DOE/EA-1676

FINAL

ENVIRONMENTAL

ASSESSMENT

Environmental Assessment for DEPARTMENT OF ENERGY LOAN GUARANTEE FOR U.S. GEOTHERMAL'S NEAL HOT SPRINGS GEOTHERMAL FACILITY IN VALE, OREGON

U.S. Department of Energy
Loan Guarantee Program Office
Washington, DC 20585

December 2009

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Washington, DC 20585

DOE/EA-1676

FINDING OF NO SIGNIFICANT IMPACT
DEPARTMENT OF ENERGY LOAN GUARANTEE FOR U.S. GEOTHERMAL'S NEAL HOT SPRINGS GEOTHERMAL FACILITY IN VALE, OREGON

AGENCY: U.S. Department of Energy, Loan Guarantee Program Office

ACTION: Finding of No Significant Impact

SUMMARY: The U.S. Department of Energy (DOE) has conducted an environmental assessment (EA) that analyzed the potential environmental impacts associated with the construction and startup of the U.S. Geothermal Neal Hot Springs 22MW electric power facility in Vale, Oregon. DOE, through its Loan Guarantee Program Office (LGPO), proposes to provide a Federal loan guarantee pursuant to Title XVII of the Energy Policy Act of 2005 (EPAct 05) to U.S. Geothermal to support the construction and startup of the proposed facility[1]. The purpose of DOE's proposed action is to expedite the deployment of a new energy technology into commercial use in the U.S. and to reduce emissions of greenhouse gases and other air pollutants.

U.S Geothermal would employ an innovative geothermal electricity production process which demonstrates an increase in power conversion efficiency up to 15 percent when compared to binary cycle systems currently available. The facility would use a non-toxic and non-flammable refrigerant in a closed-loop system with a gas scrubber to prevent the release of gas products to the atmosphere. These features would help to avoid air pollutants and anthropogenic emissions of greenhouse gases that would otherwise be produced to supply the energy through today's less efficient geothermal systems. The air cooled geothermal plant would have no direct emissions, and the indirect and equivalent CO_2 emissions from the Neal Hot Springs geothermal plant would be less than .04 pounds per kilowatt.

All discussion and analysis related to the potential impacts of construction and operation of the proposed U.S. Geothermal facility are contained in the Final EA (DOE/EA-1676), which is incorporated here by reference. DOE examined potential impacts on the following resources and found none to be significant: floodplains; wetlands; water resources and water quality; threatened or endangered species and critical habitats; prime or unique farmlands; geology and soils; visual, recreational, and aesthetic resources; property of historic, archaeological, or architectural significance; Native American concerns; environmental justice; public health and safety; air quality; global climate change; waste management; transportation; socioeconomic conditions; noise; and terrorism-related impacts.

In accordance with applicable regulations and policies, DOE sent a notification letter regarding the Department's determination to prepare an EA to the Oregon Governor's Office and the City

[1] The amount requested for the loan guarantee is not being disclosed at this time because it is business sensitive. Moreover, should DOE approve a loan guarantee, the amount may differ from the original request.

of Vale on June 8, 2009. The letter described the proposed action and stated that a draft EA would be sent to the state for review. On October 6, 2009, DOE sent the draft EA to the Oregon Governor's Office, Eastern Region Department of Environmental Quality, and the City of Vale inviting their comments on the draft. The draft EA was also posted on the Loan Guarantee Program Office website. DOE received no comments on the draft EA.

DETERMINATION: On the basis of the Final EA, DOE has determined that providing a Federal loan guarantee to U.S. Geothermal for construction and startup of a 22MW geothermal electricity generating facility in Vale, OR, will not have a significant affect on the human environment. The preparation of an environmental impact statement is therefore not required, and DOE is issuing this Finding of No Significant Impact.

Copies of the Final EA are available at the DOE Loan Guarantee Program Office website at http://www.lgprogram.energy.gov/NEPA-1.html or from

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Additional information on the DOE NEPA process is available from

Office of NEPA Policy and Compliance
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585
202-586-4600 or 1-800-472-2756

Issued in Washington DC on the 2nd day of December in the year 2009.

Jonathan Silver
Executive Director, Loan Programs

Environmental Assessment for Department of Energy Loan Guarantee for U.S Geothermal's Neal Hot Springs Geothermal Facility in Vale, Oregon
DOE/EA-1676

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LIST OF ACRONYMS

ACOE	U.S. Army Corps of Engineers
BLM	Bureau of Land Management
CO_2	carbon dioxide
DOE	U.S. Department of Energy
DSCFM	dry standard cubic feet per minute
DOGAMI	Department of Geology and Mineral Industries
EIA	Energy Information Administration
EPA	U.S. Environmental Protection Agency
EPAct 2005	Energy Policy Act of 2005
MW	megawatt
NO_x	nitrogen oxides
OSHA	Occupational Safety and Health Administration
ppm	parts per million
SHPO	State Historic Preservation Office
SO_2	sulfur dioxide
SWPPP	Storm Water Pollution Prevention Plans
USC	United States Code

Executive Summary

The U.S. Department of Energy (DOE) is proposing to issue a loan guarantee to U.S Geothermal Inc. (U.S Geothermal) for construction and startup of a geothermal facility (Facility) in Vale, Oregon.

DOE has prepared this Environmental Assessment (EA) to comply with the National Environmental Policy Act (NEPA) (42 USC 4321, et. seq.), the Council on Environmental Quality's regulations for implementing NEPA (40 CFR Parts 1500-1508) and DOE's NEPA regulations (10 CFR Part 1021). The EA examines the potential environmental impact of the proposed Facility and whether issuing a loan guarantee for construction and startup of U.S. Geothermal's proposed Facility would cause significant environmental impacts. DOE will use the information in this review to inform its funding decision.

PROPOSED ACTION AND ALTERNATIVES

DOE's proposed action is to issue a loan guarantee to U.S Geothermal for construction and startup of the Neal Hot Springs Facility 22 MW geothermal electric power facility in Vale, Oregon. Vale is a rural area nearly 75 miles northwest of Boise, Idaho consisting largely of native range for livestock and dryland pasture. U.S Geothermal would employ an innovative geothermal electricity production process which demonstrates an increase in power conversion efficiency when compared to binary cycle systems currently available on the market. The proposed facility would use a non-toxic and non-flammable refrigerant in a closed-loop system with a gas scrubber to prevent the release of gas products to the atmosphere.

Alternatives that were considered but dismissed are discussed in the EA. The no action alternative, which assumes DOE would not provide loan guarantee funds to U.S Geothermal is analyzed in detail along with the proposed action.

SUMMARY OF ENVIRONMENTAL EFFECTS

DOE expects no significant adverse environmental impacts from construction and operation of the Facility.

The proposed action would have minor direct and indirect beneficial impacts on socioeconomics from job opportunities. Additionally, DOE expects the electricity generated by U.S Geothermal to have potential beneficial impacts on global climate change by providing renewable electricity through an innovative process that reduces air pollutants and GHG emissions.

1.0 PURPOSE AND NEED FOR AGENCY ACTION

The Energy Policy Act of 2005 (EPAct 2005) authorized DOE to make loan guarantees for projects that "avoid, reduce, or sequester air pollutants or anthropogenic emissions of greenhouse gases; and employ new or significantly improved technologies as compared to commercial technologies in service in the United States at the time the guarantee is issued." Title XVII identified ten categories of technologies and projects that are potentially eligible for loan guarantees, including those for renewable energy technologies. The two principal goals of the Title XVII loan guarantee program are to encourage commercial use in the United States of new or significantly improved energy-related technologies and to achieve substantial environmental benefits. DOE has reviewed U.S Geothermal's application and prepared this EA as part of the process to determine whether to issue the loan guarantee.

2.0 PROPOSED ACTION AND ALTERNATIVES

DOE's proposed action is to issue a loan guarantee to U.S Geothermal (USG) for construction and startup of the Neal Hot Springs Facility, a 22 MW geothermal electric power facility. The plant would require 7.5 miles of new transmission line to be designed, permitted, constructed, and operated, by Idaho Power Company. U.S Geothermal submitted an application to DOE under the EPAct 2005 loan guarantee program to support construction and startup of the Facility.[1] This chapter provides information on U.S Geothermal's project and describes the proposed action, alternatives considered and the no action alternative.

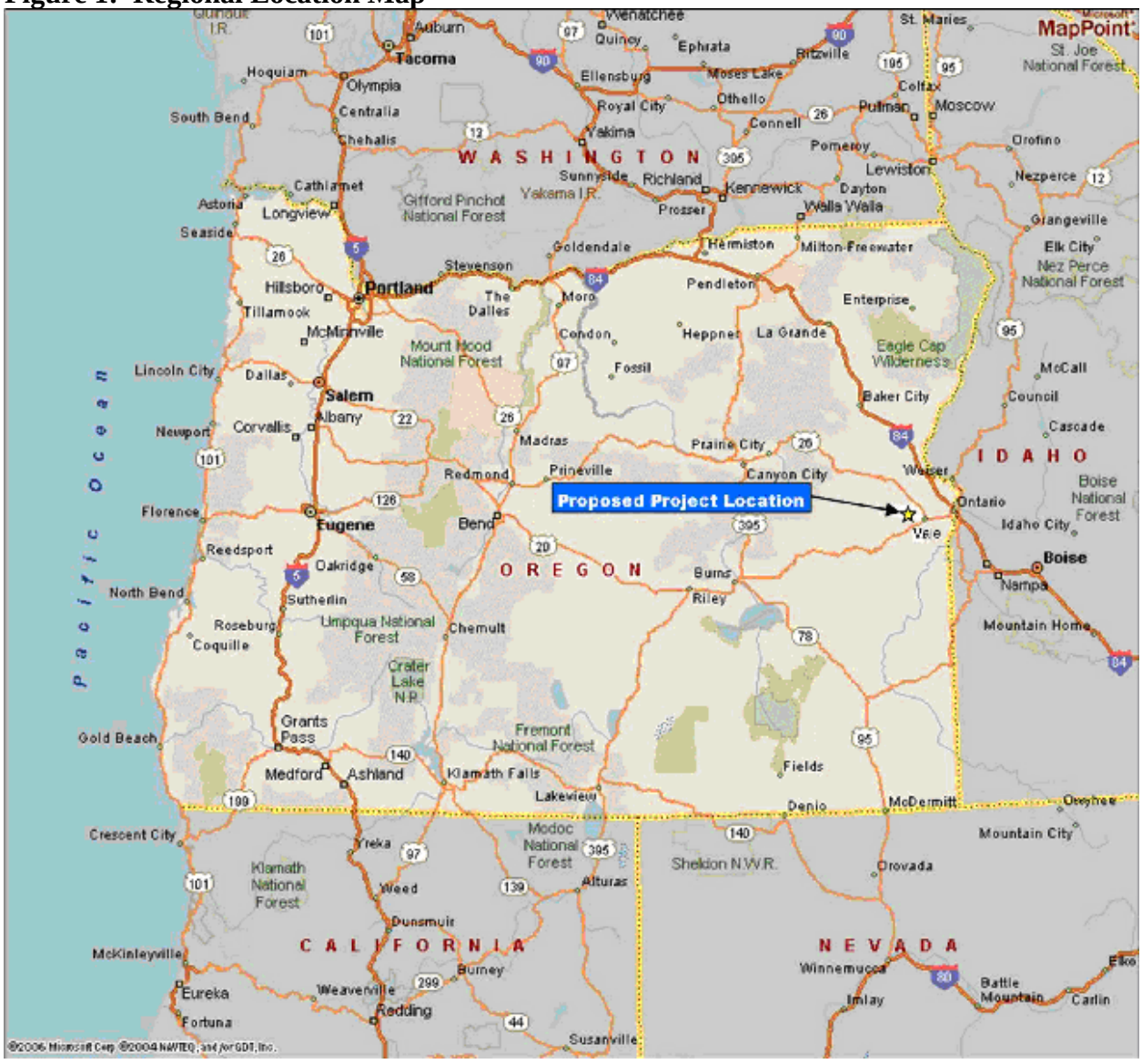
The proposed project is located in Malheur County Oregon approximately 12 miles west northwest of the Known Geothermal Resource Area located at Vale, Oregon (Figure 1). The project components would be located in Sections 5, 8, and 9, Township 18 South, Range 43 East, Willamette Meridian. The production wells would be sited on a geologic fault system that trends northwest from the confluence of Bully Creek and Cottonwood Creek. The injection wells would be sited along the Cottonwood fault adjacent to the existing county road and return the cooled geothermal water to the source aquifer in accordance with Oregon state law. The power plant would be located adjacent to the existing Bully Creek road. The geothermal water collection lines would be constructed between the wells and to the geothermal plant site. Approximately 25 acres would be affected by all project components under the proposed action. Surface rights of approximately 2.5 acres for one production well and its associated infrastructure is administered by the BLM; all other mineral rights and surface rights associated with this DOE decision are privately owned. An August 2009 EA and FONSI were issued by BLM for the surface rights.

