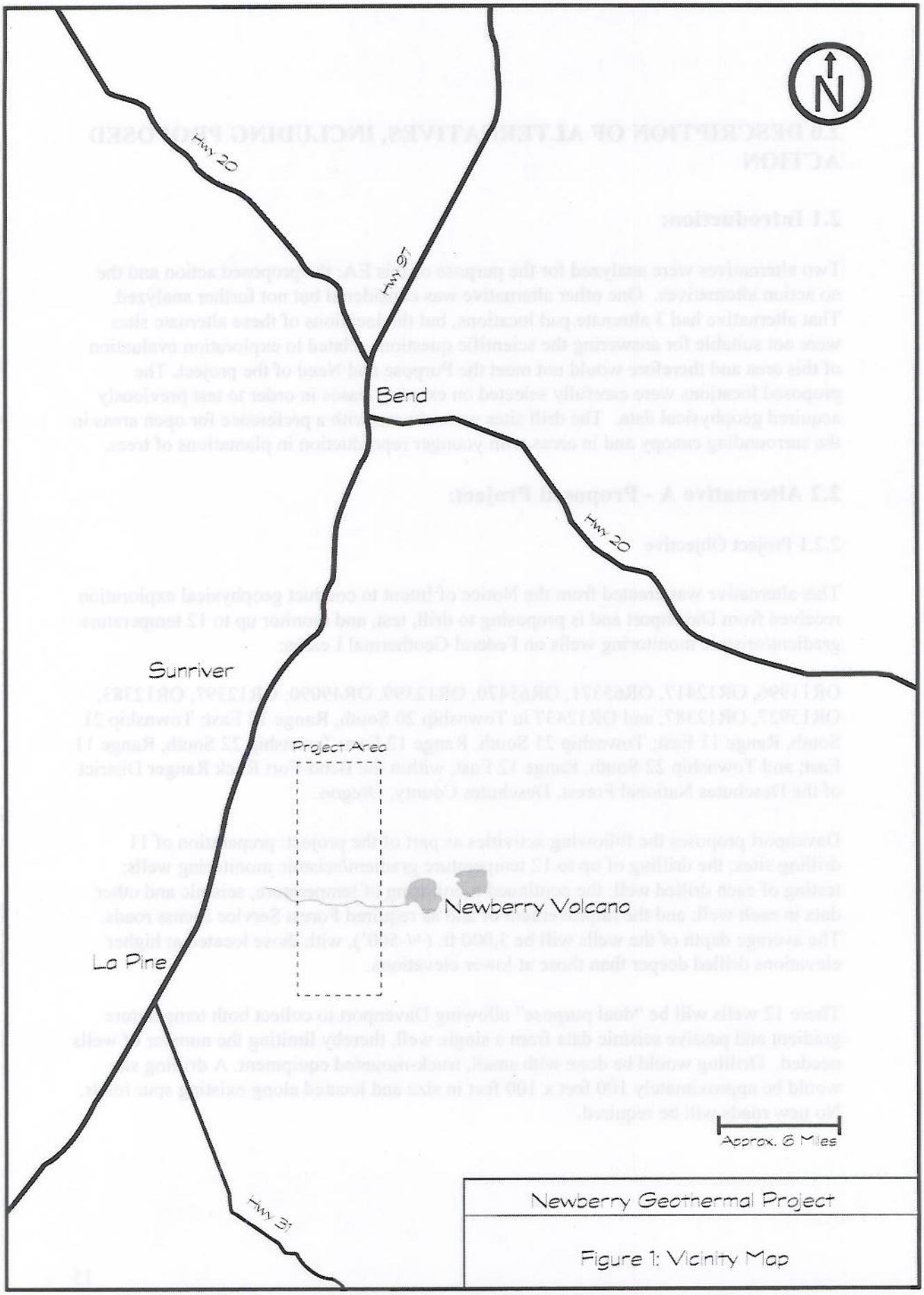
2.2.1 Project Objective

This alternative was created from the Notice of Intent to conduct geophysical exploration received from Davenport and is proposing to drill, test, and monitor up to 12 temperature gradient/seismic monitoring wells on Federal Geothermal Leases:

OR11996, OR12417, OR65371, OR65470, OR12399, OR49090, OR12397, OR12383, OR15927, OR12387, and OR12437 in Township 20 South, Range 12 East; Township 21 South, Range 11 East; Township 21 South, Range 12 East; Township 22 South, Range 11 East; and Township 22 South, Range 12 East, within the Bend-Fort Rock Ranger District of the Deschutes National Forest, Deschutes County, Oregon.

Davenport proposes the following activities as part of the project: preparation of 11 drilling sites; the drilling of up to 12 temperature gradient/seismic monitoring wells; testing of each drilled well; the continued monitoring of temperature, seismic and other data in each well; and the improvement of and as required Forest Service access roads. The average depth of the wells will be 3,000 ft. (+/-500'), with those located at higher elevations drilled deeper than those at lower elevations.

These 12 wells will be "dual purpose" allowing Davenport to collect both temperature gradient and passive seismic data from a single well, thereby limiting the number of wells needed. Drilling would be done with small, truck-mounted equipment. A drilling site would be approximately 100 feet x 100 feet in size and located along existing spur roads. No new roads will be required.



Newberry Geothermal Project

Figure 1: Vicinity Map

The upper portion of each well (down to approximately 600 to 1000 ft.) would be drilled using rotary reverse circulation technology. A 4.5 inch casing will be cemented in place and passive seismic monitoring will begin. Geophones will be placed in this top section of the well for a period of approximately one week.

When the passive seismic monitoring portion of the project is completed, the geophones will be removed and a truck mounted core drill rig will be brought in to drill the lower portion of the well to a final depth of 3,000 ft. (+/-500'). The lower portion of the wells will be drilled with a truck mounted core drill rig, producing a continuous set of core from the base of the 4.5 inch casing to the total depth of the hole.

Each hole will be completed with the placement of tubing, approximately 2 inches in diameter, and sealed at the bottom. The tubes will be filled with water, providing a static column of water for obtaining temperature data. Very low viscosity mud will be put in the hole, around the tubing in the completed hole. Surface completion of each hole will be with a stand pipe approximately 12 inches in diameter. This stand pipe will be cemented into the ground and have a locking lid, for safety and security purposes. The stand pipe will extend approximately 1 foot above the surface.

The drilling of each well would take approximately 2 weeks for the upper section of the well and 4 weeks for the lower section. The completed temperature gradient wells will collect data: first, one month after well completion, and second, 6 months after well completion. Once all data has been collected, and there is no possible future need for the wells, each well will be plugged and abandoned and each site will be restored to its original condition as required by the BLM and Forest Service.

Figure 2: Detailed Location Map, illustrates the location of the proposed project sites within the Newberry Volcano area. One site is on an existing Davenport drill pad. The locations of the drilling sites are shown in Figure 2 and the table below. All sites are directly off of existing USFS roads. No new roads will be constructed. The proposed well locations have been chosen based on the cumulative geophysical data available.

Table 1: Drill site locations:

Name	Location (Sec, T, R)	Lease Number	Access Road	USFS Management Allocation
TG 29N	Sec 29, T20S, R12E	OR11996	FS 9720	Scenic Views
TG 17N	Sec 17, T21S, R12E	OR12437	FS 9735-600	General Forest
TG 24N	Sec 24, T21S,	OR12417	FS 9736-300-155	Scenic Views

	R11E			
TG 19N[2]	Sec 19, T21S, R12E	OR65371	FS 9735-500-540	General Forest
TG 30N	Sec 30, T21S R12E	OR65470	FS 9736-300-370	General Forest
TG 32S	Sec 32, T21S, R12E	OR12399	FS 2215-600-800	Scenic Views
TG 2S	Sec 2, T22S R11E	OR49090	FS 9736-720	Scenic Views
TG 5S	Sec 5, T22S, R12E	OR12397	FS 2215-700-748	General Forest
TG 12S	Sec 12, T22S, R11E	OR12383	FS 2215-550	General Forest
TG 7S	Sec 7, T22S, R12E	OR12397	FS 2215-390	General Forest
TG 16S	Sec 16, T22S, R12E	OR15927	FS 2225-400	General Forest
TG 19S	Sec 19, T22S, R12E	OR12387	FS 2225-310	General Forest

Site Preparation

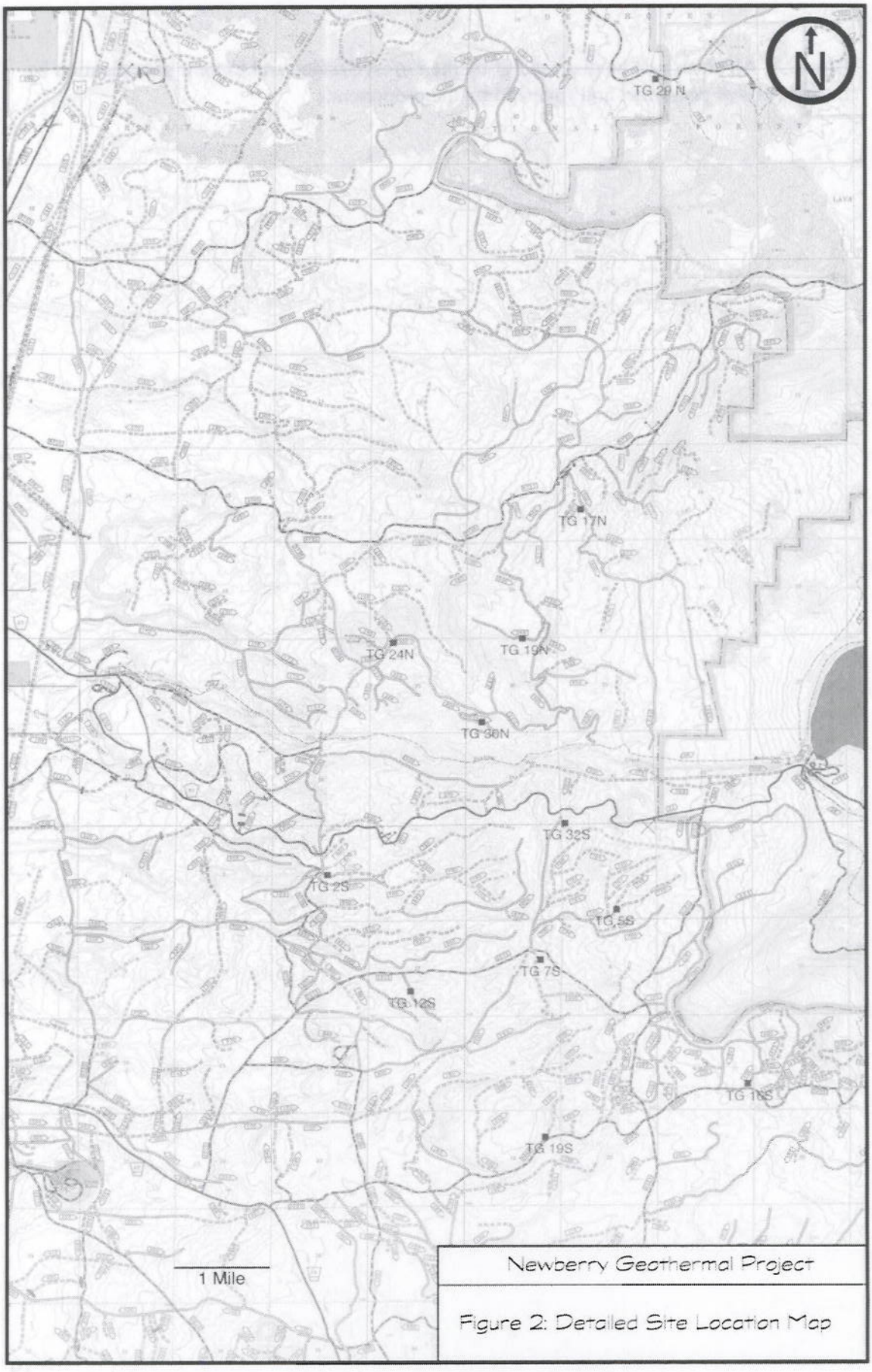
Previously disturbed areas with minimal vegetation were sought for drill sites. The locations were carefully selected with a preference for open areas in the surrounding canopy and in areas with younger reproduction in plantations of trees. Clearing of vegetation at the well site locations and along some access roads would be conducted where necessary to allow for safe access and placement of the truck-mounted drilling rig and auxiliary equipment. All of the drilling locations are directly accessible by existing Forest Service roads. No new roads will be constructed. On some of the narrower spur roads, some trimming of vegetation will be necessary as well as some light grading in spots where the road has not been maintained. Each site will be no larger than approximately 100 feet x 100 feet in size. Site preparation would include removal of vegetation and some surface leveling with a backhoe. No fill material is needed for the preparation of the drilling sites.