On the portion of property where BLM administers the surface rights, USG has leased the mineral rights and the "perpetual right of ingress and egress to and from said real property…" which were retained by the original surface owners when the surface estate was deeded to the BLM.[2] The project would be constructed entirely on land utilized for farming and cattle grazing.

[1] The amount requested for the loan guarantee is not being disclosed at this time because it is business sensitive. Moreover, should DOE approve a loan guarantee, the amount may differ from the original request.

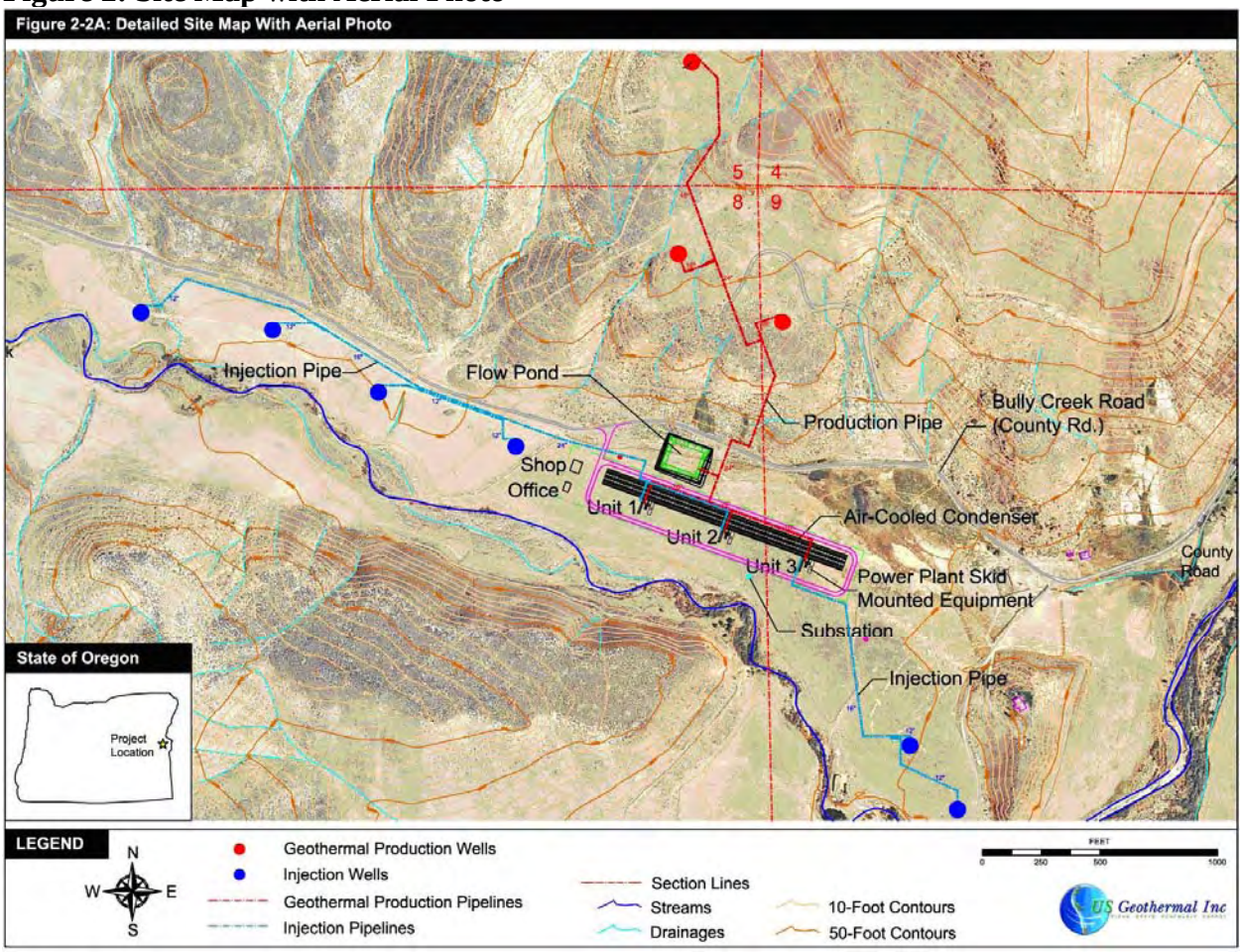
[2] Malheur County Recorders Office, Warranty Deed 06757, Book 105 Page 111.

Figure 1: Regional Location Map



USG has installed one geothermal well and is the process of installing 2 additional production wells. Other than the three production wells there are no additional existing geothermal facilities on the property (Figure 2).

Figure 2: Site Map with Aerial Photo



2.1 Description of Proposed Action

Equipment and System Descriptions

The Project consists of the following:

- Construction of injection wells to circulate cooled geothermal fluid[3] back into the source aquifer. The number of wells would depend upon the permeability of each of the injection wells. A total of five injection wells have been assumed. Each well would consist of a leveled area for drilling, a "mud pit" for storage of drill cuttings and the injection well drilled to a depth of 2000 to 5000 feet. The wells would be drilled into the Cottonwood and Neal fault systems. Fluid returned back into the ground would typically be injected at temperatures of 140 to 150 °F (see Figure 3).

[3] Geothermal fluid is a term used to describe water and steam resources that exceed a state established temperature and are therefore utilized for their energy value not for a consumptive water use. Geothermal fluids must by law, be returned to the source aquifer and are not appropriated for consumptive uses.

- Installation of three power plants, each consisting of binary cycle heat exchange units, condensers, cooling systems, a turbine, a generator, and associated equipment.

- Installation of production well pumps and associated equipment

- Installation of the pipelines connecting the production and injection wells to the power plant.

- Installation of a substation and power lines

- Construction of an office, control room and maintenance shop.

Drill Pads

Wells would be installed on level drill pads approximately 150 by 200 feet in size with an overall disturbance of approximately 200 by 300 feet. The wells would be located along or near existing access roads on farmland or dryland pasture. The well pads would be constructed to create a level pad for the drill rig and a graded, graveled surface for the support equipment. A track mounted excavator, front end loader, grader, compaction equipment and caterpillar style tractor dozer (D-7 or D-8 size) would be used to construct the drill pad to create the level work space. Storm water runoff from disturbed areas around the constructed drill pad would be controlled through the use of silt fence and erosion control materials consistent with best management practices for storm water. A reserve pit would be excavated with a tracked backhoe. The reserve pit would contain and store drill cuttings, waste drilling mud and storm water runoff from the constructed pad. All machinery, drilling platforms, and oil and fuel storage areas on the drill pad would drain to the reserve pit in order to prevent the offsite release of spills or storm water runoff from these source areas. Working surfaces would be covered with coarse rock or gravel to reduce dust during drilling. The access road and drill pad would be maintained to safely accommodate semi-trucks, trailers and drilling equipment. Drill pad construction and maintenance would be implemented in accordance with industry standard Best Management Practices (BMPs) published by the Department of Interior, Bureau of Land Management in what is referred to as the "Gold Book".[4]

Injection Wells

The injection wells would be drilled with a truck-mounted rotary drilling rig. The drilling rig would include diesel engines, hydraulic pumps, fuel and drilling mud storage tanks and mud pumps. Auxiliary equipment, such as air compressors could be used during drilling. During drilling, the top of the drill rig mast would be in order of 100 feet above the ground surface. The well bore would be drilled using non-toxic, temperature-stable drilling mud composed of a bentonite clay-water or polymer-water mix for all wells. A 30 x 50 feet mud pit would be used to mix water and drilling mud. Variable concentrations of additives would be mixed with the drilling mud as needed to increase mud weight, prevent corrosion, circulate the drill hole cuttings to the surface,

[4] Department of Interior, BLM, Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development (The Gold Book) Fourth Edition, 2006

and prevent mud loss. Additional drilling mud would be mixed and added to the mud system as necessary.

The well would be fitted with blowout prevention equipment and all aspects of the drilling project are reviewed and permitted by the Oregon Department of Geology and Mineral Industries (DOGAMI).

On average, 2-3 large tractor trailer trucks (delivering drilling supplies and equipment), and 5-10 small trucks, service vehicles or work vehicles, would be driven to the site each day throughout the typical 20- to 40-day drilling process. Drilling would be conducted 24-hours per day, 7-days per week by a crew of six to nine workers. During short periods, as many as 15 staff would work on the drill site at any one time. Gray water and sewage would be removed to an authorized disposal site.

Well Testing

Testing would be performed on each well after completion. The tests would be run for five to ten days. During testing geothermal reservoir characteristics would be evaluated. The test would consist of pumping the geothermal fluids from the well through onsite test equipment. The on-site test equipment would include standard flow metering, recording and sampling apparatus.
If a site is found to be not viable for injection, the well would be abandoned in conformance with all requirements of the Oregon Department of Geology and Mineral Industries (DOGAMI). Abandonment involves plugging the well bore with cement sufficient to ensure that fluids do not move across or into different aquifers.

Water Sources

Water for drilling is supplied from a nearby cold water well that is permitted with the Oregon Department of Water Resources. Up to 20,000 gallons of water are needed per day for drilling, which is recycled within the reserve pit. The water supply is piped by a 4 inch diameter temporary pipeline to each well site.

Well Completion

Well completion would include installation of the following:

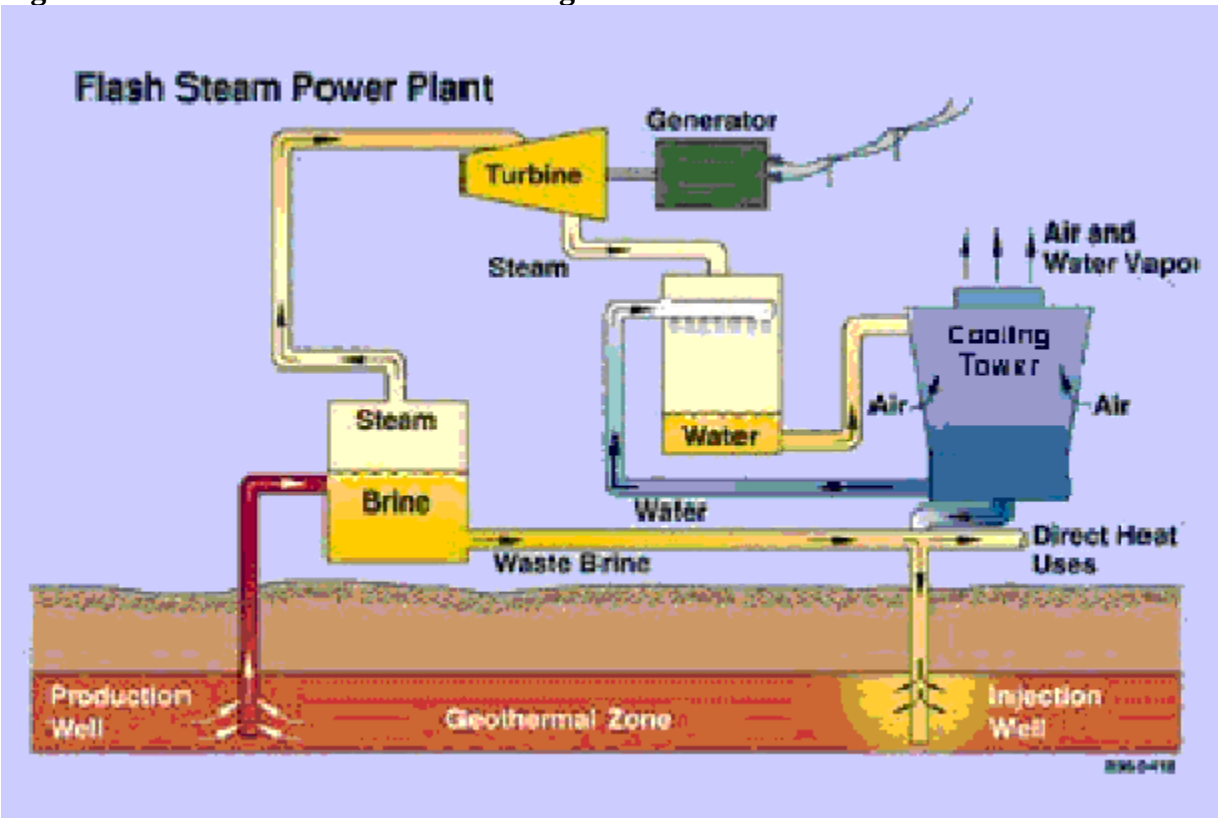
- 30 inch conductor casing
- 20 inch surface casing placed to approximately 300 feet below ground surface (bgs).
- 13 3/8 inch intermediate string from approximately 2,000 feet bgs to surface.
- Optional 9 5/8 inch production casing placed to approximately 3,500 feet bgs.

Upon completion the well pad would be shaped, graded and stabilized to minimize the affected acreage and ongoing care and maintenance would be implemented. Surface facilities, as previously described, would be maintained on site into the foreseeable future. Under these conditions, a pump control module, production size pipe, and power supply would be installed at each well. The pump control module is housed in a prefabricated steel enclosure approximately 8 feet wide, 8 feet tall and 20 feet long. All construction and surface improvements would be maintained for an anticipated geothermal operation period of at least 30 years.

Geothermal Power Plant

For the binary, Rankine cycle power plant[5], geothermal water would be pumped from the production wells, pass through the heat exchangers and then injected back in the ground in a closed system. A secondary working fluid would pass through the other side of the heat exchanger and be vaporized by the heat from the geothermal fluid. The vapor passes through the turbine to turn the generator. The vapor discharges to the air-cooled condenser where it is recycled in a closed loop back through the heat exchanger to be vaporized again (Figure 3). No air or water discharge is generated by the Facility.

Figure 3: Geothermal Power Plant Configuration



The operations area for each of three power plants is approximately 250 feet x 160 feet or 1 acre. Onsite construction would include contouring and preparing a permanent construction and operations site utilizing typical earth moving equipment. The power plant construction site is located in a currently utilized agricultural field that supports residual wheat, alfalfa, and weed species. The foundation for the power plants would be designed and constructed to meet all engineering requirements. Finally, coarse durable rock and gravel would be placed over the working area to provide a suitable surface for dust suppression, erosion control, and day to day vehicle operations. The heat exchangers and cooling towers would not be covered by any building. All disturbed lands not required for plant operations would be revegetated upon

[5] A thermodynamic cycle that converts heat into energy using a closed loop, which usually uses water as the working fluid.

completion of construction. All visible structures would be painted a muted color to minimize the visual impacts in the area.

The power plants are skid mounted, modular units. Major equipment is mounted on skids and all supporting piping, instruments, electrical, and controls are pre-fabricated in the shop, and then shipped to the site for rapid construction. In the field, it is only necessary to pour concrete foundations for the pre-fabricated skids, and then assemble the modular skids into a single integrated power plant, once the skids arrive. The power plants would employ significantly improved technology. Each power module is comprised of all the electrical, instrumentation, and controls for the supercritical power cycle. The major equipment on the skid includes the cycle pumps, a supercritical evaporator, a turbine and generator and all necessary electrical and mechanical equipment. The refrigerant vapor from the turbine discharges to a modular off-the-shelf air-cooled condenser which condenses the vapor back into a liquid and is then recycled into the heat exchangers.

Air Cooling System

The air cooling system consists of three independent cooling units containing an array of cooling fans. The overall dimension of the land on which the three units would be located is approximately 1,100 feet by 60 feet or 1.5 acres. The air cooling system would be constructed as a component of the power plant. The cooling fans are planned as modular unit that are constructed on site. Each fan unit is constructed of steel and fiberglass frame approximately 16 feet square and 30 feet high. Fans, approximately 14 feet in diameter and mounted on top of each unit to draw air over the cooling system.

Pipelines to the Power Plant

The project would require pipelines to deliver geothermal water from the production wells to the power plant, and to deliver cooled fluid from the power plant to the injection wells. The pipelines would be installed above ground and would vary in diameter from approximately 12 to 24 inches. Pipelines would be supported on conventional drilled pier supports or alternately using specialized insulation and jacketing placed directly on the ground. All pipes would be insulated to minimize thermal losses and provide personnel protection from burns.

Power Line Connection

The power plant would be connected to the local electric grid utilizing a 69-kV transmission line. The power line connection is being made through an interconnection agreement with the local utility, Idaho Power, which is obligated to provide service for the project. Idaho Power would own and be responsible for design, construction, permitting, land acquisition, operations and maintenance of the line. Idaho Power has secured the required rights-of-way, and is proceeding independently with its design and permitting requirements.

The proposed project would include 12.47-kV electrical lines from a substation located at the power plant site to the production well pumps. Included with the power lines would be disconnect switches, transformers and other related equipment as required. Approximately seven acres would be affected by access and auger holes required for the single wood pole, 69kV

power line that Idaho Power would install for the project. The route for the transmission line travels southeast from the project ½ mile then East along the section line to a point of interconnection at Grand Boulevard and West 2nd North. Two miles of the 10.5 mile transmission line already exist, approximately ¼ mile of new line would be permitted by the Bureau of Reclamation, and approximately ½ mile of line would be permitted by the Bureau of Land Management.

Office and Shop Facility

The shop and office would be located on the west end of the power plant facilities. The shop would consist of a metal building constructed on a concrete slab. The office could be either a stick built or prefabricated unit. The office building would contain the power plant control room, offices, a lunch room, a bathroom, and a meeting room. The entire office would encompass an area of approximately 25 foot by 40 foot (1000 square feet). The dimensions of the shop would be approximately 40 feet by 50 feet (2000 square feet). The shop would provide a weatherproof area for on-site construction and repair work along with equipment, vehicle, spare parts and tool storage. All buildings would be constructed with siding colored to blend with the surrounding region. Finally, the perimeter of the entire operations area (approximately 4 acres) that is utilized for the power plant, cooling towers, and office would have a 6 foot chain link security fence.

2.2 Alternatives Considered but Eliminated

The Neal Hot Springs site is a well known geothermal site that has been utilized for private and commercial uses for many years. No unresolved conflicts involving alternative uses of resources have been identified. All mapped geothermal springs in western Malheur County were evaluated and only the Neal Hot Springs site indicated temperature characteristics suitable for geothermal exploration and development.

U.S. Geothermal acquired the development rights to the site because of:

1. The prior exploration history that demonstrated a very productive geothermal system.
2. The Neal site is predominantly private land.
3. Malheur County has established a geothermal overlay zone that encompasses the development site.
4. The site is reasonably close to the existing transmission system.
5. Access is provided by a Malheur County maintained road.

2.3 No Action Alternative

Under the No Action Alternative, DOE would not issue a loan guarantee for the proposed Facility. Nonetheless, the Facility would be built by U.S Geothermal through another source of funding. Therefore, if the Facility is not built through funding of the Federal loan guarantee, the environmental effects discussed in the EA would occur regardless.

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL EFFECTS

This chapter describes the existing environmental, social and economic conditions of the project area and the potential environmental effects that could result from implementation of the proposed action or no action alternative.

3.1 LAND USE AND VISUAL MANAGEMENT STANDARDS

Affected Environment

Neal Hot Springs is located in Malheur County, Oregon approximately 12 miles west of Vale, Oregon. The site is located at 2,800 feet above sea level and is in the Owyhee uplands. The Owyhee uplands lie in the northwest corner of the Great Basin. This region differs from the rest of the province in that it is a flat deeply dissected plateau with little interior drainage where fault-block topography is less pronounced. The drainage basin of the Owyhee River encompasses the uplands. Originating in Nevada, the Owyhee River flows northerly through Idaho and Oregon to join the Snake River near Adrian, Oregon. In spite of low rainfall in the area, steep gradients give the river and its tributaries well-defined drainage patterns and deep canyons. Cutting through the uplands over 6,000 feet above sea level, the river drops to approximately 2,000 feet where it joins the Snake River. Small streams flowing in from the hills are largely intermittent.[6]

The site is typical of mid-elevation Owyhee Plateau rangelands. Malheur County has a semiarid winter precipitation pattern characterized by hot, dry summers and cold winters. The county is within Climate Division #9 (Southeast Oregon) as determined by the Western Regional Climate Center.[7] The average annual precipitation for Vale from 1893 through 2008 was 9.23 inches. The average annual maximum temperature for the same date range was 64.7 degrees Fahrenheit (°F) and the average annual minimum temperature was 35.8°F.[8]

Farming, ranching, and hunting are the predominant activities in the area of the proposed action. Adjacent federally managed lands are open to off-highway vehicle (OHV) use and there are no travel restrictions limiting OHVs to designated trails.[9]

The project site and transmission line route are located on lands that are utilized solely for dryland farming or cattle grazing and is adjacent to federally managed lands.

The proposed site is adjacent to BLM lands. The BLM has initiated the visual resource management (VRM) process to manage the quality of landscapes on public land and to evaluate the potential impacts to visual resources resulting from development activities. VRM class designations are determined by assessing the scenic value of the landscape, viewer sensitivity to the scenery, and the distance of the viewer to the landscape. These management classes identify various permissible levels of landscape alteration, while protecting the overall visual quality of the region. They are divided into four levels: Classes I, II, III, and IV. Class I is the most

[6] Orr E. L. and W. N. Orr. 1999. *Geology of Oregon*. Kendall/Hunt Publishing Co., p 79
[7] http://www.wrcc.dri.edu/narratives/OREGON.htm
[8] http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?or8797
[9] Southeastern Oregon Resource Management Plan (SEORMP), Appendix I and Appendix X – Map OHV, 2002

restrictive and Class IV is the least restrictive. The proposed action is located adjacent to an area that the BLM manages as a Class IV VRM area. The management objective in Class IV areas is to allow major modification of the existing landscape character.[10] The level of change to the landscape can be high. Management activities may dominate the view and be the major focus of viewer attention. Every attempt would be made to minimize the visual impacts through careful location, minimal disturbance, and respecting the basic landscape elements.

The Owyhee River headwaters begin in northern Nevada then travel west into Oregon and then north through Malheur County. The Owyhee dam and reservoir are located southwest of Nyssa, Oregon and approximately 30 air miles southeast of the project site. Two sections of the river, above the Owyhee Reservoir, are designated by both the State of Oregon and the United States Congress as a Wild and Scenic River. The designated corridor located approximately 40 air miles southeast of the project. No portion of the Owyhee River or the Scenic River corridor is visible from the project site and no project activities would result in any affect on the Owyhee Wild and Scenic River corridor.

Malheur County is recognized as an active geothermal region and Malheur County has assigned a geothermal overlay district to facilitate geothermal development throughout the entire county.[11]

Environmental Consequences

The power plant and wells are not visible from any state or federal highway or from local residences that are not associated with the project. The transmission line would be visible from the Bully Creek Road. The proposed action complies with visual resource management standards that are applicable on adjacent federal lands. The project is also located within Malheur County's geothermal overlay district. The project has been reviewed by the community, there have been no adverse comments regarding the proposal and the project has received unanimous approval from the Malheur County Planning and Zoning Commission. As a result, the project is consistent with visual resource and land use requirements.

3.2 GEOLOGY AND SOIL RESOURCES

Affected Environment - Geology and Soil

Malheur County is recognized as an active geothermal region. The area of the Proposed Action has been subjected to numerous exploration efforts for oil and gas, geothermal, and hardrock mineral resources. BLM managed lands northeast of the Proposed Action were historically leased for oil and gas exploration and the known geologic character of the site resulted in the reservation of mineral rights by prior surface owners. Numerous surface manifestations (hot springs) associated with deep geothermal resources have been mapped from Owyhee Reservoir north and west to Beulah Reservoir. The U.S. Interior Department has identified seven sites in Oregon as among the 35 “highest potential” geothermal regions in the country. The sites include

[10] Op.Cit. SEORMP, Appendix J and Appendix X – Map VRM, 2002
[11] http://www.malheurco.org/

Newberry Crater near Bend and the Klamath Falls, Lakeview, Crump Lake, Summer Lake, Malheur River and Vale areas of southern and eastern Oregon.[12]

The Neal Hot Springs geothermal reservoir is hosted in Tertiary volcanic and volcanoclastic rocks consisting of basalt flows, dikes and plugs injected into and interbedded with ashflow tuffs and tuffaceous lake sediments.[13]

The soils found in the area of the proposed action were surveyed and described in Oregon's Long Range Requirements for Water 1969, Map 1-10, Malheur Drainage Basin that was consulted and soil survey data that is available through a BLM fourth order soil survey. Soils are Encina series which are moderately deep or deep, well-drained clay loam soils derived from old stratified sediments. The native vegetation consists mostly of bluebunch wheatgrass, Sandberg bluegrass, big sagebrush, rabbitbrush, and squaw apple. Encina soils are used mostly for rangeland grazing. They have good potential for range seeding and are suited for irrigation on lower slopes.

Affected Environment - Seismicity

The largest recorded earthquake within a 160 kilometer radius of the project was a 5.1 magnitude event that occurred on June 12, 1992. The earthquake was centered 96 kilometers northwest of the project site at a depth of approximately 10 kilometers below ground surface. Between 1973 and 2006, five other earthquakes were recorded within a 160 kilometer radius of the project. The closest being a 4.6 magnitude earthquake 68 kilometers northeast of Neal Hot Springs at a depth of approximately 33 kilometers below ground surface. Exhibit 9 includes the table of all earthquakes from the US Geological Survey Data base for a 160 km radius centered on the project site from 1973 to 2006. The project is not located within a seismically active region. The appendix includes the magnitude, depth, and distance from the project of each seismic event.