All trees to be removed on the sites larger than 4" diameter at the stump will be designated and marked by Forest Service representatives before felling. All lodgepole pine 7.0 inches diameter breast height (d.b.h.) to a 6.0" diameter inside bark (d.i.b.) top and an 8 foot minimum length and ponderosa pine 8" d.b.h. to a 6" d.i.b and 8' minimum length and larger will be piled close to the road and all other material 4.0 inch d.b.h to 2.0" top and a 16 foot minimum will be piled separately close to the road to be sold as

[2] TG 19N- Highway 9736 is a Safety Act road and will require additional road considerations which include:

- Transportation and sign plan will be submitted and approved by FS prior to activity at this site
- Appropriate road signing will meet MUTCD standards.
- All activities must be safely off the roadway.
- Will require certified flaggers during operation periods.
- Will need adequate sight distances for traffic pulling onto 9736.

Biomass. All slash will be disposed of by the Forest Service and to their specification by Forest Service personnel and financed by the proponent.


N
TG 29 N
TG 17N
TG 24N
TG 19N
TG 30N
TG 32S
TG 2S
TG 5S
TG 7S
TG 12S
TG 18S
TG 19S
1 Mile
Newberry Geothermal Project
Figure 2: Detailed Site Location Map

Reserve/Sump Tanks

A series of 3 reserve tanks will be used for the containment of drilling muds, cuttings, and other operations by-products at each well site. Each reserve tank would be approximately 10' x 10' x 10' deep. Each tank will have an approximate 7,500-10,000 gallon capacity. These tanks will be removed once drilling is completed and the non-toxic drilling mud and cuttings will be disposed of at an approved site.

Well Drilling

The drilling plan for proposed wells is described in Appendix B - Drilling Plan. This is representative of the drilling plan for all of the wells, as they will be essentially identical in design. This is also representative of the plan for all wells but is subject to change depending on conditions encountered with the first well. Figure 3 shows a typical truck-mounted drilling rig that would be used to drill the temperature gradient wells.

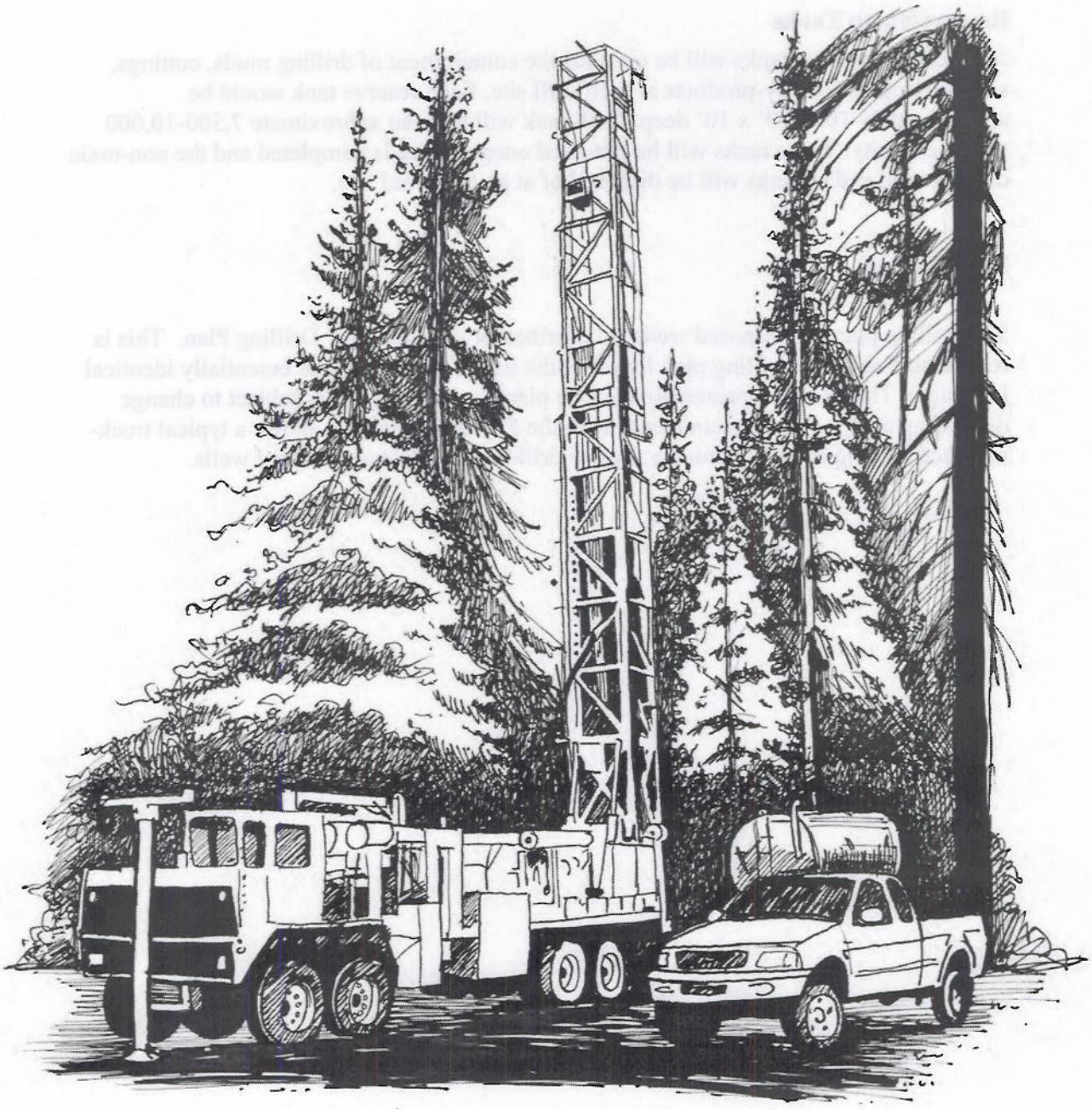


Figure 3: Artist Rendering of a Typical Truck Mounted Drilling Rig on Site

Schedule

The proposed project would begin in the spring of 2010, as soon as it is possible to access the sites, and is anticipated that it will be completed by December 2011. Drilling will take approximately 2 weeks for the upper section of each well and 4 weeks for the lower section. Drilling will be conducted 24 hours/day with two crews working 12 hours per shift.

Equipment and Crew

The actual drilling of the wells would be accomplished by a contracted drilling company and overseen by Davenport staff with monitoring by BLM and the Forest Service. After brushing access roads and preparing the drill sites, the drilling contractor would move in the truck-mounted drill rig and related equipment. Each crew would comprise of 3 people. It is not anticipated crews will camp on site. Drilling crews will be housed offsite. One trailer will be located on site to allow the drilling supervisor to be there for 24 hours/day for short periods of time should difficult drilling scenarios be encountered. Portable toilets will handle sanitary waste.

Water Source

Water will be provided by existing water wells at Davenport's two previously constructed exploration pads (well pads 55-29 and 46-16). The water will be delivered to the drilling sites by up to two 3,500-4,000 gallon water trucks. Water usage will be 2,000-3,000 gals per day for 4-7 days per well for the upper portion of the wells. The lower portion of the wells will require 400-500 gals per day for approximately thirty days per well.

Fire Prevention

Fire precaution measures will be in place and in accordance to Forest Service Industrial Precaution Level (IFPL) fire prevention program for the Central Oregon Fire Management Service (COFMS). Fire extinguishers and tools will be kept on site at all times and with each vehicle and the employees will be instructed in their use. Communication will be maintained and emergency services will be contacted in the event of an emergency. An operating plan for emergency notification needs to be in place prior to implementation.

Spark arresters will be used on all potential spark-emitting equipment. Smoking would be allowed only in designated areas. All local state, and federal fire protection standards applicable to the activities of the project will be observed.

Hydrogen Sulfide (H2S)

While it is not anticipated that H_2S will be encountered while drilling, crews will be prepared for such a scenario. H_2S monitors will be placed at the discharge line on the

truck-mounted drill rig at each site to monitor for the presence of H_2S. In addition, all drilling personnel will be required to have had H_2S safety training prior to arriving on location.

Site Personnel

To complete the proposed project, approximately 3 persons may be at a well site 24 hours per day at any given time during drilling operations. Two crews of 3 people working 12-hour shifts, with two 12-hour shifts per day. There could also be one to two supply personnel on site at any given time performing specialty operations such as mud mixing, refueling, cementing, or delivering supplies. In addition, a geologist will be on location throughout drilling operations.

Public health and safety will be ensured through the use of appropriate equipment, operating procedures and notices. Appropriate warning signs will be posted on all construction and testing equipment as necessary. Supervisory personnel will be on site during the course of operations. Public access into the drill sites will be restricted for safety.

Well Testing

The passive seismic monitoring will be conducted during the interim between the rotary drilling and the core drilling stages of the temperature gradient wells. Geophones for passive seismic monitoring will be placed in the rotary-drilled and cased upper portion of each of the temperature gradient wells (approximately 700 ft deep). Data will be collected continuously for a period of approximately one week.
Once this data has been collected, the geophones will be removed and a truck-mounted core rig will be brought back on site to complete the drilling of the lower portion of the temperature gradient well.

Each hole will be completed with the placement of tubing, approximately two inches in diameter, and sealed at the bottom. The tubes will be filled with water, providing a static column of water for obtaining temperature data. Very low viscosity mud will be put in the hole, around the tubing, to avoid vertical movement of groundwater in the completed hole.

Each temperature gradient well will be measured for water temperature at least twice, first a minimum of one month after well completion, and second a minimum of six months after well completion. To economize on data collection equipment mobilization costs, the measuring unit will be brought into the area only once for each data collection run.