Environmental Consequences

Environmental Consequences - Geology and Soil

Injection well drilling, power plant construction, and pipeline construction associated with the proposed project would result in ground disturbance that would have limited impacts on soils. Topsoil would be salvaged in accordance with best management practices and impacted areas would be reclaimed. The stockpiling, reuse, and seeding of topsoil would minimize any adverse effects of construction related disturbance. Upon completion of the construction phase, areas that are not needed for daily operations would be stabilized and revegetated. Drilling impacts to soils would also be minimized since drilling would occur along existing access routes or only require short access roads.

There would be no effect on mineral resources from drilling, testing and energy production.

[12] News of Interest, Oregon Department of Geology and Mineral Industries, June 18, 2003

[13] William Teplow, Professional Geologist, personal communication, 2008

Drilling at the Neal Hot Springs Geothermal Facility would occur to a depth of 2,300 to 4,500 feet to reach the geothermal reinjection points. The well would be cased during drilling to prevent contamination between ground water sources. Well logging equipment installed in the well during the production tests would have no nuclear or radioactive components that could pose a threat to aquifers. Each well would be flow tested then pump tested to evaluate the suitability of the injection well. During testing, geothermal aquifer parameters would be monitored to ensure that geothermal resources are protected for long term development.

Environmental Consequences - Seismicity

The Neal Hot Springs project is not expected to induce seismic events because the project is designed to balance geothermal reservoir pressures, not increase pressure or induce rock fracture. The Neal project involves water temperatures, flow, and geologic conditions that are typical of binary cycle geothermal power projects that have been operating in California, Nevada, and Idaho without incident. The water recharge techniques used in binary cycle projects have not been shown to induce seismic events and therefore make seismic events much less likely than those used for enhanced geothermal projects.[14]

The Neal Hot Springs project involves the binary cycle technology that pumps water from known geothermal reservoirs that are located along localized, near surface, fractures or faults, extracting the heat, and then injecting the water back into the reservoir to maintain a constant pressure. Enhanced geothermal systems, by contrast, involve injecting water from the surface into deep formations of hot, dry rock in order to induce rock fracturing and production of heated water that can be pumped to the surface to extract the heat.

There are several reasons why the binary cycle technology has a lower seismic risk than enhanced geothermal systems. First, there is a much lower differential between the reservoir temperature ($\leq$ 350 degrees F) and the injection water (approximately 150 degrees F). Also, in a binary system the injection and pumping are shallow, relative to regional fault zones and earthquake activity. For example, reservoir and injection zones at Neal Hot Springs are between 2000 and 3500 feet as compared to the estimate that an injection greater than 3 miles deep

[14] Seismic events have recently been associated with an enhanced geothermal project in Basel, Switzerland, and concerns raised regarding a Northern California project. Both projects are designed for deep heat recovery from hot dry rock. In the Basel Geopower project "…engineers intended to use the 200C temperatures at 5000 meters to heat injected water which is then pumped back to the surface for recovery. The technique relies on the fracture of existing pores and crevices by injection of cold water. The fractures create a path for water to cycle through the hard granite, so that the heated water can be brought back to the surface through a separate borehole a distance away from the injection hole." (http://www.treehugger.com/files/2007/01/geothermal_powe.php) The project located at the Geysers in California is also designed to demonstrate the viability of creating an engineered heat extraction system below the naturally occurring steam resource. The project would deepen an existing well into hot dry rock, stimulating fractures by pumping cool water into the well and drilling a new well to intercept those fractures and resulting water flow (http://altarockenergy.com/demo.html). Both projects result in high temperature differential between the water and the temperature of the dry rock resulting in rock fracture at depths of 11,500' to 12,500' below ground surface at the Geysers and approximately 16,000' below ground at Basel. In contrast, the Neal Hot Springs project will only drill to a depth of 2000 – 3500 feet and is designed to intercept an existing flow path, not to create a new rock fracture.

(15,840 feet) is required to induce significant faulting [15](Majer 2008). Finally, a binary system is designed to intercept an existing flow path, not to create new rock fracture as is done in an enhanced system. The goal of geothermal reinjection is to balance, not increase, the fluid and pressure within the geothermal system in order to ensure long term geothermal production.

Although the Neal wells would be drilled into an existing fault, drilling would not have effects on the fault or induce seismicity.

Construction would have no effects on tectonics or geology in the project region. Construction of the power plant and pipeline would require some ground disturbance but would not encounter bedrock or induce a seismic event.

3.3 Wetlands and Floodplains

The Cottonwood Creek drainage is an intermittent stream with a very narrow riparian corridor and limited wetland habitat. The stream does not support fish resources. Human encroachment from farming practices and overgrazing has contributed to a loss of riparian vegetation and an incised stream channel. The Federal Emergency Management Agency (FEMA) has prepared a flood hazard map for Cottonwood Creek in the area of the proposed action. FEMA mapping indicates the 100 year floodplain to be located south of the proposed action. The proposed power plant and transmission line would not be located in or adjacent to the 100 year floodplain. [16]

The area of the power plant and transmission line has been evaluated for the presence of wetlands. Three springs or seeps occur along the north side of the Bully Creek road. The springs or seeps do not generate measurable flow but do support riparian vegetation and soils. The total surface areas of the combined springs or seeps are less than 1 acre and are not connected to Cottonwood or Bully Creeks. The proposed power plant and transmission line would not result in any construction in, fill, or excavation of any wetland areas. In summary, the proposed project would not result in any adverse impacts to wetland areas nor would it take place anywhere in a floodplain.

3.4 Property of Historic, Cultural, or Archaeological Significance

Affected Environment

Pre-European contact Native American peoples were extremely well adapted to their environment. The subsistence economy was strongly oriented toward gathering and collecting because plant foods were abundant and more dependable than fowl, fish or mammals. Historic documents indicate that several hundred plants were used by the Indians of the Great Basin for medicinal purposes, fiber sources and food. The Exploration into this area during the historic period began with the expeditions of John Jacob Aster, after he heard the stories from the Lewis and Clark Expedition of 1804-1806. The first written observations of southeastern Oregon can

[15] Majer, E.L. 2008. White Paper: Induced Seismicity and Enhanced Geothermal Systems. Center for Computational Seismology, Berkeley National Laboratory

[16] National Flood Insurance Rate Map, FEMA, Malheur County Panel 475-2775, September 1986

be found in journals kept by fur trappers. Trapping occurred along the Owyhee, Snake, Malheur, North Fork Malheur and South Fork Malheur Rivers. The era of the fur trade provided the basis for American families to travel west. For Native Americans, increased use of the Oregon Trail burdened grazing resources, killed off game, and displaced resident bands.[17]

Environmental Consequences

A professional archaeologist conducted a literature search of known cultural resources and conducted a Class III inventory at the proposed site of the plant using pedestrian transects spaced less than 30 meters apart. The survey for this project was designed to locate, record, and evaluate all prehistoric and historic cultural resources visible on the ground surface. The route selected by Idaho Power for the transmission line does not cross over or near any known historical or cultural sites. However, upon completion of the final transmission line design and establishment of preferred pole locations and ground disturbance, Idaho Power would evaluate proposed disturbance areas for cultural and archeological resources as required by the State of Oregon and National Historic Preservation Acts. No archeological sites are documented near the project area and no archeological or paleontological artifacts were observed. No direct or indirect impacts to cultural or paleontological resources have been identified. This information was conveyed to the Oregon State Historic Preservation Officer in a "finding of no historic properties affected" letter (Exhibit 7).

The proposed action would not adversely affect any known cultural, paleontological, or archeological artifacts. If archeological or paleontological resources or artifacts are observed construction activity would cease and additional cultural evaluations must be conducted. Federal mandates and objectives to protect and conserve cultural and paleontological resources would be supported.

3.5 Native American Concerns

The following Federally listed American Indian Tribes were identified as having an interest in Malheur County, OR[18]:

- Confederated Tribes of the Warm Springs Reservation
- Fort McDermitt Paiute and Shoshone Tribes of the Fort McDermitt Indian Reservation
- Paiute-Shoshone Tribe of the Fallon Reservation and Colony
- Pyramid Lake Paiute Tribe of the Pyramid Lake Reservation
- Reno-Sparks Indian Colony
- Shoshone-Paiute Tribes of the Duck Valley Reservation
- Walker River Paiute Tribe of the Walker River Reservation
- Yerington Paiute Tribe of the Yerington Colony & Campbell Ranch

[17] http://www.blm.gov/or/resources/heritage/culturalheooregon.php

[18] This information was gathered using the Tribal Directory Assessment Tool (TDAT) on the Housing and Urban Development (HUD) website: http://www.hud.gov/offices/cpd/environment/tribal/.

DOE provided the tribes listed above with a description of the proposed project and invited them to initiate government to government consultation to share any concerns they might have (see Exhibit 6). No concerns were reported to DOE. There are no known sites of religious or cultural significance listed on or eligible for listing on the National Register of Historic Places in the immediate vicinity of the proposed project. No concerns regarding the religious or cultural significance of the site were identified by the Tribes. Therefore, the project would not have any adverse impact on resources of concern to Native American tribes.

3.6 BIOLOGICAL RESOURCES

Affected Environment

The project area is located in two distinct and different vegetative communities. Upland areas are located north of Bully Creek road and along a three mile segment of the transmission line route, while cultivated land is located south of Bully Creek road and along an additional two and one half (2 1/2) miles of the transmission route. Upland areas of the project area consist of shrub steppe plant communities dominated by sagebrush species and bunchgrasses. The dominant vegetation is Wyoming big sagebrush with an understory of perennial grass species, primarily bluebunch wheatgrass. Pasture land is managed for a single cutting of grass and alfalfa mixed with invasive and weedy species. Two vegetation surveys were conducted by a certified biologist, the contracted botanist and range management specialist on the upland areas. The first site survey was conducted in May 2008 and the second in June 2008; both completed in the southeast quarter of Section 5. Ms. Beavers reported the area appears to have been subjected to a rangeland fire as evidenced by a distinct line where sagebrush has been eradicated. Essentially the east two thirds of the site are covered in medusa head rye grass, whitetop, cheat grass, and other annual grasses. The west one third of the site supports a mix of shrub steppe vegetation. The surrounding hillsides also support a mix of sagebrush steppe shrubs and annual grasses which are described in the botanical specialist report. A large amount of bare soil is found on the site and medusa head rye has created a mat of litter under the herbaceous canopy.[19] There are seven (7) acres of potential surface disturbance associated with the transmission line; four (4) acres of cheat grass with no shrubs and 3.0 acres of shrub steppe vegetation with 10-20% canopy cover.

Invasive nonnative species are noxious weeds, insects and plant diseases that are not native but have come to thrive in a given ecosystem. Invasive, nonnative species spread from infested areas by people, equipment, livestock/wildlife and the wind. Because of their aggressive colonization and lack of natural enemies, these species can be highly destructive, competitive with native species, and difficult to control. Dominant invasive species identified on the site include hoary cress (*Cardaria draba*), medusa head rye *(Taeniatherum caput-medusae)*, and cheatgrass (Bromus tectorum). The Bully Creek corridor and the surrounding uplands support numerous populations of noxious weeds such as puncture vine, hoary cress and cheat grass. No population of threatened, endangered, proposed, and candidate (TEPC) plant species were found, but the site

[19] Botanical Specialist Report, Rebecca Beavers, July 2008

could support some TEPC species.[20] Generally, the vegetation on the project area lacks structural and species diversity necessary to provide favorable wildlife habitat.

Wildlife in the area of the proposed action is typical of big sagebrush/bluebunch wheatgrass and sagebrush/cheatgrass disturbed habitat types in the northern Great Basin and Owyhee Uplands communities. The project area is within the winter ranges for pronghorn, mule deer, and elk. Coyote, bobcat, and cougar along with small game and non-game species such as black tailed jack rabbit, and cottontail rabbits are transient in the project area. Birds may be found in the area as either seasonal residents or as migrants. All birds, except California quail, sage grouse, chukar partridge, gray partridge, and ring-necked pheasant are considered migratory birds. The site provides poor to marginal habitat for migrant species because of poor habitat conditions. Raptor species are seasonal residents and forage opportunistically throughout the region but do not utilize the project site or immediate area for nesting. Sage grouse utilize sage-steppe habitats throughout the West, primarily in areas dominated by sagebrush (Artemesia spp.), forbs, and grasses. While good sage grouse habitat may exist in the Cottonweed Creek drainage, the project site and adjacent lands do not provide suitable sage grouse habitat based on canopy cover and understory conditions. The nearest sage grouse strutting ground is approximately 4 miles west of the proposed action.

Amphibians are typically confined to wet or marshy areas located along Bully Creek and around natural springs. Reptiles are confined to dry, rocky areas located within and adjacent to the project area. Rabbits (lagamorphs) may be found in the area but have not been observed during any site review. The project area may support reptiles and rodents but most wildlife is found on hillsides and in adjacent more diverse habitat. The plant site and injection well locations are located on lands that have been used for farming and animal feeding operations which have resulted in lack of habitat. Rodents, reptiles, and avian species may wander near the heat power plant due to its proximity to shrub steppe hillsides to the north of the building. No fishery resources are present.