2.2.2 Temperature Gradient Well Reclamation

Once the temperature and geophysical data has been collected, each site would be restored to its original condition. Restoration of the sites would include plugging and

abandoning the wells and planting of vegetation as specified by the BLM and Forest Service. Reclamation activities are shown in Table 2 below.

Table 2: Reclamation and Restoration

Site	Reclamation Activities
TG29N	Subsoil portions of site that have become detrimentally compacted. Where previously un-compacted sites are used; salvage and stockpile topsoil materials and coarse woody debris (CWD) that are scraped or excavated from the surface as a result of grading and site development. Re-apply and contour topsoil materials and any CWD back onto the site. Pile residual material remaining from grapple contract.
TG17N	Existing well pad.
TG24N	Pile slash.
TG19N	Subsoil portions of site that have become detrimentally compacted. Subsoil drill pad sites in plantations where subsoiling occurred previously. Pile slash.
TG30N	Pile slash.
TG16S	Cut and Deck merchantable logs to specifications. Subsoil portions of site that have become detrimentally compacted. Where previously un-compacted sites are used; salvage and stockpile topsoil materials and coarse woody debris (CWD) that are scraped or excavated from the surface as a result of grading and site development. Re-apply and contour topsoil materials and any CWD back onto the site. Pile any material generated from activity. Dead down material from past treatment needs to be piled with newly created material. Plant ponderosa pine and protect from animal damage.
TG2S	Pile slash. Allow for natural lodgepole pine regeneration.
TG5S	Cut and Deck merchantable logs to specifications. Pile any material generated from activity. Dead down material from past treatment needs to be piled with newly created material. Allow natural lodgepole regeneration.
TG12S	Subsoil drill pad sites in plantations where subsoiling occurred previously. Decommission non-system that may be used for drill site access after project completion. Pile slash and cut brush. Plant ponderosa pine and protect planted trees from animal damage.
TG19N	Pile slash.
TG7S	Subsoil portions of site that have become detrimentally compacted. Recontour any excavated soil materials resulting from site leveling on gentle or moderate slopes. Pile any material generated from activity. Heavier brush component, any brush cut will be piled with thinning slash. Allow natural regeneration of lodgepole pine.
TG32S	Cut and Deck merchantable logs to specifications. Where previously un-compacted sites are used; salvage and stockpile topsoil materials and coarse woody debris (CWD) that are scraped or excavated from the surface as a result of grading and site development. Re-apply and contour topsoil

	materials and any CWD back onto the site after project. Pile slash. Allow natural lodgepole regeneration.

2.3 Alternative B - No Action:

Under the No Action alternative, the geothermal exploration activities proposed by Davenport would not be approved. Analysis of this alternative is required by the National Environmental Policy Act to establish a base line from which to evaluate the relative impact to the environment of implementing the proposed action.

If this alternative were selected, no drilling sites would be prepared and no exploratory drilling would occur, the access roads would remain at their current or appropriate maintenance level.

Meeting the Purpose and Need

The No Action alternative would not meet any elements of the Purpose and Need:

- With this action no additional information would be acquired regarding the geothermal resources, and there would not be an opportunity to gain further knowledge about the volcanic and geologic features of the area.
- With this action the BLM would not be carrying out the intent of the federal geothermal leases issued from 1982 to 2003, which allows the lease holder to pursue geothermal activities on these lease areas nor would it meet the intent of the National Energy Policy or the Energy Policy Act.

2.4 Alternatives C - Other Action Alternatives:

No other action alternatives were considered other than the proposed action.

2.5 Alternatives Considered, but Eliminated from Further Analysis:

The BLM considered whether other alternatives could address the proposed action, whether any other alternatives would be significantly different or have significantly different effects, and whether there would be a reasonable need to evaluate other alternatives. Upon satisfactory review of the technology, operations, and equipment proposed in the Plan, BLM did not identify other alternatives that would meet the purpose and need.

2.6 Comparison of Alternatives

Table 3 below provides a comparison of the alternatives. For more detailed descriptions of the environment and the effects of the alternatives, please refer to Chapter 3.

Table 3: Comparison of Alternatives

	Unit of Measure	Alt. A: Proposed Action	Alt. B: No Action
Wildlife	Acres of tree cover removed in designated travel corridors and old growth areas	< 1.0	0
Visuals	Number of sites and size in acres of areas that would have vegetation removed sufficient to be seen from designated viewpoints	10 sites, <2.5 acres	0
Vegetation/Tree Plantations	Average Size, number, and species of trees to be cut	Specific to Each Site listed below:	0
	TG 29N	Approx. 12, 5 inch Avg. DBH Ponderosa and/or Lodgepole pine	0
	TG 17N	0 (on existing well pad)	0
	TG 19N	Approx. .25 acres, Avg. 5 ft. tall Lodgepole Pine	0
	TG 24N	0 (existing opening)	0
	TG 30N	Approx 20, 8 inch Avg. DGH White Fir	0
	TG 32S	Approx. 50, < 6 inch DBH Lodgepole Pine	0
	TG 2S	Approx. 50, 1-5 ft. tall Lodgepole Pine	0
	TG 5S	Approx. 40, 3-6 ft. tall Lodgepole	0

		Pine	
	TG 7S	Approx. .25 acres, <5 ft. tall Lodgepole Pine	0
	TG 12S	Approx. 10, 5-8 ft. tall Lodgepole and Ponderosa Pine	0
	TG 16S	Approx. 25, < 5 inch DBH Lodgepole Pine	0
	TG 19S	Approx. 10, 6-10 ft. tall Lodgepole Pine	0

3.0 AFFECTED ENVIRONMENT

3.1 Introduction:

This chapter presents the potentially affected existing environment of the project area in terms of relevant issues as identified by the interdisciplinary specialists and presented in Section 1.8. This chapter provides the baseline for comparison of impacts and consequences described in Chapter 4. Discussion is limited to the issues and environmental elements which are necessary to understand and evaluate the proposed project and the No Action Alternative.

3.2 General Setting:

The general project area encompasses Davenport's federal geothermal lease positions on the western flank of Newberry Volcano, outside the Newberry National Volcanic Monument (NNVM) and within the Bend-Fort Rock District of the Deschutes National Forest. The project area is adjacent to (but not within) the NNVM. One site (TG29N) is near an Inventoried Roadless Area.

The project area is located on the northwestern, western and southwestern flanks of Newberry Volcano, a 500-square mile shield volcano—one of the largest in the Cascade Range. The area covers approximately 32,000 acres and the terrain is made up of pressure ridges, tumuli, and gently to moderately sloping high lava plains. The habitats through the project area consist predominately of dry pine forest (lodgepole and ponderosa) of various age classes with a few white fir mixed throughout. Manzanita, *Ceanothus. sp* and several species of currant make up the deciduous shrub understory at most sites with grasses, forbs, conifer duff, and other downed woody material comprising the ground cover.

A history of fire exclusion, beetle damage, and logging has substantially altered the forest vegetation in most of the proposed well site locations. Most of the proposed well sites are small openings adjacent to or within young stands. A few stands have been managed using the uneven-aged silviculture system in which trees of different species in a given stand are maintained at many ages and sizes to permit continuous natural regeneration.

There are numerous Forest Service roads in and around the project vicinity that were constructed and maintained for forest management, timber sales, recreation access, and general public or commercial uses. There are user created roads in the area as well.

Over the 32,000 acre lease area, 12 specific locations have been selected and proposed as sites to drill temperature gradient/passive seismic monitoring wells, one of which is on an existing drill pad. Each of the remaining sites would be no larger than 100 feet by 100 feet in area. Total area subject to potential disturbance will be less than 2.5 acres, over a 32,000 acre project area. Each of these sites is described individually below in Section 3.5.1 and in Chapter 4, Section 4.3.3.

3.3 Resources/Issues Brought Forward for Analysis:

As described in Chapter 1.8 - Scoping and Identification of Issues, relevant issues to be carried forward, addressed, and analyzed in Chapters 3 and 4 include the potential for the following effects:

1. Wildlife:

   Exploratory drilling has the potential to disrupt nesting attempts and/or remove nesting, foraging, or fledgling habitat on the proposed drilling sites which are within 0.25 miles of nests (1.0 miles for blasting). Drilling activities have the potential to disturb nesting sites during the breeding season (Jan 1 - Aug 31 for bald eagles, April 1- Aug 31 for osprey, and March 1- Aug 31 for goshawk). Drilling also has the potential to remove tree cover within wildlife travel corridors and produce sufficient noise disturbance over an extended period of time to render the travel corridor less effective during the season of use. The Deschutes LRMP Wildlife Standards and Guidelines that support this issue statement include: WL-1, 2 - 5, 12, and 56.

2. Visual Quality:

   Vegetation removal on the drill sites has the potential to cause small areas to not meet the goals for highest possible visual quality as seen from selected viewpoints. The Deschutes LRMP Standards and Guideline that supports this issue statement is M8-19.

3. Disturbance to existing plantations and established tree stands:

   Clearing of drilling sites has the potential to remove vegetation from established plantations and young or mature timber stands. This may result in a loss of investment in time and dollars that have been spent to replant and manage these stands towards a timber production goal on General Forest lands. The Deschutes LRMP Standards and Guideline that supports this issue statement include TM-7, M8-17, and M8-27.

3.4 Units of Measure for the Above Issues

1. Wildlife:

   - Acres (or square feet) of tree cover removed in designated travel corridors and old growth areas

2. Visuals:
   - Number of sites and size in square feet of areas that would have vegetation removed sufficient to be seen from the designated viewpoints.
3. Disturbance to existing plantations and established tree stands:
   - Volume to be cut at each site, average size (diameter, height) of trees being cut, and/or species of trees to be cut.

3.5 Existing Conditions of Resources Brought Forward for Analysis

3.5.1 Wildlife:

In early August 2009, Northwest Wildlife Consultants conducted a database search for special status wildlife species records in the vicinity of the proposed well site locations. They also conducted a wildlife and habitat field investigation at and around each site.[3] Species of interest included those determined to be "Management Indicator Species" (MIS) by the Deschutes National Forest Land and Resource Management Plan (USDA 1990) and "priority migratory bird species" as per the Migratory Bird Treaty Act (MBTA). Lists of migratory birds considered being "Birds of Conservation Concern" (BCC) by the U.S Fish and Wildlife Service (USDI 2002) for Bird Conservation Region 9 (BCR 9), and "focal" species by the Oregon-Washington Partners in Flight (Altman 2000) were used to address MBTA species.

In addition to this survey, the first year of field surveys for the northern goshawk in the Ogden project area were completed in July 2009 by Forest Service wildlife biologists. These surveys overlapped a large portion of the project area.

There is suitable habitat or potentially suitable habitat in or near the proposed project area for Cooper's hawk, northern goshawk, sharp-shinned hawk, red-tailed hawk, northern flicker, hairy woodpecker, and flammulated owl. The general vicinity of the Project is used mostly during spring, summer, and fall by mule deer and rocky mountain elk, and these species do occur in the area.