The proposed action incorporates Oregon's Sage Grouse Conservation Guidelines[21] and U.S. Geothermal has committed to evaluate additional conservation measures as the project progresses. Applicable conservation guidelines include management and control of invasive species, avoiding known occupied sage grouse habitat, preventing habitat fragmentation, reducing disturbance from off-highway vehicles and utilizing existing travel and utility corridors. The nearest suitable sage grouse habitat is located approximately 3.5 miles north and west of the project site and the nearest known lek is located 4 miles west of the proposed action. The proposed action is located more than 2 miles from known occupied sage grouse habitat and meets the standards established by the Sage-Grouse Conservation Assessment and Strategy for Oregon.

Protected and sensitive species that could occur in the project area were identified through literature searches. Ground surveys were not performed due to the heavily disturbed nature of the project area and the general lack of habitat. The US Fish and Wildlife Service (USFWS)

[20] Op cite, Beavers

[21] Sage-Grouse Conservation Assessment and Strategy for Oregon, Oregon Department of Fish & Wildlife, August 5, 2005

maintains a list of endangered, threatened, and candidate species as determined under the Endangered Species Act and the Oregon Natural Heritage Information Center (ORNHIC). A query under Section 7 of the ESA was made to determine whether any species could occur in the project area. ORNHIC maintains a list of rare, threatened, and endangered species as determined by the state of Oregon under the Oregon Endangered Species Act (see Exhibit 10). Potential for occurrence was determined based on an evaluation of the type of habitat, or lack thereof, at the project site.[22] No listed, proposed, or candidate species occur in the project area and the project area does not provide habitat for any listed, proposed, or candidate species.

Environmental Consequences

The construction work would commence on areas that are utilized for farming and ranching. After construction, the well pads and works sites would be subject to partial reclamation, maintenance, and intermittent human use.

The proposed action would not result in direct impacts to vegetation. Impacts would result in physical removal of approximately 1.5 acres of native shrub steppe vegetation and approximately 1.5 acres of invasive grass species such as medusa head rye and cheatgrass. The Proposed Action would result in short term impacts to vegetation because of the road and drill pad construction on the three acre site however reclamation, weed control, and seeding would be implemented.

The site does not provide vegetation or physical features that cause the site to be attractive to wildlife and the site does not provide core or critical habitat for wildlife or birds. Grazing at various times during the year further reduces ground cover and habitat conditions. No direct impacts to wildlife or birds are anticipated. Impacts from construction (regardless of the season) would result in the loss of approximately 20 acres of marginal and low quality habitat and subsequent displacement of individuals that utilized the affected land. Indirect impacts would result from the construction activity and noise which is expected to cause avoidance behavior and keep some birds away from the area of human activity. Idaho Power would construct all transmission lines in accordance with state and federal fish and wildlife standards for protection of raptors. Construction is temporary and indirect impacts to birds, including migratory birds, are temporary and short term. Individual birds would be displaced but would adjust and relocate to surrounding vegetative communities that exhibit higher structural and species diversity. Based on habitat suitability and timing of human activities, there would be no adverse impacts to birds or violation of the Migratory Bird Treaty Act.

The proposed action would result in direct impacts to vegetation. Because the area currently supports noxious or invasive species, ground disturbance within the project area would not increase overall area for weed colonization, however the diversity of invasive species could increase and additional species could become established. Impacts to vegetation would result from physical vegetation removal and the potential transport of noxious or invasive species off site or onto the project area.

[22] http://www.fws.gov/oregonfwo/Species/Lists

Design features included in the proposal call for washing vehicles before they first enter the area, revegetation and weed spraying. Controlled access, design features, and weed management activity provide measures to control the spread of invasive and noxious plant species.

The proposed action would not result in or contribute to the loss of critical habitat, listing of species, species viability, the demise of local populations of terrestrial or avian fauna, or create significant trends toward federal listing of species. Additionally, The U.S. Fish and Wildlife Service (USFWS) in La Grande, Oregon sent a "no effect" determination in July 2009 (see Exhibit 5). The proposed action supports state and federal wildlife management objectives. In summary, the proposed action would cause minor biological resource impacts but no adverse, unavoidable impacts.

3.7 WATER RESOURCES

Affected Environment

The Project area is located in the Bully Creek Hydrologic Subbasin. The proposed action is located on a dry south-facing hillside. There are no surface waters or riparian zones affected by the proposed action. The stream channels in the vicinity of the Project are ephemeral, flowing only during or immediately after rainfall, but dry the rest of the year.

The nearest surface water is Cottonwood Creek, an intermittent drainage, located 400 feet south of the plant site. The transmission route would cross Cottonwood Creek and Bully Creek but there would be no construction activity is located within wetlands. Three intermittent springs and seeps occur north and east of the power plant site. The springs and seeps do not generate measurable flow.

USG's application calls for implementation, maintenance, and evaluation of Best Management Practices to control surface runoff and erosion from disturbed lands. The Oregon Department of Environmental Quality, Oregon Department of Oil, Gas and Mineral Industries, Oregon Department of Water Resources and the US Army Corps of Engineers manage water quality, water quantity, and wetlands. Each agency has reviewed the surface and subsurface geothermal development activities. The agencies have both engineering and environmental management responsibility to ensure all activities are conducted in a manner that would not adversely affect water quality, water quantity, wetlands and associated natural resource values. Design features call for implementation and ongoing evaluation of Best Management Practices to protect water quality.

Ground water in the project area is utilized for domestic use or in the case of near surface geothermal water, for direct use home heating. There are no current operations that utilize the deep geothermal aquifer.

Environmental Consequences

The project would have little potential for adversely affecting the quality of surface waters in the project area because all activities are located at least 400 feet north of Cottonwood Creek and land shapes minimize or prevent sediment from being transported to surface water. The proposed action would have no direct or indirect effects to water quality or wetlands. The project would have little potential to affect the deep geothermal aquifer because all geothermal water is required to be returned to the source aquifer and does not contact any processing equipment. As part of the drilling permit process the DOGAMI reviewed the well design and construction to assure that surface, ground, and geothermal waters would not comingle. All geothermal water is recycled within the geothermal aquifer and is not altered physically or chemically.

3.8 SOCIOECONOMICS

Affected Environment

The closest population center is Vale Oregon, 12 miles east of the proposed action. Absentee landowners are common throughout the region and the local economy is based on agricultural commodities such as onion, corn, alfalfa and cattle. Vale has a population of approximately 3,800 residents while Malheur County has a population of approximately 30,907. There are five manufacturing related businesses but the dominant employer is the city and county government which employs over 130 staff. The second largest employer is the Eagle-Pitcher Minerals Company that produces high quality filtration material from diatomaceous earth. [23]

The median household income in Malheur County is $36,100, approximately $12,600 below the Oregon state median income.

Environmental Consequences

Construction would be performed by local companies, providing temporary work for drilling and power plant construction. Drilling operations would employ up to 15 staff for approximately 6 months. Construction activity associated with the proposed action may employ up to 50 construction staff for up to 120 days. No socioeconomic changes are attributable to the transmission line. Construction of the proposed project would not result in any major socioeconomic changes.

Operation of the proposed power plant would require approximately 5 permanent additions to the current workforce with an annual payroll of an estimated $300,000. The proposed action would have little or no direct effect on population, demographics, employment, or availability of housing or community services. Operation of the proposed project would not result in any major socioeconomic changes. The project would require no change in the current city or county infrastructure but would provide approximately $700,000 in annual property tax revenue that is distributed to Oregon and Malheur County.

[23] Oregon Economic & Community Development Department (http://info.econ.state.or.us)

The proposed action is located in a rural area with minimal existing infrastructure but well suited to power plant development. There is one county maintained access road, an existing power line, telephone lines, and one coldwater well for fresh water.

Under the proposed action Malheur County and the City of Vale would not need to provide any new services or expand existing services. The current infrastructure and services provided within the community are adequate to meet project needs and support both the construction workforce and the long term operations staff who would reside in the community. The Bully Creek road is currently maintained by the Malheur County Road Department. The road department typically grades and services the road twice annually. Based on daily traffic volume and construction deliveries, we anticipate two additional grading and maintenance efforts during the construction period. Ongoing operations would not require additional maintenance.

During construction, potable water would be supplied by individual contractors and staff. During operations, the existing potable water well would be utilized to supply fresh water needs for up to five staff. The existing wells have sufficient capacity to provide the office and staff needs and Oregon Water Law allows for commercial and industrial water use of up to 5000 gallons per day without the need for a water right or permit.[24]

During construction, wastewater would be generated by contractors and staff. Portable toilets and sanitary stations would be provided and all wastewater would be removed by a permitted wastewater management company. During operations, wastewater would be generated by up to five staff. All wastewater would be disposed in an onsite septic system permitted by the Malheur County Environmental Health Department.

No other unique or special infrastructure requirements are required for the proposed action. No adverse impacts to socioeconomic conditions would occur as a result of the proposed action. Construction and maintenance of the transmission line would have no adverse impacts to the Malheur County infrastructure. New transmission poles located in rural areas may however provide a more cost effective opportunity for local landowners to provide power to remote locations. As a result, construction of several new water wells and residences could result from the proposed action.

3.9 ENVIRONMENTAL JUSTICE

Affected Environment

Since the early 1970's, there has been increasing concern over the disproportionate environmental and human health impacts on minority populations and low-income populations. To address this concern, President Clinton issued Executive Order 12898 on February 11, 1994, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (Hereafter, EO). The EO directs each federal agency "to make achieving environmental justice part of its mission by identifying and addressing, as appropriate,

[24] Water Rights in Oregon, Oregon Water Resources Department, March 2008, pgs. 7-8, (ORS 537.545)

disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations." A President Memorandum accompanying the EO directs federal agencies to analyze "the environmental effects, including human health, economic and social effects, of Federal actions, including effects on minority communities and low-income communities, when such analysis is required by the National Environmental Policy Act of 1969 (NEPA)."

The demographics of Malheur County are similar to those of the State of Oregon although there is a higher percentage of Hispanics (27.7%) in Malheur County than in the state as a whole (11%). The county population is 93.5% White, 2% Asian, 1.5% Black, 1.3% American Indian or Alaska Native persons, 0.2% Native Hawaiian and other Pacific Islander, and 1.5 % mixed race. A total of 27.7% of the community is of Hispanic or Latino origin.[25] The median household income in Malheur County is $36,100, approximately $12,600 below the Oregon state median income. The percentage of residents living in poverty was 18.3% (US Census Bureau 2006), which is higher than the percentage of residents living in poverty in Oregon or the U.S.

Environmental Consequences

Environmental justice impacts occur if there is any disproportionately high and adverse human health or environmental effects on minority or low-income populations. U.S. Geothermal has not identified any potential adverse impacts from the project. Therefore, no disproportionately high and adverse human health or environmental effects would affect minority or low income populations in the project area.

3.10 AIR QUALITY

Affected Environment

Air quality in Oregon is regulated by the Department of Environmental Quality (DEQ). DEQ implements local programs as well as operates the federal environmental program within the state for implementation of the Clean Air Act, as delegated by the US Environmental Protection Agency (EPA). The air pollutants of greatest concern in Oregon are:

- Ground-level ozone, commonly known as smog
- Fine particulate matter (mostly from wood smoke or other combustion sources, cars and dust) known as:
  - PM10 (10 microns and smaller in diameter) and
  - PM2.5 (2.5 microns and smaller in diameter)
- Hazardous air pollutants (also called Air Toxics)
- Carbon monoxide (mostly from motor vehicles)
- Carbon Dioxide (CO_2)

[25] US Census Bureau, State & County Quick Facts (http://quickfacts.census.gov/qfd/states/41/41045.html)

The State of Oregon has adopted the federal air quality standards from the Clean Air Act. The federal and state standards are the same. These standards fall into two general categories, ambient standards that limit air pollution levels in a given area and emission standards that apply to direct sources. The State of Oregon also has CO_2 emissions standards for new energy facilities set by the Oregon Energy Facility Siting Council (OEFSC), and the Facility is below the thresholds regulated by OEFSC.[26]

The national ambient air quality standards (NAAQS) are defined as levels of specific air pollutants above which detrimental effects on human health and welfare may result. Pollutants for which ambient air quality standards have been established are known as federal "criteria" pollutants. Since the US EPA updated the NAAQS in 1997, there are ambient air quality standards for eight criteria pollutants. Pollution sources contributing to areas of nonattainment for criteria pollutant standards are subject to tighter restrictions. The proposed project area has not been classified as a nonattainment area for any criteria air pollutants. The project would not be located in or adjacent to any mandatory Class I (most restrictive) Federal air quality areas, U.S. Fish and Wildlife Service (USFWS) Class I air quality units, or American Indian Class I air quality lands.[27]

Environmental Consequences

Indirect impacts would result from emissions and dust generated by vehicles traveling to the site, from equipment used for construction and drilling, and from fugitive emissions of R-134A refrigerant. The proposed action would not result in direct air emissions.

Construction and Well Drilling

The primary pollutants of concern during construction and well drilling are particulates in the form of fugitive dust and diesel exhaust emissions. Fugitive dust emissions would be generated by ground-disturbing activities related to transportation, well pad construction, and grading for construction of the power plant facility. The well pads would be constructed adjacent to the existing roads and would require minimal earthwork. Installation of the pipelines would require some grading and earthwork. As discussed earlier, total surface disturbance is estimated at 25 acres that could contribute to dust emissions for a period of approximately 6 months.

The drill rig would be powered by a large bore diesel engine. Diesel combustion emissions would be emitted from construction equipment and vehicles used to access the project site. Emissions of criteria pollutants and air toxics (small quantities of diesel PM, acetaldehyde, benzene, and formaldehyde) would be released during well pad, pipeline, and power plant construction by diesel-powered equipment. Figure 5 shows a worst-case emissions scenario for a large bore stationary diesel engine based on estimated maximum daily fuel consumption while drilling.[28] Due to the smaller size of the proposed drill rig and variables in operating parameters

[26] Oregon Carbon Dioxide Emission Standards For New Energy Facilities
http://www.oregon.gov/ENERGY/SITING/docs/ccnewst.pdf
[27] http://www.epa.gov/oar/data/

[28] http://www.epa.gov/otaq/ap42.htm

of the engines, emissions are expected to be significantly lower than the worst-case scenario and emissions from the drill rig would be considerably less than those shown in Figure 4. Also, the geothermal water has no non-condensable gases such as hydrogen sulfide or carbon dioxide.

Figure 4. Estimated Emissions from Construction and Transportation

Pollutant	Emission Factor (lbs/mmBTU)	Total Projected Emissions (tons per year)	EPA Permit Threshold (tons per year)
Carbon Monoxide - CO	0.085	21.0	100
Sulfur Dioxide – SO_2	0.0202	.48	50
Nitrogen Oxides - NO_x	3.20	80.04	100
Particulate Matter - PM	0.0573	1.44	25
Organic Compounds	.09	2.28	NA
Carbon Dioxide – CO_2	165	4128	NA

Fugitive dust generated from earth-moving activities and from vehicles traveling to the site would be controlled by watering. Watering would minimize any adverse impacts from particulate matter emissions during ground disturbance.

Elevated particulate concentrations in the vicinity of the project would be short term and temporary. Given the small size of the construction area, and the small fleet of vehicles needed for construction, emissions would be minimal and would not contribute to or cause an exceedance of air quality standards. No issues related to air quality have been identified and there would be no residual air quality impacts. No mitigation is proposed beyond the proposed road watering and utilization of construction best management practices.

Power Plant Operations

Geothermal power plant operations would not generate direct emissions or emissions of criteria pollutants. The plant would be a binary-type geothermal plant which uses non-ozone depleting secondary working fluid known as R-134A. Binary plants are closed systems and do not result in direct air emissions. Indirect emissions would be related to minor amounts of R-134A refrigerant that is lost annually through valve leaks and seals. Manufacturer specifications indicate that less than 1% (1000 pounds) is lost annually per turbine. This is a normal aspect of operations.

Air Conformity Analysis

The project would not be located within any non-attainment areas and would not exceed any conformity requirements as dictated in the Environmental Protection Agency's (EPA) rule "Determining Conformity of General Federal Actions to State or Federal Implementation Plans" (40 CFR 93,Subpart B). The project would not contribute to any violation of federal ambient air quality standards. In total, due to the displacement of fossil fuel based power generation, the

displacement from the proposed geothermal Facility would reduce the overall emittance of criteria pollutants.

Global Climate Change

The Intergovernmental Panel on Climate Change, in its Fourth Assessment Report, stated that warming of the earth's climate system is unequivocal, and that warming is very likely due to anthropogenic greenhouse gases (GHG) concentrations.[29] DOE is not aware of any methodology to correlate the CO_2 emissions exclusively from the proposed project to any specific impact on global warming; however, studies such as the IPCC report support the premise that CO_2 emissions from the proposed project, together with global greenhouse gas emissions, would very likely have a cumulative impact on global warming. Although the project would contribute to cumulative increases in greenhouse gases and related climate change when combined with other projects globally, GHG emissions from the proposed action would be minimal increases in CO_2, resulting from construction and transportation.

Because the proposed action is a closed-loop binary cycle system, geothermal steam discharge would be limited to the 12-24 hour period of flow testing. The binary cycle heat exchangers and turbines are proposed to be air cooled and would not result in direct air discharges. Indirect air discharge would result from leaks around seals and valves that control the flow of R-134A refrigerant. Refrigerant losses are expected to be less than 1% of the working volume of the refrigerant. Based on a working volume of 300,000 pounds for all three units, no more than 3,000 pounds per year of R-134A would be lost through valves and seals. The global warming potential (GWP) of R-134A, along with many other refrigerants and gases has been evaluated and estimated by the Environmental Protection Agency (EPA)[30]. Specifically, R-134A is not ozone depleting and poses no danger to the ozone layer; however, it has a GWP of 1300 times CO_2. Regardless of the higher GWP, the air cooled geothermal plant would have no direct emissions and the indirect and equivalent CO_2 emissions from the Neal Hot Springs geothermal plant would be less than .04 pounds per kilowatt; far less than 2.095 pounds of direct CO_2 emissions per kilowatt of coal based power. Figure 5 provides a comparison of CO_2 emissions from traditional electric and heating fuels to the proposed air cooled geothermal electric Facility.

Figure 5: Air Cooled Geothermal vs. Fossil Fuel CO_2 Emissions for Electrical Generation

	Air Cooled Geothermal	Coal	Petroleum	Natural Gas
Emissions (pounds CO_2 per kilowatt hour)	0.04	2.095	1.969	1.321

SOURCE: Bloomfield et al. 2003

Geothermal operations that utilize steam to directly generate electricity are known to produce carbon dioxide and emit hydrogen sulfide gas (H_2S) along with various trace metals which can

[29] Intergovernmental Panel on Climate Change, Fourth Assessment Report, Climate Change 2007: Synthesis Report, Summary for Policy Makers, released in Valencia, Spain, November 17, 2007.

[30] *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 -2000*, U.S. EPA, Office of Atmospheric Programs, EPA 430-R-02-003, April 2002. <www.epa.gov/globalwarming/publications/emissions>

be emitted with the steam vapor. The Neal Hot Springs geothermal project utilizes a closed-loop binary power plant and therefore has no gas emissions.

The proposed action would have a beneficial effect on reduction of GHG emissions and reduce anthropogenic sources of CO_2 attributable to electric generation and reduce the overall discharge of criteria air pollutants.

3.11 Noise

Affected Environment

Noise sources in the project area are typical of rural rangelands. Noise sources are generated primarily from on and off road vehicles, irrigation pumps, intermittent use of construction equipment, private and military aviation. The background noise generated by the "hum" of electric irrigation pumps most likely dominates the audible environment. The proposed action is located more than one and a half (1.5) miles from any sensitive receptor and approximately 1,600 feet from the nearest property boundary. The typical average noise level of this type of environment as estimated by Caltrans (1998) is 20-40 dBA.

The Oregon DEQ has established rules for noise emissions from new industrial or commercial noise sources. The proposed power generating Facility is classified as a commercial or industrial noise source (DEQ 2008). The Oregon administrative rules (OAR 340-35-035) require that DEQ regulations provide that no person owning or controlling a new industrial or commercial noise source located on a previously unused industrial or commercial site shall cause or permit the operation of that noise source if the noise levels generated or indirectly caused by that noise source increase the ambient statistical noise levels, L10 or L50, by more than 10 dBA in any one hour, or exceed the levels specified in Figure 6, as measured at an appropriate measurement point, as specified in subsection (3)(b) of this rule, except as specified in subparagraph (1)(b)(B)(iii). The construction site and equipment operations are exempt from these rules but DEQ standards apply to the power plant operations. The administrative rules, section 340-35-035.3, further state that the appropriate measurement point shall be that point on the noise sensitive property line nearest the noise source.

Figure 6: Oregon One Hour Noise Source Standards

New Industrial and Commercial Noise Source Standards Allowable Statistical Noise Levels in Any One Hour	
7 am – 10 pm	**10 pm – 7am**
L50 – 55 dBA	L50 – 50 dBA
L10 – 60 dBA	L 10 – 55 dBA
L1 - 75 dBA	L 1 – 60 dBA

Environmental Consequences

Project operation noise would be limited to noises generated by the power plant. The turbine and cooling fans of the proposed power plant would be the greatest source of long-term noise generated by the project. Turbines and cooling tower fans can generate up to 85 dBA of noise at

3 to 5 feet from the turbines (DOE 2002). Utilizing natural sound attenuation at a rate of 6 dBA for each doubling of distance from the receptor, the expected noise generated by plant operations when measured at the nearest property boundary is expected to 31.2 dBA.[31] The projected noise level is below the regulatory thresholds and the proposed action would comply with Oregon state law. Noise would be generated by power line construction but no noise impacts are attributable to the power line itself. Construction related noise is short term and temporary and would not be discernable from agricultural equipment operations in the same vicinity. Therefore, no adverse impacts from noise are expected.

3.12 Human Health and Safety Assessment

U.S. Geothermal's response plans address injuries, well blowouts, fires, spill or discharge contingencies, drilling safety and action plans, and hazardous gas control.

The purpose of these plans is to provide guidance to field personnel and management in the event of an uncontrolled well flow (e.g., "blowout") or other field related emergency. The plans are intended to be comprehensive in that they describe the nature of various hazards or problems that might be encountered and specify appropriate preventive or anticipatory actions and equipment, as well as specific responses, notifications and follow up procedures that are required in the event of such a field emergency. In addition to blowouts, emergencies such as accidents and injuries are covered, as are fire hazards management and risk assessment.

Malheur County has not prepared a comprehensive risk analysis with regard to the potential for threats and natural disasters. The county has however prepared a Community Wildfire Protection Plan and a Multi-Jurisdictional Natural Hazard Mitigation Plan. The project is located in an area of the county where emergency services are limited to ambulance services. Fire response services are coordinated with the Bureau of Land Management with regard to range fires, but provide minimal structural protection and are of limited service. County guidance indicates to landowners that fire protection in remote locations is a personal responsibility.

The potential hazards to workers associated with drilling and testing includes potential exposure to fuels and lubricants, geothermal fluids, and high noise levels associated with equipment. Drilling would occur in pasture and rangelands from developed well drilling pads. Vegetation is limited at the drill site and the likelihood of causing a fire is minimal. Well logging tools would be used during production testing; however, no nuclear or radioactive devices would be used.

Drilling would not involve hazardous substances but would subject drill crews and staff to drilling additives and mud, diesel fuel, lubricants, solvents, oil, equipment/vehicle emissions, and geothermal fluids. USG and its contractors would comply with all local, state, and federal regulations regarding the use, transport, storage, and disposal of hazardous materials and wastes. A spill control and prevention plan is also maintained to prevent adverse impacts to the environment from fuel, oils, and lubricants. Drilling mud and fluid would be directed to the mud pit. The mud pit is constructed below ground level and reclaimed in place. Adverse impacts are not expected based on past drilling experience. The drill site would be fenced to prevent unauthorized access.

[31] http://www.engineeringpage.com/cgi-bin/noise/dis_one.pl

Well blowouts and pipeline failures are rare occurrences during well drilling and can result in the release of drilling additives and fluids from the geothermal resource. In the event of a blowout there would be an uncontrolled release of geothermal fluid that would flow downhill and be collected in an existing retention pond with a 12-hour capacity before overflowing into neighboring agricultural lands. Blow out prevention includes:

- Performing regular wellhead maintenance, including corrosion control and inspection, pressure monitoring, and use of blowout prevention equipment such as shutoff valves;
- Maintaining an emergency response plan for well blowout,
- Providing workers with a fact sheet about the potential human health and safety impacts from exposure to liquids and gases from the production well during a blowout.

With implementation of these measures, on site plans, and standard safety precautions, adverse impacts are not expected to result from power plant construction or transmission line installation and maintenance. Workers would be required to wear hearing protection and other personal protection equipment as required by the Occupational Health and Safety Organization to prevent injuries. Fire hazards would be minimized through the maintenance of an on-site water tank to put out any potential fires. Other measures include:

- Fire extinguishers and shovels would be available on-site.
- All brush build-up around mufflers, radiators, and other engine parts must be avoided; periodic checks must be conducted to prevent this build-up.
- Smoking would only be allowed in designated smoking areas; all cigarette butts would be placed in appropriate containers and not thrown on the ground or out windows of vehicles.
- Cooking, campfires, or fires of any kind would not be allowed.
- Portable generators used in the Project Area would be required to have spark arresters.