A description of existing habitat and species of interest detected are listed for the general area around each of the proposed well sites below:

Temperature Gradient Well 29N, T20S, R12E (Section 29)

This proposed drill site is located in a recently thinned ponderosa stand, with a few remnant older trees up to 88 cm DBH. Canopy cover does not exceed 40%. Due to the recent management, there is no real understory vegetation and the stand could be

[3] The following habitat descriptions are for the general area at and around the individual wells sites. The actual well sites are typically smaller existing open areas within these larger described areas.

considered even-aged. The sparse groundcover consists primarily of manzanita, with a little *Ceanothus* and a few forbs and grasses. There is some downed woody material left over from the previous management, and there are some small snags and standing dead trees that could provide foraging sites for generalist woodpeckers. The north side of road adjacent to the well site consists of a stand that is relatively uneven-aged and has not been recently logged. This stand is composed of primarily ponderosa pine in the upperstory, a fuller understory, and denser groundcover. Accipiter calls were broadcast throughout the survey area with no response.

Temperature Gradient Well 17N, T21S, R11E (Section 17)

This proposed site is located on an already developed 5-acre exploration well pad that was surveyed and permitted in 2007. No additional surface disturbance will be required.

Temperature Gradient Well 24N, T21S, R11E, (Section 24)

This proposed well site adjacent to McKay Butte consists of an uneven-aged previously-harvested stand of ponderosa pine (up to 68 cm DBH), some younger lodgepole pine, and a few older white firs. Very little understory vegetation existed, including a few forbs and grasses, with abundant downed woody and some standing dead lodgepole. Canopy cover in parts of the survey area exceeded 50%. Accipiter calls were broadcast throughout the area and an adult northern goshawk responded. This individual flew in from the west and perched at the top of a ponderosa pine, calling back in response to the broadcast calls. The survey area is presumed to be part of a nesting territory; however, no nests were found in the survey area. There were suitable snags for nesting woodpeckers in the area as well as likely foraging habitat for some generalist woodpecker species.

Temperature Gradient Well 19N, T21S, R12E (Section 19)

This proposed well site is located in a shallow basin, and the majority of the area has been heavily-logged in the past. The vegetation consists of a lodgepole pine plantation, with a few remnant larger trees that were not harvested (white fir up to of 73 cm DBH). The understory is very sparse younger conifer saplings, and the groundcover consists of dense manzanita and currant with a few forbs and grasses. Better wildlife habitat exists on the south side of the Forest Service road that divides the survey area (the proposed well would be on the north side); consists of an uneven-aged stand with much more upperstory and even some canopy closure. There is greater species diversity of upperstory trees as well as understory and ground cover species. Due to the early age of the plantation and lack of larger trees there is little snag component and limited possibilities for foraging woodpeckers. Accipiter calls were broadcast throughout the survey area with no response. There was a fairly well-used mule deer trail into the plantation from an adjacent stand, with new understory growth and ground cover attracting the deer.

Temperature Gradient Well 30N, T21S, R12E (Section 30)

This proposed well site is dominated by ponderosa pine (up to 54 cm DBH) with some older white fir and young lodgepole pine. The ground cover consists primarily of dense manzanita and a few forbs and grasses. The area could be considered reasonably mature with mixed-age trees providing some canopy closure in parts of the stand. There is a fairly significant standing dead tree component that includes some larger snags (white fir of 71 cm DBH), which can and probably does provide foraging and nesting opportunities for generalist woodpeckers. Accipiter broadcast calls were conducted with no response; however, there is moderate likelihood of use during the breeding season by accipiters, especially sharp-shinned and Cooper's hawks.

Temperature Gradient Well 32S, T21S, R12E (Section 32)

This proposed well site is a previously-managed dry pine forest consisting almost exclusively of young lodgepole pine with very few young white firs mixed throughout. The ground cover is predominantly *Ceanothus sp.*, manzanita, and currant sp. There were no snags suitable for cavity nesting birds found within the survey area. Accipiter calls were broadcast throughout the area with no response.

Temperature Gradient Well 2S, T22S, R11E (Section 2)

This proposed well site is a previously-managed dry pine forest consisting of primarily young lodgepole pine with some older ponderosa pine- up to 60 centimeters (cm) diameter at breast height (DBH). The ground cover is a mix of bitterbrush, manzanita, and a few sparse grasses and forbs. There was little to no snag component and the few dead trees were very small beetle-killed lodgepole without any signs of woodpecker foraging. Accipiter calls were broadcast throughout the survey area with no response.

Temperature Gradient Well 5S, T22S, R12E (Section 5)

This proposed drill site is a young lodgepole stand (very dense in spots) with some larger ponderosa pine (up to 88 cm DBH). The main groundcover species consist of *Ceanothus* and currant. There is also a good deal of downed lodgepole pine material and some interspersed forbs and grasses. There is no snag/beetle kill habitat component for foraging woodpeckers. Accipiter calls were broadcast throughout the survey area with no response.

Temperature Gradient Well 7S, T22S, R12E (Section 7)

This proposed drill site is on a thinned stand of mature and mixed-age grand fir (up to 77 cm DBH) with some ponderosa pine mixed throughout (up to 88 cm DBH). The understory and ground cover are predominantly lodgepole pine saplings and manzanita, with some forbs and grasses. Several snags, some rather large, provide high potential for both foraging and nesting by generalist woodpecker species. The survey area has some

overstory canopy cover over 50% and has some potential for accipiter use, though no nests were found and no accipiter response to broadcast calls was detected.

Temperature Gradient Well 12S, T22S, R11E (Section 12)

This proposed drill site is a very young ponderosa pine plantation with some small lodgepole pine interspersed throughout. There is dense groundcover of manzanita and *Ceanothus* as well as a few forbs and grasses; there are no older trees or snags for nesting or foraging woodpeckers. Because the stand is quite young, there is no real upperstory component to the forest and accipiter calls were broadcast with no response.

Temperature Gradient Well 16S, T22S, R12E (Section 16)

This proposed drill site is on an uneven-aged, thinned stand, with regenerating lodgepole and ponderosa pine and a few remnant larger grand firs (up to 88 cm DBH) and ponderosa pine (up to 73 cm DBH). The main groundcover is manzanita, *Ceanothus*, and currant, with pine duff and a few forbs and grasses. There are a few small snags and some beetle-killed trees providing some generalist woodpecker foraging opportunities; there are, however, very few nesting structures are available. There is a low likelihood of accipiter use, and none responded to broadcast calls.

Temperature Gradient Well 19S, T22S, R12E (Section 19)

This proposed drill site is composed of almost entirely lodgepole pine, with the majority of it being young saplings with a few older trees up to 48 cm DBH. Ponderosa pine is quite sparse and mostly younger trees with a few remnants up to 44 cm DBH. The groundcover is rather sparse, consisting of manzanita, *Ceanothus*, and currant, with a few forbs and grasses. There are some dead (beetle-killed) lodgepole and ponderosa pine snags (up to 31 cm DBH) that provide foraging and nesting opportunities for generalist woodpeckers. There is very little canopy closure, and accipiter calls were broadcast throughout the survey area with no response.

3.5.2 Visuals:

The 1990 LRMP as amended and Management Area (MA) allocations guide all Deschutes National Forest management and activities, including geothermal development. Eight of the proposed sites are within General Forest Management Area, MA-8, which emphasizes timber production and timber management. Four sites (29N, 24N, 2S, and 32S) are located within the Scenery Management Allocation, MA-9. The following viewpoints will be considered for comparison of impacts and consequences in Chapter 4:

- Forest Road 21 Viewpoint
- Paulina Peak summit

- Highway 97 between mileposts 150 and 167
- McKay Butte
- Paulina Creek Trail #56
- North Rim Trail #57
- Forest Roads 2100, 9735, 9720 (east end), and 2225

The Scenic Views Management Area has a general goal of providing Forest visitors with high quality scenery that represents the natural character of central Oregon. Most of the standards and guidelines for Scenic Views deal with timber management because the scenic resource is most often affected by timber harvest and resulting vegetation changes in the landscape.

One of the general objectives of the Scenic Views designation is that to the casual observer, results of activities either will not be evident or will be visually subordinate to the natural landscape. More specifically, LRMP standards and guidelines provide for mineral development in Scenic Views if the facilities and improvements are located, designed, and maintained to blend with the characteristic landscape. The LRMP recognizes that scenery management objectives may not always be met when the viewer is within the project site. Scenic Views standards and guidelines also allow for trees to be removed where necessary for access to geothermal sites.

Most of the areas in and around Davenport's geothermal leases are not visually unique to the western flank of Newberry. If the general area is viewed from a distance or from an aerial position, the dominant features are the varied topography and the extensive timber harvest pattern of the forest vegetation. The project is located within an area that has had a number of timber sales, thinning, and other timber management projects in the recent past, which has shaped the appearance of the landscape. All sites are located immediately adjacent to existing Forest Service roads and within existing small open areas.

3.4.3 Disturbance to existing plantations and established tree stands

Vegetation within the project area is generally typical of the lodgepole pine types found in the Deschutes National Forest. The sites are primarily within lodgepole pine plant associations, with some ponderosa pine trees and white fir present. Lodgepole pine forest stands in the general vicinity have suffered considerable mortality due to mountain pine beetle infestations, as the common denser and older lodgepole stands were particularly susceptible to such infestations. The amount of late and old structure ponderosa pine is far below the historic range of variability. A large portion of the area is second-growth pine, which was established following historic logging in the 1920s through the 1940s. Portions of the area have been thinned dating from the 1960s to as recently as 2009. In thinned and unthinned areas, tree growth is increasing stand density relative to stocking capacity of the site. There are also areas of dense lodgepole pine that are either mature stands, or have been regenerated in the past. Mixed conifer stands are a smaller component of the landscape and are comprised primarily of ponderosa pine with a mix of lodgepole pine and white fir.

4.0 ENVIRONMENTAL IMPACTS

4.1 Introduction

This chapter describes the expected environmental effects of implementing the Proposed Action and the No Action alternatives, and provides the scientific and analytic basis for their comparison. All known environmental effects including direct, indirect, and cumulative effects are disclosed and mitigation measures to reduce any potential adverse effects are described within this chapter.

This chapter contains summaries or portions of resource reports that can be found in the Administrative record.

Direct, indirect and cumulative effects will be considered. Direct environmental effects are those occurring at the same time and place as the initial cause or action. Indirect effects are those that are caused by or will result from the proposed action and are later in time, but are still reasonably certain to occur. Finally, cumulative effects result from collective past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such actions.

4.2 Past, Present and Future Activities in the Project Area

There have been a considerable amount of activities in and around the 32,000 acre geothermal lease area on which the 12 temperature gradient wells are proposed. There have been numerous timber sales, thinning projects, and reforestation activity in the past two or more decades. This is an area that has been—and continues to be—highly managed for timber production. As evident from aerial photographs, it appears that most of the area has been affected in the past by forest management projects, including road construction, that have substantially altered the forest vegetation over an extensive area.

Presently, there are four major projects in the area that are in progress or are in the process of being planned. These include: the Bon Timber Sale which is currently in progress; the Ogden Landscape Vegetation Management Project which will involve 14,600 acres and is currently being analyzed; the Finley Butte Fire vegetation management project to be thinned and mowed in 2010, and the Lava Rock OHV Project, which encompasses approximately 140,650 acres.

Each of these projects have or will affect similar environmental components that are being evaluated in this EA, particularly forest vegetation, wildlife habitat, nesting goshawks and other raptors, and visual resources.

There are no other geothermal exploration drilling projects planned or proposed at this time and any predictions would be purely speculative and not a reasonably foreseeable

action.[4] If this project provides suitable information about the underground geology, it may lead to the proposal of additional exploration activities; however, the locations and type of studies are not presently known and may be dependent on the results from this project. Any proposals for subsequent studies or exploratory activities would require further environmental analyses and approvals.

The following past, present and reasonably foreseeable future proposed activities were considered reasonably foreseeable for the cumulative effects analysis:

- Ogden Landscape Vegetation Management Project
- Bon Timber Sale
- Finley Butte Fire Vegetation Management Project
- Lava Rock OHV System

4.3 Alternative A – Proposed Action

Davenport proposes the following activities as part of the Proposed Action:

- Preparation of 11 drilling sites
- Drilling of up to 12 temperature gradient/passive seismic monitoring wells
- Testing and data collection of each drilled well
- Continued monitoring of temperature, seismic, and other data in each well
- Improvement, if required, of Forest Service access roads to safely accommodate vehicles and equipment

The average depth of the wells will be 3,000 ft. (+/-500'), with those located at higher elevations drilled deeper than those at lower elevations. These 12 wells will be "dual purpose" allowing Davenport to collect both temperature gradient and passive seismic data from a single well, thereby limiting the number of wells needed and reducing both cost and site disturbance.

Sites will be located along existing low standard or spur roads and within existing open areas. Drilling would be done with small, truck-mounted equipment. Each drilling site would be no larger than approximately 100 feet by 100 feet in size. Site preparation will involve modifying existing openings by removing some existing small trees and shrubs in order to safely accommodate equipment. Limited surface smoothing may be needed in some areas on some sites. No new roads will be required. Upon project completion, sites will be restored to simulate pre-existing conditions and blend in with the surrounding environment.

Project design criteria incorporate mitigating features to minimize potential adverse effects to forest resources. Such features include selecting sites which are:

- Within an existing clearing or open area, have minimal existing vegetation, and where no merchantable timber would need to be removed

[4] Davenport Newberry Holdings LLC does plan on conducting some geophysical surveys in the area during 2010, but these do not involve drilling, or motorized equipment and will have minimal site disturbance.

- Previously disturbed or previously used for timber management or logging activities, such as landings or log deck locations
- Hidden or visually screened by surrounding timber stands and topography from distant scenic viewpoints
- Adjacent to unimproved or low standard Forest roads or spur roads
- Adjacent to or near timber stands with tree heights greater than the height of the drilling equipment
- Located in remote areas to minimize incidental contact with Forest visitors, recreation sites, and to maximize distance from known viewpoints
- Able to accommodate smaller drilling equipment, such as a truck-mounted rig similar to that commonly used to drill domestic water wells

4.3.1 – Wildlife

ISSUE: Exploratory drilling has the potential to disrupt nesting attempts and/or remove nesting, foraging, or fledgling habitat on the proposed drilling sites which are within 0.25 miles of nests (1.0 miles for blasting). Drilling activities have the potential to disturb nesting sites during the breeding season (Jan 1 - Aug 31 for bald eagles, April 1- Aug 31 for osprey, and March 1- Aug 31 for goshawk). Drilling also has the potential to remove tree cover within wildlife travel corridors and produce sufficient noise disturbance over an extended period of time to render the travel corridor less effective during the season of use. The Deschutes LRMP Wildlife Standards and Guidelines that support this issue statement include: WL-1, 2 - 5, 12, and 56.

There is suitable habitat or potentially suitable habitat in or near the proposed project area for Cooper's hawk, northern goshawk, sharp-shinned hawk, red-tailed hawk, northern flicker, hairy woodpecker, and flammulated owl. The general vicinity of the Project is used mostly during spring, summer, and fall by mule deer and rocky mountain elk, and these species do occur in the area.

No Endangered, Threatened, Proposed, or Candidate species or Species of Concern were determined to occur within the project area.[5]

No nests were located within the project area. However, one northern goshawk was observed in the immediate vicinity of site 24N, which also has the most suitable habitat.

In addition to this survey, field surveys were conducted by the USFS for the northern goshawk in the Ogden project area between July 2nd and July 24th 2009. The Ogden survey area overlaps the majority of project area. Only sites 29N, 16S, and 19S occur outside of the Ogden survey area.[6]

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[5] Biological Evaluation for Environmental Assessment DOI-BLM-OR-P000-2010-003-EA, February 15, 2010

[6] TG 12S, while technically outside the Ogden survey area, is less than 0.15 miles south of FS road 2215 which forms the southern boundary of the Ogden area. The area south of 2215 was determined by USFS to not contain suitable habitat and therefore did not warrant surveys.

Two northern goshawk nest sites with a total of three nests were detected as a result of these surveys. In addition, while there is no known active eagle or osprey nests, there is a historical Osprey nest located within the riparian area along Paulina creek.

The approximate distance from any known nest site, and the historical Osprey nest site, to the nearest temperature gradient monitoring hole (TGH) is provided below:

Osprey Nest (S 31, Paulina Creek): TGH #30N = 0.7 miles
Goshawk Nest T22S, R11E, Sec. 10: TGH #2S = 1.8 miles
Goshawk Nest T22S, R11E, Sec. 25: TGH#24N = 0.2 miles

Due to the detection of a northern goshawk at well 24N and the need for additional pre-construction surveys at TG 19S and TG 29N, there will be surveys conducted at these sites in the spring of 2010 (not earlier than May 15) in an attempt to locate the presence of a nesting pair. If nesting raptors are located within ¼ mile of these sites, drilling would be timed to not occur during the restricted nesting season of March 1 – August 31. If nesting raptors are not located during these surveys the drilling activities could commence.

Direction is provided by the Deschutes National Forest Land and Resources Management Plan (USDA 1990) as summarized in the following.

Where nest sites are not known, the following physiographic and vegetative characteristics will be used: mean canopy cover of 60 percent or greater, tree density of a least 195 trees per acre, stand age of 100 years or more, and stand size of at least 25 acres. Locating new roads within nest site stands will be avoided. "Disturbing" activities will vary site specifically. An evaluation of potential disturbance will be made prior to planned activities. Active raptor nest sites should be protected from disturbing activities within a ¼ mile (one mile for the use of explosives) of nests by restricting operations during the nesting period of March 1– August 31. If the specified restriction period must be compromised, Project activity at the end of the period (e.g. the last month or two) is least likely to cause nest abandonment. A nest site may be considered inactive for the year if nesting activity is not evident by May 15.

Four drilling sites occur immediately adjacent to or within designated travel corridors and old growth areas (TG24N, TG 30N, TG 32S and TG 19S). While the well sites were chosen specifically to minimize the amount of vegetation to be cleared, some removal of vegetation will be necessary. Less than 0.25 acres per site and less than 1 acre total vegetation would be removed adjacent to or within these areas. The vegetation removed would be primarily small lodgepole and ponderosa pine trees, shrubs, and grasses typical of the plant associations in that area. The small size of these areas, and their location adjacent to existing roads and clearings, will minimize the footprint and any potential disturbance to the forest wildlife habitat.

The proposed project will not involve long-term use of the sites by large equipment including a drilling rig. The number of days that there would be any human or mechanical activity is limited, and expected to be less than 60 days total at each site. This temporary and short duration of activities will minimize any disturbance to wildlife near these three sites.

Due to the small area of vegetation to be removed, and the timing restrictions during the breeding season should a nesting pair be located within ¼ mile of a drilling location, there would be a minimal contribution of negative cumulative effects to wildlife or wildlife habitat from the proposed action.

4.3.2 – Visual Quality

ISSUE: Vegetation removal on the drill sites has the potential to cause small areas to not meet the goals for highest possible visual quality as seen from selected viewpoints. The Deschutes LRMP Standards and Guideline that supports this issue statement is M8-19: "To the extent possible, the highest visual quality level will be provided unless it requires a reduction of timber outputs. In that case, the minimum allowable visual quality objective is Modification. Created openings will be shaped and blended to the natural terrain, to the extent practical."

A combination of natural features, manmade components, and past forest management activities (including roads, fire, and logging) dominate the scenery and contribute to the visual interest. Each proposed well site is located in areas in which a number of timber sales, thinning, and other timber management projects have occurred in the recent past; all of which have influenced the landscape's appearance. It is a diverse forest landscape and variations such as small openings, either natural or created, are common.

Eight of the proposed sites (17N, 19N, 30N, 5S, 7S, 12S, 16S, and 19S) are within General Forest Management Area, MA-8, which emphasizes timber production and focuses on vegetation management.

The remaining four proposed sites (29N, 24N, 2S, and 32S) are located within the Scenic Views Management Area, MA-9, which emphasizes scenic values and includes the goal of providing Forest visitors with high quality scenery that represents the natural character of central Oregon. The general theme and objectives of MA-9 provides that to the casual observer, results of activities either will not be evident or will be visually subordinate to the natural landscape.

Scenery Management System Objectives are defined in terms of Scenic Integrity Levels which describe existing conditions and whether the landscape is visually perceived to be "complete" or not. The most complete or highest rating for Scenic Integrity Levels means having little or no deviation from the landscape character. Management Areas are further classified by Scenic Integrity Levels.

Well sites 2S and 32S are within a High Scenic Integrity Level (formerly Retention) with a natural appearing landscape; well sites 24N and 29N are within a Medium Scenic Integrity Level (formerly Partial Retention) with a slightly altered landscape; and well sites 19S, 16S, 12S, 7S, 5S, 30N, 19N, and 17N are within a Low Scenic Integrity Level (formerly Modification) with an altered landscape appearance.

Scenic Integrity Levels describe the level of development allowed and ways to mitigate deviations from the area's landscape character. Usually the most effective way to meet Scenic Integrity Levels is to repeat visual form, line, color, texture, pattern, and scale common to the scenic values of the landscape character being viewed. For example, in natural and natural appearing landscapes, deviations such as created openings can sometimes be visually enhanced through repetition of size, shape, spacing, surface color, edge effect, and pattern of natural openings common to the existing landscape character.

Preparation of the well sites will be done in a manner to help achieve this visual objective. No new openings will be created. Areas with the least amount of vegetation, such as spur roads and landings formerly used in logging operations, will be incorporated as much as possible into each well site. Existing openings will be modified only to the extent needed to accommodate equipment. No large trees will be removed. No permanent structures will be constructed. The shape, size, color, edge effect, and pattern of existing openings will be repeated and visual attributes already present at each site will be retained. Once the drilling equipment has been removed and the site restored, each small former well site will blend in with the landscape character and not appear changed or out of place.