The Facility would not store or use hazardous or flammable materials, as a result the fire response and safety measures implemented for systems that do use hazardous and flammable materials are unnecessary. Due to the safety measures taken, no adverse impacts to safety or occupational health would occur as a result of the proposed action.

3.13 Evaluation of Terrorism-Related Impacts

The proposed Facility has a very low probability of attack due to the remoteness of the location and relatively small potential as a target for intentionally destructive acts. The potential for the proposed action to result in terrorism-related activity or impacts would be negligible.

3.14 Cumulative Impacts

Cumulative impacts are those that may affect resources of concern (resources for which the proposed action could contribute incrementally) arising from the proposed action in conjunction with past, present, and reasonably foreseeable future actions in the particular region of influence during the time period in which the proposed action would incrementally contribute. Past and

present activities consist primarily of dispersed recreation, livestock grazing, and mineral exploration and development activities. The surface impact related to all current land disturbing activities in the BLM Cumulative Effects Study Area[32] of 201,280 acres is approximately 20 acres, or less than .001 % of the CESA. USG is conducting geothermal development activities on approximately 6 acres adjacent to the proposed action. Within the geographic scope of this analysis, the only other known action is an Idaho Power transmission line construction project. There are no other known actions proposed or anticipated during the period of this proposed action in the CESA.

For this analysis the "foreseeable future" is a 25-year operations period of the power plant and well sites. The proposed action and effects have been described previously within this environmental analysis. It is assumed that recreational activities, locatable minerals exploration and livestock grazing activities within the CESA would continue into the foreseeable future in the same manner and to the same degree as they have been conducted in the present and recent past. The identifiable present effects of past actions result from the construction of fences, spring developments, pipelines, roads, grazing management, off road vehicle use, oil and gas exploration, and associated road development.

There are no reasonably foreseeable actions that would incrementally lead to a cumulatively significant impact on area resources that are impacted by the proposed project. The EA analysis identified no incrementally significant impact to any of the resource areas assessed. Consequently, given the minimal number of past, present, and reasonably foreseeable future actions that could contribute to significant cumulative impacts within the spatial and temporal site boundaries of the proposed project, the project is not expected to result in any significant cumulative effects.

[32] The Cumulative Effects Study Area is an area that has been defined by the local Bureau of Land Management (BLM) staff. The staff established an area encompassing the portion of the Bully Creek hydrologic subbasin immediately adjacent to and surrounding the Neal facility.

4.0 LIST OF PREPARERS

The following persons were primarily responsible for preparing this EA:

Joe Marhamati, NEPA Document Manager, Loan Guarantee Program Office, DOE

Joe Montgomery, Senior Associate, NISC-TMS

Matthew McMillen, NEPA Compliance Officer, Office of the Chief Financial Officer, DOE

Scott Nichols, Manager, Permits and Lands, U.S. Geothermal

Robert Cline, P.E., Vice President, Engineering, U.S. Geothermal

Amy Mitchell, Executive Assistant, U.S. Geothermal

Kevin Kitz, P.E. Vice President, Project Development, U.S. Geothermal Inc.

Rebecca Beavers, Botanist and Professional Range Manager

Mark Druss, PhD, RPA, Archeologist

Ian Spanswick, P.E., Turbine Air Systems

5.0 LIST OF AGENCIES CONTACTED AND ASSOCIATED PERMITS

Malheur County Commissioners, Vale, Oregon, April 2009, July 2009

Vale District Bureau of Land Management, Vale Oregon, May 2008 to present

Oregon Department of Fish and Wildlife, Vale Oregon, April 2009

U.S. Fish and Wildlife Service, LaGrande, Oregon, July 2009

Oregon Department of Geology and Mineral Industries, Albany, Oregon, March 2008 to present

Oregon Department of Environmental Quality, Portland, Oregon, June 2008 to present

Vale Chamber of Commerce, Vale, Oregon, April 2009

Figure 7: Permitting Requirements and Status

Agency	Permit / Approval	Status / Timing
DOGAMI	Drilling Permit	Approved on 9/1/09.
Malheur County	Conditional Use Permit	Approved on 9/25/09.
Malheur County	Building Permit	Pending final engineering design.
Malheur County	Septic Permit	Pending final engineering design.
DOGAMI & Oregon DEQ	Injection Well Permit	Application pending results of well drilling.
Oregon DEQ	Construction Stormwater Permit (NPDES)	Application immediately prior to construction.

6.0 REFERENCES

Aikens, C. M. (1993). *BLM, OR/WA Cultural Heritage.* Retrieved May 2009, from USDI-BLM: http://www.blm.gov/or/resources/heritage/culturcheooregon.php

Allen, C. (2005). *The Oregon History Project, Malheur Indian Reservation.* Retrieved April 2009, from Oregon Historical Society: http://www.ohs.org/education/oregonhistory/historical_records/dspDocument.cfm?doc_ID=63029619-9698-B33E-18180586E8AA762E

Atmospheric and Science Board. (2006). *Surface Temperature Reconstruction for the last 2000 Years.* National Research Council.
Beavers, R. (2008). *Botanical Report for Neal Hot Springs, Oregon.* Boise.

Bureau of Land Management. (2006). *Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development (The Gold Book)* (Fourth Edition ed.). Washington DC: Department of Interior.

E.L. Orr, W. O. (1999). *Geology of Oregon.* Kendall/Hunt Publishing Co.

EMPS Inc. (October 2008). *Final PEIS for Geothermal Leasing in the Western US.* Bureau of Land Management.

Energy Source and Census Division. (2007). *Renewable Energy Trends 2007.* Washington DC: Energy Information Administration.

EPA Air Data Homepage. (2009, May). Retrieved May 2009, from Environmental Protection Agency: http://www.epa.gov/oar/data/geosel.html

EPA Air Pollutant Emission Factors. (2009, June). Retrieved June 2009, from EPA Modeling & Inventories: http://www.epa.gov/otaq/ap42.htm

EPA Atmospheric Program Office. (2009, April). *Greenhouse Gases & Climate Change.* Retrieved June 2009, from EPA: www.epa.gov/globalwarming/publications/emissions

GISS Datasets, 2007 Global Temperature Trends. (2008, August). Retrieved June 2009, from NASA, Goddard Institute for Space Studies: http://data.giss.nasa.gov/gistemp/2007

Oregon Department of Water Resources. (2009, March). Water Rights in Oregon. Oregon Department of Administration.

IPCC, Working Group I. (2007). *Climate Change 2007:The Physical Science Basis.* International Panel on Climate Change.

Majer, E. (2008). *Induced Seismicity and Enhanced Geothermal Systems.* Center for Computational Seismology. Berkeley National Laboratory.

Malheur County Code. (2008, May). Retrieved June 2009, from Malheur County: http://www.malheurco.org/

Malheur County Quick Facts. (2009, June). Retrieved June 2009, from U.S. Census Bureau: http://quickfacts.census.gov/qfd/states/41/41045.html

Malheur County Recorders Office. (Book 105, Page 111). *Warranty Deed 06757* (Vol. Book 105). Vale, OR: Malheur County.

NOAA Climate Data Center, 2007 Annual Report. (2008, April). Retrieved June 2009, from National Climatic Data Center: http://www.ncdc.noaa.gov/oa/climate/research/2007/ann/ann07.html

Noise Attenuation Calculation. (n.d.). Retrieved June 2009, from Engineering Page: http://www.engineeringpage.com/engineering/noise.html

Oregon Office of the U.S. Fish & Wildlife Service. (2008, September). Retrieved June 2009, from U.S. Fish and Wildlife Service: http://www.fws.gov/oregonfwo/Species/Lists/Documents/County/MALHEUR%20COUNTY.pdf

Oregon Department of Geology, (2003, June). Retrieved March 2009, from Oregon Department of Geology and Mineral Industries: http://www.oregongeology.com/sub/pub%26data/pub%26data.htm

Oregon Department of Water Resources, Long Range Requirements for Water 1969, Map 1-10, Malheur Basin General Soil Map

Teplow, W. (2008, November). Professional Geologist, Personal Communication.

Vale Community Profile. (n.d.). Retrieved June 2009, from Oregon Economic & Community Development Department : http://info.econ.state.or.us:591/FMPro?-db=Community.fp4&-Format=forms.htm&-lay=webpage&-op=eq&sort%20name=Vale&-Find

Vale District BLM. (2002). *Southeast Oregon Resource Management Plan & Record of Decision.* Vale: USDI.

Vale District BLM. (2002). *Southeast Oregon Resource Management Plan, Map: Hydra-1*. USDI BLM.

Western Regional Climate Center, Average Temperature & Precipitation. (2009, May). Retrieved May 2009, from NOAA: http:/www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?or8797

Western Regional Climate Center, General Climate Data. (2009, May). Retrieved May 2009, from NOAA: http://www.wrcc.dri.edu/narratives/OREGON.htm