Several standard & guidelines from the LRMP provide guidance for siting other multiple use projects within a Scenic Views Management Area. Standard & Guidelines M9-5, M9-24, M9-41, M9-55, and M9-67 provide direction that "trees may be removed where necessary to provide access for special uses, mineral activities, and administrative purposes". Standard & guideline M9-83 provides that "mineral developments, utilities, and electronic sites may be located in these (Scenic Views) areas if the facilities and associated improvements are located, designed, and maintained to blend with the characteristic landscape". Standard & guideline M9-84 directs that "trees may be removed within the Scenic Views Management Area where necessary to permit access to geothermal sites, mineral development, electronic sites, utilities, and other special uses sites".

The goal for energy resources on the Forest is to provide for exploration, development, and production of energy resources. The desired future condition for energy directs that drill pads, to the extent possible, are designed and located to minimize impacts on other resources, particularly visual quality.

The proposed project would be consistent with the direction of the LRMP for visual resources and geothermal exploration in General Forest and Scenic Views management areas. Careful siting, prudent use of project design features, and application of mitigation

measures will allow the scenic objectives to be met and prevent the project from detracting from the visual quality of the existing landscape.

The proposed drilling activity is temporary and of relatively short duration. Project design to favor the use of smaller drill rigs and the need for fewer pieces of equipment will minimize the size of area required at each site to accommodate the operation. All this will help minimize visual effects by helping to keep the sites as inconspicuous as possible and subordinate to the landscape.

Each well site will be less than 100' x 100' feet in size (less than ¼ acre). The actual footprint within this area will be even smaller and will minimize potential disturbance to the forest resources. The well sites are not intended to be "cleared and leveled" in order to accommodate the drilling operation. Instead, siting and layout is flexible and can be adjusted to each specific site. Equipment and vehicles will be able to park and operate in a natural field setting, not requiring an industrial pad or open clearing. Larger trees will not need to be removed, but may need to have some lower limbs taken off. Vegetation will only need to be removed to the extent to allow vehicles and equipment to safely enter and operate. Vegetation removal will be selective and emulate patterns of existing openings to best blend in. Sites will utilize existing openings and will be rehabilitated to resemble pre-existing conditions and blend in with surrounding conditions at the end of the project. There will be no unnatural lines, colors, or textures remaining.

Well sites were chosen specifically to minimize the amount of vegetation that would need to be removed; however, some removal of shrubs and small trees will be necessary as described and quantified in Section 4.3.3. Existing openings will be used a much as possible, but some downed wood materials will need to be moved aside and some small trees and shrubs will have to be removed to modify or enlarge existing openings. In most cases, only shrubs or small trees (predominantly lodgepole pine) would have to be removed on the sites to accommodate the project, and little or no merchantable timber would need to be removed.

Vegetation removal will be kept to a minimum and would be completed in a manner that would not leave an obvious line or noticeable contrast. The temporary use of roadbeds for equipment and setup will help minimize the amount of vegetation to be removed and limit the amount of area to be disturbed.

Sites were selected that were distant, remote, and visually screened by surrounding forest vegetation and topography so that they would be hidden and not be easily or readily seen from viewpoints or popular recreation sites. Sites were also selected within disturbed areas and existing openings in order to help them blend in, minimize additional disturbance, minimize the amount of vegetation that would need to be removed, and to avoid the need to create new openings.

Project design and mitigation measures will ensure that the highest visual quality level will be provided, and created openings will be shaped and blended to the natural terrain during implementation of the Proposed Action.

The following view points, three of which are inside the NNVM, were considered during the evaluation of how scenic values may be affected. The approximate distance from each selected viewpoint to the nearest temperature gradient monitoring hole (TGH) is provided below:

Paulina Peak Summit (NNVM): TGH # 16S = 2.5 miles
Paulina Creek Trail #56 (NNVM): TGH # 30N = 0.4 miles
North Rim Trail #57 (NNVM): TGH # 32S = 2.7 miles
Forest Road 21 Viewpoint: TGH # 32S = 0.5 miles
McKay Butte: TGH # 24N = 0.3 miles
Highway 97 between mileposts 150 and 167: TGH # 2S = 5.0 miles
Forest Road 2100: TGH # 32S = 0.5 miles
Forest Road 9735: TGH # 17N = 0.5 miles
Forest Road 9720 (east end): TGH # 29N = 100 feet
Forest Road 2225: TGH # 19S = Site is adjacent to road.

Refer to Figure 4, which is an aerial photograph to show the current landscape with diverse topographic features, forest vegetation, open areas, and results of previous management actions. The map also identifies proposed TGH monitoring sites.

Three of the viewpoints are within the Monument. The NNVM legislation specifically provides that, "the fact that activities or uses outside the Monument and Special Management Area can be seen, heard, measured, or otherwise perceived from within the Monument and Special Management Area shall not, of themselves, limit, restrict, or preclude such activities or uses up to the boundary of the Monument and the Special Management Area".

Distance, topography, tree height, and landscape variation will all contribute to screening the small well sites and making them difficult to recognize and not evident from viewpoints in or outside of the Monument. Careful site selection, the ability to utilize a small footprint, and the potential to nestle each site next to roads, within existing small openings, and surrounded by taller forested stands will mitigate visual effects and help make the well sites visually subordinate in the diverse landscape.

Modification of existing openings would be made to blend in with the surrounding landscape and would not be identifiable as a change or disruption of the scenery. The modified openings will have little deviation from the landscape character or from existing disturbance patterns that are part of the landscape.

From a distance, the viewer may be able to discern that there is an open area at the well location; however, the opening should not stand out, be obtrusive, or be unique from other openings in the scene. Most importantly, it would not be apparent that the original open area was modified or enlarged to accommodate a drilling project.

Newberry Geothermal Project

Figure 4: Aerial Photograph

A site is more likely to be noticeable during the period of active drilling. The drill rig and support vehicles would be unnatural objects in a forest setting and could stand out from the landscape. This would be a temporary visual impact and would likely not be very different than viewing recreation traffic or logging equipment, which are more typically associated with forest uses and forest management.

Once the temporary drilling equipment has been removed and the site has been restored, no long term negative visual effects are expected. Mitigation measures, including restoring the site to a natural condition, will minimize visual effects and result in the site blending in and appearing no different from other small openings in the area.

The proposed project would not contribute significantly to cumulative surface disturbance or to visual resources, given its relatively small scope, temporary duration, limited size, and minimal amount of surface disturbance. When compared to the extensive vegetation management and large scale projects that have occurred or will occur in the local and greater vicinity, the cumulative effect contributed by this project (particularly after the sites have been restored), would be negligible.

The proposed project blends in well with past, present, and future forest management activities and vegetation treatments, as they help disguise and visually hide the small well pads located within open areas originally created by roads and timber harvest. Future vegetation treatments would readily be able to incorporate and assimilate the abandoned well sites.

Geothermal exploration projects have occurred at Newberry in the past. A total of approximately two dozen exploratory wells have been drilled in and around Newberry Volcano, including within the Crater. All wells have been abandoned except for two deep wells drilled by Davenport in 2008, which are still being monitored.

There are currently six large production-size well pads (each approximately 5 acres in size) located on the western flank of Newberry, plus one pad that was partially built. These are currently in active status and/or are being maintained by the geothermal leaseholder or operator under terms specified by BLM and Forest Service. When no longer needed, these sites be reclaimed and restored to a natural condition. Except for the existing wells and pads noted, all other sites (approximately 19) have been reclaimed and restored to a natural condition.

The Proposed Action would contribute additional well pads on the Forest— but each pad will be only a fraction of the size (1/4 acre compared to 5 acres), would be present for a short duration, and would not contribute a significant cumulative effect in terms of surface area or visual resources.

4.3.3 – Disturbance to Existing Plantations and Established Tree Stands

ISSUE: Clearing of drilling sites has the potential to remove vegetation from established plantations and young or mature timber stands. This may result in a loss of an investment in time and dollars that have been spent to replant and manage these stands towards a timber production goal on General Forest lands. The Deschutes LRMP Standards and Guideline that supports this issue statement include TM-7, M8-17, and M8-27.

Preparing drilling sites will require the removal of less than 0.25 acres of vegetation per site for a total of less than 2.5 total acres of disturbance. The drilling sites are purposefully located within cleared or partially cleared areas alongside existing roads.

The vegetation removed would be mostly small lodgepole pine trees and shrubs, typical of the plant associations in that area.

A discussion of the average size and species of trees to be cut at each site is discussed below:

TG 29N
This site is located in a recently thinned ponderosa stand, with a few remnant older trees up to 34 inches (DBH). Due to the recent management, there is no real understory vegetation. The sparse groundcover consists primarily of manzanita, with little ceanothus and a few forbs and grasses. For drilling operations, about 6 -12 trees up to 4-5 inches in diameter may need to be removed, as well as up to 20 or so saplings that are among the logging debris. The logging debris would need to be pushed aside, but then can be scattered over the site as part of the restoration work when the drilling has been completed. Some of the stumps may need to be cut off so they are closer to the ground, but it is not likely that any will need to be dug up and removed. A few small shrubs next to the road may need to be removed.

TG 17N
This site is on a previously cleared geothermal exploration well. No trees will be removed.

TG 19N
This is within the old Fishhook Timber Sale. There is a scattered overstory of white fir and lodgepole pine. In the immediate area required for drilling operations there are approximately 30 small lodgepole pines that would be removed, up to 6-8 feet tall, with most being less than 5 feet. Cutting or damaging ponderosa pine will be avoided.

TG 24
This is near the base of McKay Butte. It is on the east side of Road 155, near its junction with Road 340, and is accessed from Road 300, which is accessed from Road 9736. The ground cover consists of needles and duff. The area has second growth ponderosa pine

trees, 60 to 80 feet tall. No trees would need to be removed, but down logs and debris would have to be moved and some trees would need to be limbed. Cutting or damaging ponderosa pine will be avoided.

TG 30N
The site is in a small open area within a timber stand. This location has tall second growth ponderosa pine, about 80 feet tall and up to 16-18 inches diameter. There are also some white fir trees present, up to about 8 inches dbh. Ground cover consists of needle duff. On the opposite side of the road there is a more open area which has manzanita shrubs.

The operation would use both sides of the road— the left side for the drill rig and the right side for parking, equipment, and as a turn around area. On the drilling side, some dirt would need to be moved to make the site more level and even with the road. Site prep here would include removing a few dead shrubs, a few very small trees, moving a couple of down logs and some debris, and limbing-up the trees. On the opposite side of the road, the shrubs along the road would need to be removed (area about 30 feet long by about 10-15 feet wide), plus 2 old stumps would need to be taken out. Cutting or damaging ponderosa pine will be avoided.

TG 32S
The area mostly has 15-20 foot lodgepole pine trees. About 40 to 50 such trees (less than 6 inches diameter) would need to be removed. Setting up in FS Road 600 would avoid some tree removal. Cutting or damaging ponderosa pine will be avoided.

TG 2S
The site is in an open area. Ground cover consists of needle duff and about 4 small manzanitas. There are about 3 ponderosa pine trees (6-8 inch DBH) at the site, but these would not need to be removed and the operation can work around them.
A number of small lodgepole pines, 1-5 feet tall, would need to be removed.
There are some old rotten stumps on site that would create a work hazard. These would be removed with the site preparation. Setting up in FS Road 670 would avoid some tree removal. Cutting or damaging ponderosa pine will be avoided.

TG 5S
The area is within a lodgepole pine stand. Ground cover consist of dead and down lodgepole pine, needle duff, and small lodgepole seedlings. This would require removing approx. 30-40 small lodgepole pine trees (less than 6 feet tall; most are less than 3 feet). Cutting or damaging ponderosa pine will be avoided.

TG 7S
This site is surrounded by mature white fir and ponderosa pine stands. It is within a small pocket with lodgepole pine trees ranging in size from seedlings up to about 8 feet tall, with most being 4-5 feet in height. Most of those needing to be removed will be lodgepole pines less than 5 feet tall and smaller than 3 inches in diameter. Setting up in

FS Road 390 would avoid some tree removal. Cutting or damaging ponderosa pine will be avoided.

TG 12S
This site is located on a ridge, at a junction with an unnamed spur road. Access is via an old railroad grade. There is quite a bit of brush present—ceanothus and manzanita. It is in an open area with a young ponderosa pine stand. Brush and a few young ponderosa pine trees would need to be removed. It is estimated that about 8 small ponderosa pine and 2 young lodgepole pine trees (1-3 inches diameter, 5-8 feet tall) would need to be removed. Setting up in unnumbered FS Road would avoid some tree removal. Cutting or damaging ponderosa pine will be avoided. This site is located within Finley Mechanical Thinning/Brush Treatment Service Contract Unit 5 (169 AC). 2010 award date as funding allows.

TG 16S
This area has lodgepole pine trees approx. 5-8 feet tall, some ceanothus, and no ground cover or thinning debris. There are lodgepole pine trees about 15-20 feet tall and 3-4 inches in diameter. It is estimated that less than 25 lodgepole pines (less than 5 inches diameter) would need to be removed. Setting up in FS Road 400 would avoid some tree removal. Cutting or damaging ponderosa pine will be avoided.

TG 19S
Sapling lodgepole pines and up to approximently10 small (6-10 feet tall) lodgepole pines would need to be removed. There is a lodgepole pine about 30-feet tall that would not be removed. Setting up in FS Road 310 would avoid some tree removal. Cutting or damaging ponderosa pine will be avoided.

The small size of each of these areas, and their location adjacent to existing roads and clearings, will minimize the footprint and any potential loss of vegetation. Because the trees to be removed are for the most part smaller diameter trees, very little loss of established plantations or mature timber stands would take place.

Due to the small area of vegetation to be removed, there would minimal negative cumulative effects from the proposed action. Impacts will be further minimized by reclamation of the sites. The proposed Lava Rock OHV system and McKay Butte are both in the area of Site TG 24N. Created openings along designated OHV routes such as FS Road 9736-300 raise the possibility of tempting riders to leave the designated route and ride cross-country. This is particularly an issue where riders might be attracted to ride up skid trails or firelines that are in the process of being restored and revegetated, such as exists at McKay Butte. However, in the case of Site TG 24N, the small created opening along the OHV route is surrounded by dense lodgepole pine vegetation that effectively screens and blocks any access to old firelines or skid trails on McKay Butte.

4.4 Alternative B – No Action

4.4.1 – Wildlife

Under the No Action alternative, there would be no change to the existing vegetation. There would be no clearing of any vegetation for drill sites, and no disturbance to potential nesting sites.

4.4.2 – Visual Quality

Under the No Action alternative, project activity would be absent so there would be no new effects to existing scenic resources. The past timber harvest units and existing roads would continue to dominate the landscape character that is typical for this part of the Deschutes National Forest.

4.4.3 – Disturbance to Existing Plantations and Established Tree Stands

Under the No Action alternative, there would be no change to the existing vegetation. There would be no clearing of any vegetation for drill sites and no loss of vegetation from established plantations and young or mature timber stands.

4.5 Mitigation Measures

Wildlife

Additional pre-construction surveys will be conducted at site TG 24N, TG 19S and TG 29N in the spring of 2010 (not earlier than May 15) in an attempt to locate the presence of a nesting pair. If nesting raptors are located within ¼ mile of the site, drilling would be timed to not occur during the restricted nesting season of March 1 – August 31. If nesting raptors are not located during this survey then drilling activities could commence.

Cultural Resources

A total of five heritage resources were identified or re-recorded during the heritage survey. Three of the sites, all historic period resources, will be easily avoided during drilling operations. Two prehistoric sites will be tested for subsurface deposits prior to drilling and site deposits will be avoided during drilling. An archaeologist will be present during the drilling operation(s) to monitor for any inadvertent heritage resources. Any inadvertently discovered cultural items or sites encountered during the drilling operations by project archaeologist will be protected until evaluation can be completed by the Forest Service archaeologist.

4.6 Monitoring and/or Compliance:

Noxious Weeds/Invasive Species

Davenport will be responsible for conducting annual June weed monitoring visits to ensure that weeds do not become established on the drilling sites. If weeds are found, the applicant will hand-pull them and bag them if flowers or seeds are present. The applicant will provide the Forest Service a brief annual report that shows compliance with this mitigation.

Davenport will be responsible for monitoring the area for two growing seasons after the work is done. For example, if the work is completed in the winter of 2010/2011, the applicant will monitor in the summers of 2011 and 2012. Weed monitoring will begin the first June after the project has been completed; it is strongly encouraged that the monitoring occurs at this time rather than later in the summer because the weeds will still be small and not flowering or producing seed. Davenport will be released from further responsibility for weeds within the project area after the second year of monitoring/treatment is concluded.

The annual weed monitoring report will be due no later than September 30, will include descriptions of when they monitored, what weed species, if any, were found, and that they were treated. Hand-pulling will be the treatment. Herbicide application will not be an option for this area, as herbicides have not been approved for use.

Drill rigs, tanker trucks, trailers and any other heavy equipment shall be pressure washed in La Pine prior to their first entrance into the project area, and prior to any subsequent entrance after leaving the project area.

5.0 CONSULTATION AND COORDINATION

5.1 Introduction

The issue identification section of Chapter 1 identifies those issues analyzed in detail in Chapter 4. Appendix A provides the rationale for issues that were considered but not analyzed further. The issues were identified, in part, through the public and agency involvement process described below

5.2 Summary of Public Participation

Scoping letters were mailed to more than 400 individuals, organizations, agencies, and central Oregon Tribes in October 2009 to notify potentially interested parties about the proposed action and to provide an opportunity for them to submit comments to be considered in the environmental analysis. Mailing lists from Prineville BLM, the Deschutes National Forest, and Davenport were combined for use during scoping efforts to ensure that the greatest amount of interested and potentially interested parties would be reached. On November 4, 2009 the local Bend Bulletin newspaper published an article about the opportunity to submit scoping comments.

In October 2009 Davenport prepared and emailed an informational update, which also provided information about the upcoming project proposal to approximately 250 recipients on their electronic mailing list.

As a result of intensive and extensive scoping efforts, four letters were submitted to BLM. Two of these were from local chapters of National and State environmental organizations that have been following geothermal projects at Newberry for years, one was from a congressman who represents a district in the Portland metro area, and the fourth was from a local citizen. All but the letter from the citizen expressed concern about the project—but mostly they expressed concern about future large-scale geothermal development. The citizen's letter conveyed support for the proposal. All of the letters were reviewed and used to help develop issues and guide the environmental analysis and preparation of this EA.

Print and Internet media coverage has been extensive since late 2008. Articles regarding results from the 2008 deep exploration wells and the plans for the temperature gradient and monitoring wells as part of continued exploration efforts have appeared in major local publications, including *The Bulletin*, *The Source*, and the *Cascade Business News* from Bend, La Pine's *Newberry Eagle*, and the *Sunriver Scene*. Additionally, coverage has occurred regionally and statewide in *The Oregonian*, Roseburg's *News-Review*, and Eugene's *Register-Guard*. Serving other west coast markets, Seattle's *Post-Intelligencer* and San Jose's *Mercury News* have also run stories. Stories originating in central Oregon have been printed in other daily and weekly newspapers as well. Various publicly raised issues are often highlighted and addressed in the media coverage.

On March 4 2010, the BLM contacted Perry Chocktoot Jr. of the Klamath Tribe by phone for any additional comments on this EA. Also on March 4, the BLM contacted Joseph S. Kirk, Tribal chair of the Klamath Tribe, by telephone for comments on this EA.

5.3 List of Preparers

This EA was prepared by a third-party contractor, PLS Environmental, LLC, under the direct supervision and control of BLM. A list of individuals who helped prepare this document is listed below, along with the sections they prepared or assisted with. Persons who were consulted and contributed information are included in Section 5.2.

Name	Title	Sections of EA
Paul L. Stern	Principal, PLS Environmental, LLC	All
Alice Tye	Permitting Consultant	Ch. 1, 5, portions of 4
Linda Christian	Planning and Environmental Coordinator, BLM	Coordination, review and oversight
Kathleen Cooper	Consultant	Botany
Stephen Horne	Basin and Range Heritage Consultants	Cultural Resources
Tim Pitz, Rick Gerhardt, Robert Gritski, Brett Anderson	Northwest Wildlife Consultants, Inc.	Wildlife

5.4 List of Reviewers

The following individuals listed below reviewed the EA from both the USFS and the DOE.

Name	Agency	Area
Rod Bonacker	USFS	Overall
Barbara Webb	USFS	Wildlife
Ben Hernandez	USFS	Wildlife
Steve Bigby	USFS	Roads
Todd Renwald	USFS	Soils
Barbara Schroeder	USFS	Silviculture
Robin Gyorgyfalvy	USFS	Visuals
Marv Lang	USFS	Recreation

Jason Loomis	USFS	Fire and Fuels
Charmane Powers	USFS	Botany
Janine McFarland	USFS	Cultural Resources
Jim Lowrie	USFS	Wildlife
Rod Jorgensen	USFS	Soils
Christopher Carusona II	DOE	Overall

APPENDIX A

CONCERNS EXPRESSED IN SCOPING

These are concerns expressed by the public during scoping that were not determined to be issues to be carried forward in the analysis; however, they are indirectly addressed or resolved within the EA.

Issues are essentially an effect on a particular resource or resource component that is relevant to the analyses, and they are developed in part by concerns expressed by the public during scoping. An expressed concern does not always lead to becoming an issue; but instead it may happen to represent a topic that should be mentioned or clarified. Often, these are topics which are already included in the EA, or can be addressed by adding brief general information or explanation. Relevant issues to be carried forward in the EA are developed by agency specialists and the public, after carefully considering concerns expressed during scoping.

Following is a list of concerns expressed during scoping plus a brief description of where or how each is addressed in the EA.

Mature and old growth forests, amount and type of vegetation on sites—Chapter 3 (Affected Environment) describes the types of forest stands and they do not include Old Growth.

- Size and type of trees to be removed—Chapter 4 (Effects Analysis) describes vegetation to be removed
- Invasive plants—Addressed as a mitigation measure
- Soil compaction—Addressed as a mitigation measure where needed
- Cultural and heritage resources, historic and prehistoric sites—Addressed as a mitigation measure
- Regional Indian tribes, tribal consultation—Addressed in Chapter 1
- Key recreation areas and viewpoints in the NNVM—Addressed in Chapter 1 and Chapter 4
- Effect of small openings—Described in Chapter 4 for visual resources
- Water use and source—Described in Chapter 2: Description of Proposed Action
- Noise effects on wildlife and recreation—Described in Chapter 2 and Chapter 4
- Recreation, hunting, winter snowmobile trails—Project locations and duration described in Chapter 2; temporary use and will not occur during winter
- Fire precaution measures—Addressed as a mitigation measure
- Siting locations and selection—Addressed in Chapter 2 and in Project Design Criteria
- Size and footprint, proximity of 29N to other sites—Addressed in Chapter 2
- Use of existing landings and roads for sites—Addressed in Chapter 2 and Chapter 4
- Proximity to NNVM and roadless areas—Addressed in Chapter 1, Chapter 2, and Chapter 3
- Coordination with Ogden Landscape Veg. Mgmt. Project, Finley Butte thinning and mowing project, and with Bon Timber Sale activity—Proponent will coordinate activities with the Forest Service.
- Roads to be used, need for new roads—Addressed in Chapter 2 and mitigation measures as needed
- Reclamation, restoration, and abandonment—Addressed in Chapter 2 and mitigation measures

Connected actions—The proposal being analyzed in this EA is a proposal for a permit to conduct temperature gradient/seismic exploration to determine whether geothermal resources exist. This is not, however, a proposal for full-scale development, nor is it a proposal that would commit the resource to full development. In addition, drilling is not anticipated to reach depths within the wells to reach the geothermal resource. The scope of analysis for this EA per CEQ 1508.16 will include connected actions. Because the potential authorization of a permit to conduct exploratory drilling for geothermal resources does not automatically trigger the authorization to develop geothermal energy, the two are not connected actions as defined by the NEPA regulations 40 C.F.R. § 1508.25. The BLM and USFS retain discretion to approve/deny any future proposals for full-scale development of geothermal resources.

Concerns expressed during scoping that were determined to be beyond the scope of this environmental assessment and not relevant to the analysis include the following:

- Lack of a coherent national energy policy
- National commitment to climate change
- Validity of existing leases
- Draining of the lakes in the NNVM
- Development of a geothermal power plant
- Hot dry rock techniques for geothermal power
- Dry steam well discovery
- Siting of roads and powerlines
- Segmentation of a larger project

APPENDIX B

DRILLING PROGRAM

for

Davenport Newberry Holdings LLC

12 Temperature Gradient Wells

Deschutes County, Oregon

1. Mobilize rotary rig (reverse circulation) with all support tooling and equipment to first drill site.
2. Conduct safety meeting and establish nearby medical facilities, bio hazards, environmental issues, and inherent dangers related to the project.
3. Completely set-up rig and all related equipment, including all berms, fencing, signage, and job supplies and tooling secured.
4. Conduct safety meeting/inspection with BLM/NGC/CONTRACTOR, and all parties involved in project that will be on site.
5. Drill 12" hole to 40' and set 40' of 8 5/8" O.D. casing.
6. Cement annulus with Neat Portland cement, and allow to set for 12 hours.
7. Drill nominal 6" hole to 700', taking samples every 10', placing in canvas bag and clearly marking depth.
8. Install 700' of 4 ½" O.D casing. Fill annulus with Neat Portland cement.
9. Allow cement to set at least 12 hours before entering hole or disturbing casing.
10. Install locking cap on conductor casing.
11. Allow approximately 1 week for seismic monitoring before setting core rig over hole.
12. Move rig and equipment to next location and repeat the above process.

Wireline Diamond Core Drilling

1. Once seismic monitoring is complete, move core rig over first rotary cased hole.
2. Install Hydrill 500 BOP/Diverter on 4 ½" casing.
3. Enter cased hole with HQ core tooling, with 3.83" core bit.
4. Core to 3500' using bentonite based drilling fluid.
5. Core will be extracted by wireline methods every 10' or less, and placed in waxed cardboard boxes holding 10' of HQ size (2.5") core, clearly marked.
6. Upon completion of coring, HQ tooling will be removed.
7. 2" I.D. tubing will be installed from ground surface to the bottom of drill hole.
8. 2" tubing will be filled with clear water within 20' of ground surface and capped.
9. Remove core rig and related equipment from drill site.

APPENDIX C

BEST MANAGEMENT PRACTICES (BMP), PROJECT DESIGN FEATURES AND MITIGATIONS

Soil BMP

Objectives:

- Develop and include site specific prescriptions, design criteria and mitigation measures to protect soil, water, aquatic and riparian resources in design plans, contracts, and/or permits. Employ design, construction techniques and other practices to avoid, limit, or mitigate surface disturbances as well as maintain the reclamation potential of the site.
- Plan to limit land surface disturbance to the extent practicable while still achieving project objectives.
- Avoid adverse long-term impacts to soil, water, and riparian resources.
- When impacts cannot be avoided, limit disturbance to the minimum necessary and retain critical components, structures, and processes.
- Mitigate impacts and restore areas as needed.
- Protect steep slopes, highly erodible soils or unstable areas.
- Prevent or restore detrimental soil compaction.
- Identify and avoid unstable slopes and sensitive landforms.
- Maintain long-term site productivity.
- Integrate restoration and rehabilitation needs into the project plan.
- Prevent contamination of surface or groundwater resources by using tanks for storing drilling fluids.

Avoidance BMPs

Locate sites away from the immediate vicinity of surface waters, SMZs and floodplains.

To avoid unwanted impacts to soil resources, use existing compacted sites such as landings, skid-trails, truck turn-arounds, or road surfaces for drilling sites when possible.

Avoid unstable slopes and sensitive soils.

Avoid steep slopes requiring cut-and-fill excavation and site leveling.

Minimization and Prevention BMPs

- Minimize the disturbance footprint.
- Minimize disturbance or removal of adjacent vegetation to promote rapid vegetation recovery or regrowth after project completion.
- Use proper erosion and stormwater control practices during site development and project implementation.
- Properly manage all exploration-related wastes to protect groundwater and surface water quality.

- Prevent drilling mud, bentonite clay, industrial oils and fuels, and potentially sulfur-laden water from transport off-site, into a ground water source, or a drainage feature on a road.
- Use portable tanks to contain drilling fluids and exhumed water to the extent feasible.

- Properly contain and dispose of any hazardous or toxic materials. A condition of the permit will be a spill-prevention and containment plan.
- Dispose of non-toxic tailings or drilling mud only at approved sites. Approved disposal sites should be on nearly level ground (ex. existing rock pits). Avoid sites near existing surface water features and areas where ground water is close to the surface, including seasonal high water tables.

Post-Project Restoration BMPs and Mitigation

- Reclaim disturbed areas soon after completing project work.
- Where previously un-compacted sites are used; subsoil drill pad sites that have become detrimentally compacted upon project completion (TG29N, TG19N, TG32S, and TG16S).
- Subsoil drill pad sites that are developed in plantations where subsoiling occurred previously (sites TG19N, TG12S, TG7S)
- Where previously un-compacted sites are used; salvage and stockpile topsoil materials and coarse woody debris (CWD) that are scraped or excavated from the surface as a result of grading and site development. Re-apply and contour topsoil materials and any CWD back onto the site after project completion for restoration (TG29N, TG19N, TG32S, and TG16S).
- Recountour any excavated soil materials resulting from site leveling on gentle or moderate slopes (sites TG7S).
- Revegetate or otherwise stabilize salvaged topsoil to minimize erosion and maintain soil fertility.
- As directed by the Forest Service, where larger live green trees are removed, retain the boles and distribute onto the site as course woody debris after project completion.
- Decommission non-system or new roads that may be used for drill site access after project completion (TG12S).
- Permanently seal abandoned wells using appropriate protective measures.

Transportation System

Objectives: Maintain the existing road network and provide for public safety.
All stipulations for road use will be defined by the Forest Service road manager and will be included in appropriate sundry notices

<u>Document Concerns</u>

- The following items will be stipulated by the Forest Service Road manager to included in Sundry Notices prior to drilling operations:
    - Compliance with Laws and Regulations.
    - Nonexclusive Use.
    - Contractor Insurance Requirements.

    - Damage to Roads.
    - Road maintenance specifications.
    - Method for disposal of generated slash from roadside brushing.
  - Roadway temporary approach criteria and design.
- Listing of roads proposed to be closed during activities.
- Restoration of impacted roadways.
- Danger Trees
    - Must meet R6 policy.
- Hazmat
    - Site and communication plan approval.

Site Specific Road Concerns

- TG19N- Along 9736 Highway Safety Act road, below issues that need mitigation.
    - Transportation and sign plan must be submitted and approved by FS.
    - Appropriate road signing, must meet MUTCD standards.
    - All activities must be safely off roadway.
    - The need for certified flaggers during operation periods.
    - Will need to be certain that there are adequate sight distances for traffic pulling onto 9736.
- TG7S- Runoff and drainage issues.

Fire and Fuels

Objectives: Avoid project related fire ignitions, provide for timely notification and coordination with the Forest Service in the event of a fire in the project area, provide for public and operator safety. Provide for timely clean-up of project generated fuels.

Fire Prevention: Fire precaution measures will be in place and in accordance to Forest Service Industrial Precaution Level (IFPL) fire prevention program for the Central Oregon Fire Management Service (COFMS). Fire extinguishers and tools will be kept on site at all times and with each vehicle. Communication will be maintained and emergency services will be contacted in the event of an emergency. An operating plan for emergency notification needs to be in place prior to implementation.

All slash will be disposed of by the Forest Service and to their specification by Forest Service personnel and financed by the proponent.

Tree Removal

No trees will be cut until marked by a Forest Service representative
Current cutting spec for LP and PP saw is 7.0" d.b.h to a 6.0" top d.i.b. and a 8 foot minimum length.
Biomass specs are currently 4.0" d.b.h. to a 2.0" top d.i.b. and a 16 foot minimum length.

Wildlife

Davenport will be responsible for conducting annual June weed monitoring visits to ensure that weeds do not become established on the drilling sites. If weeds are found, the applicant will hand-pull them and bag them if flowers or seeds are present. The applicant will provide the Forest Service a brief annual report that shows compliance with this mitigation.

Noxious Weeds

- Davenport will be responsible for monitoring the area for two growing seasons after the work is done. For example, if the work is completed in the winter of 2010/2011, the applicant will monitor in the summers of 2011 and 2012. Weed monitoring will begin the first June after the project has been completed; it is strongly encouraged that the monitoring occurs at this time rather than later in the summer because the weeds will still be small and not flowering or producing seed. Davenport will be released from further responsibility for weeds within the project area after the second year of monitoring/treatment is concluded.
- The annual weed monitoring report will be due no later than September 30, will include descriptions of when they monitored, what weed species, if any, were found, and that they were treated. Hand-pulling will be the treatment. Herbicide application will not be an option for this area, as herbicides have not been approved for use.
- Drill rigs, tanker trucks, trailers and any other heavy equipment shall be pressure washed in LaPine prior to their first entrance into the project area, and prior to any subsequent entrance after leaving the project area.

Archaeology

An archaeologist will be present during the drilling operation(s) to monitor for any inadvertent heritage resources. Any inadvertently discovered cultural items or sites encountered during the drilling operations by project archaeologist will be protected until evaluation can be completed by the Forest Service archaeologist.