APPENDICES

Figure 2-7: Single TAS Unit

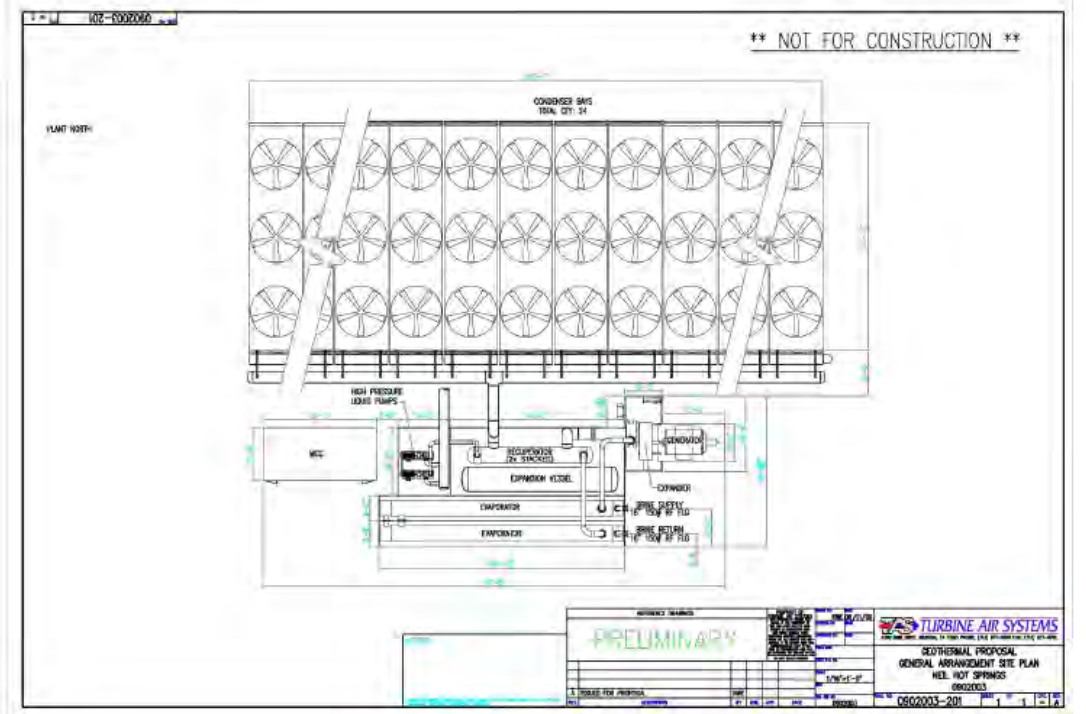


EXHIBIT 1- SINGLE TAS UNIT

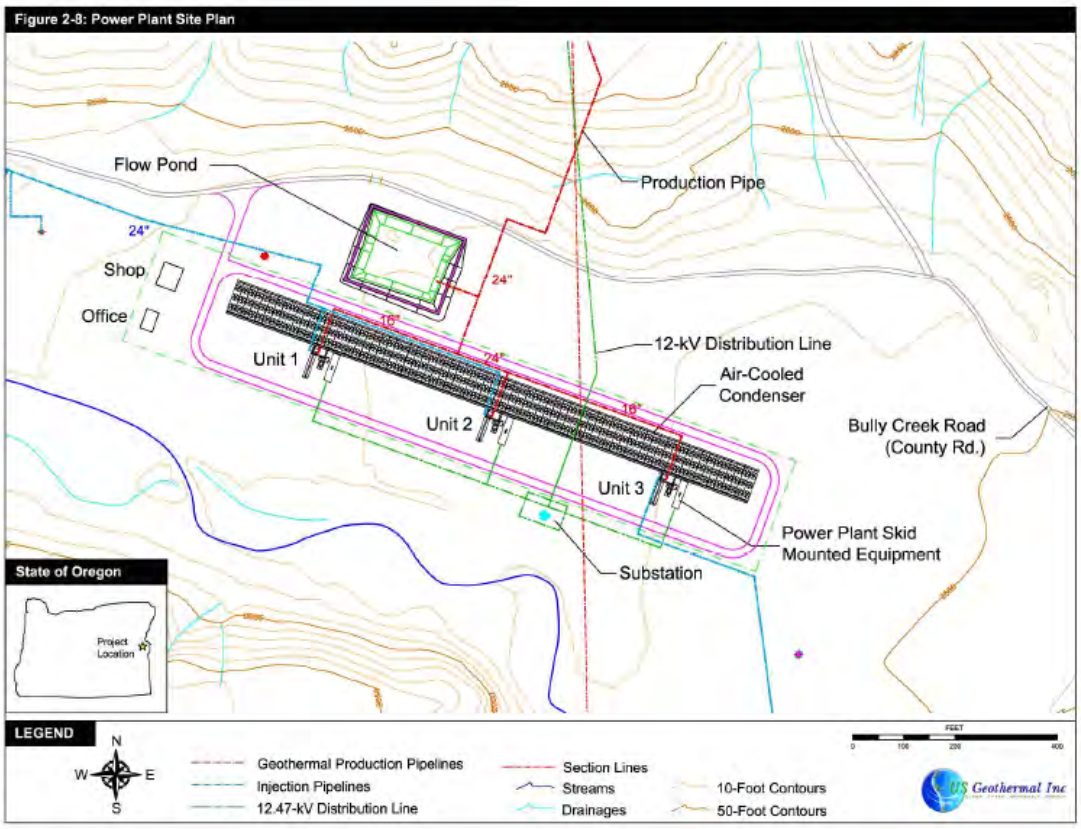


EXHIBIT 2- POWER PLANT SITE PLAN

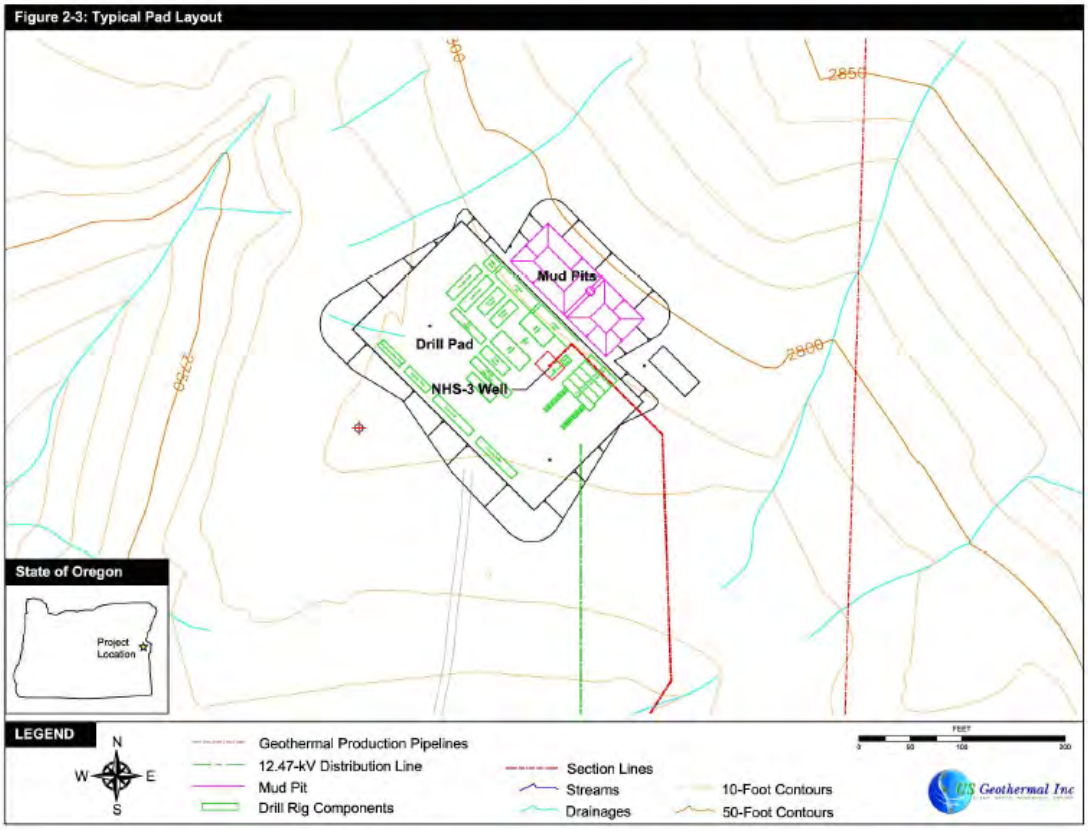


EXHIBIT 3- TYPICAL PAD LAYOUT

Figure 2-5: Well Casing Schematic

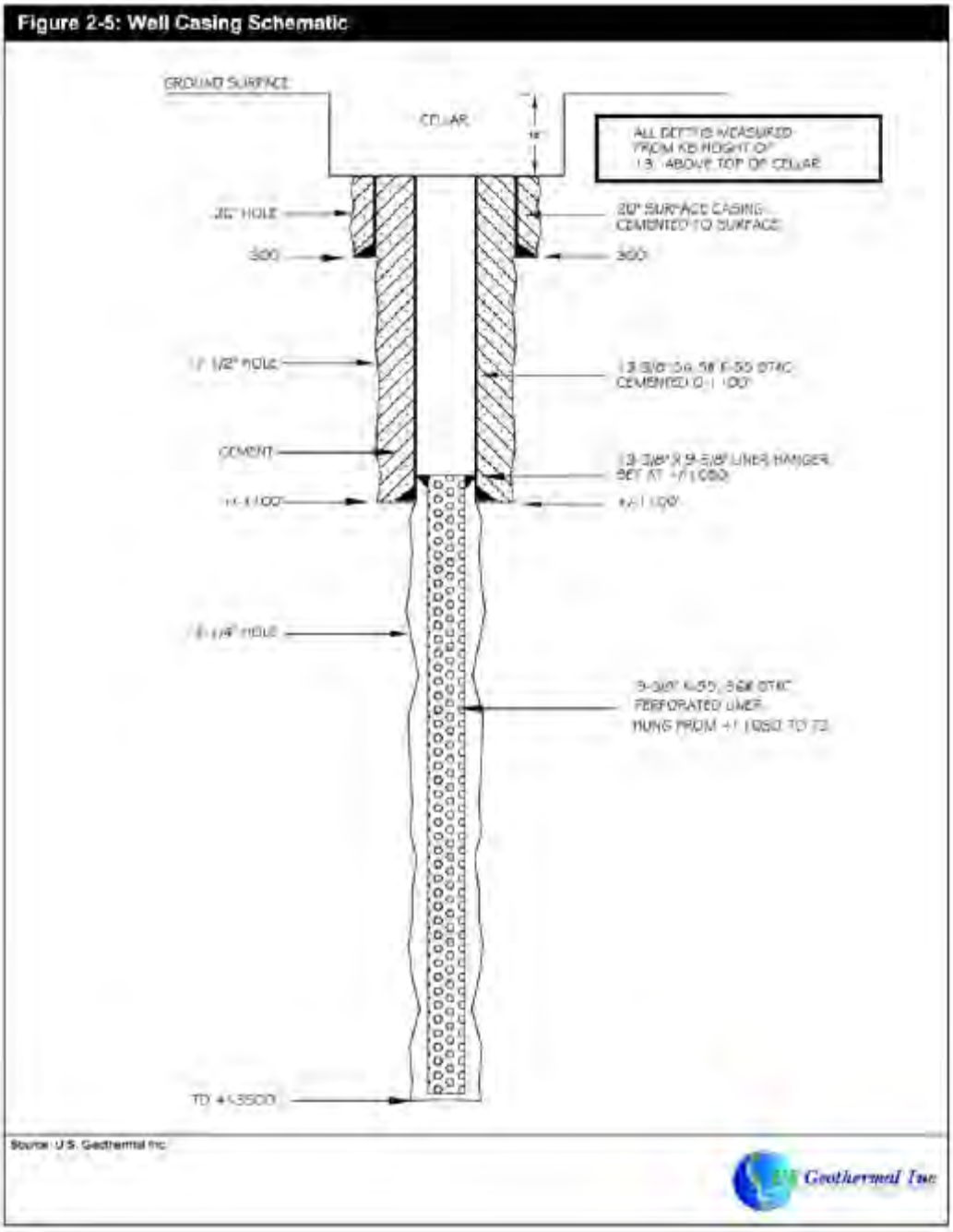


EXHIBIT 4- WELL CASING SCHEMATIC

United States Department of the Interior

FISH AND WILDLIFE SERVICE
La Grande Field Office
3502 Highway 30
La Grande, Oregon 97850
Phone: (541) 962-8584 FAX: (541) 962-8581

Reply To: 8330.TA0134 (09)
File Name: Neal Hot Springs Geothermal Power Plant Project
TS Number: 09-1543
TAILS: 13420-2009-TA-0134
Doc Type: Final

JUL 30 2009

Mr. Joe Marhamati
Department of Energy
1000 Independence Ave. SW
Washington, DC 20585

Subject: No effect determination on the Neal Hot Springs Geothermal Power Plant Project (13420-2009-TA-0134).

Dear Mr. Marhamati:

This is in response to a phone conversation on July 7, 2009, between Scott Nichols (U.S. Geothermal, Inc.) and Suzanne Anderson of my office regarding the proposed Neal Hot Springs Geothermal Power Plant Project in Malheur County near Vale, Oregon. In addition to information provided over the phone, the September 2008 draft Environmental Assessment (Assessment) prepared for the U.S. Department of Energy and a July 10, 2009 letter from the Oregon Natural Heritage Information Center (ONHIC) providing information on rare, threatened and endangered plants and animals, was received by the Fish and Wildlife Service (Service) on July 20, 2009. The Assessment, and supporting information, supported the conclusion that the proposed project will have "no effect" on listed species or critical habitat.

U.S. Geothermal, Inc. (USG) proposes to construct and operate a 22 megawatt geothermal power project. The project would be wholly located on private mineral rights that have been leased for geothermal development by USG. Approximately 2.5 surface acres of the project, which represent 12.5 percent of the project area, are administered by the Bureau of Land Management (BLM), with the remainder of surface rights owned privately. On the portion where the BLM administers the surface rights, USG has leased the mineral rights and the "perpetual right of ingress and egress to and from said real property…". The project is located in Malheur County, approximately 12 miles west northwest of a Known Geothermal Resource Area located at Vale, Oregon. The project would be constructed entirely on land utilized for farming and cattle grazing. Department of Energy will provide financial assistance for construction of the project and associated infrastructure.

EXHIBIT 5 - LETTER FROM FISH AND WILDLIFE SERVICE

You have requested the Service concur with your determination that the action, as proposed, will have no effect on any listed, proposed, or candidate species, including bull trout (*Salvelinus confluentus*) or critical habitat designated for bull trout and Columbia spotted frog (*Rana luteiventris*), a candidate species. The Act's implementing regulations 950 CFR Part 402) and Service policy (ESA Section 7 Consultation Handbook, March 1998) do not specifically provide the Service concurrence with an action agencies' determination that its proposed action will have no effect on listed species or critical habitat. However, in response to your request and based on the information you have provided to us in phone conversations, the draft Assessment, and information from the ONHIC, the Service finds no reason to disagree with your determination that the action, as proposed and analyzed, will have no effect on the aforementioned species or critical habitat.

If you have any questions or need more information, please contact Suzanne Anderson or me at (541) 962-8584.

Sincerely,

Gary S. Miller
Field Supervisor

cc:
Tim Walters, Oregon Department of Fish and Wildlife, Hines, Oregon

June 11, 2009

Honorable Elwood Memm Jr.
Chairman
Yerington Paiute Tribe of the Yerington Colony & Campbell Ranch
171 Campbell Lane
Yerington, NV 89447

Subject: U.S. Geothermal Neal Hot Springs Geothermal Facility

Dear Chairman Memm Jr.:

The U.S. Department of Energy (DOE) is evaluating the application of US Geothermal for a Federal loan guarantee to construct a geothermal facility in the city of Vale, Malheur County, Oregon. DOE is conducting an environmental review of the proposed U.S. Geothermal project in compliance with the National Environmental Policy Act (NEPA) and an historic resources review in compliance with Section 106 of the National Historic Preservation Act (NHPA).

Our records show that your Tribe has expressed an historical interest in Malheur County. I am writing this letter to extend an opportunity to you to engage DOE in government to government consultation on the proposed project. Consideration of any comments or concerns you provide will help ensure that DOE complies with its NEPA and NHPA Section 106 responsibilities.

The project site is located in the northeast ¼ of Section 9 Township 18 South Range 43 East. Neal Hot Springs. Well 1 (NHS-1) is located at north 44° 01' 31.1" latitude, west 117° 28' 0.3" longitude. The project site is located along the north side of the east-west trending Cottonwood Creek drainage. Our review of the project has not identified any historic or archeological resources, or sites of religious and cultural significance in the vicinity of the proposed project site; however, we want to give you the opportunity to raise any issues or concerns you may have regarding the site. A more detailed description of the proposed project and a map showing the site and its location are enclosed.

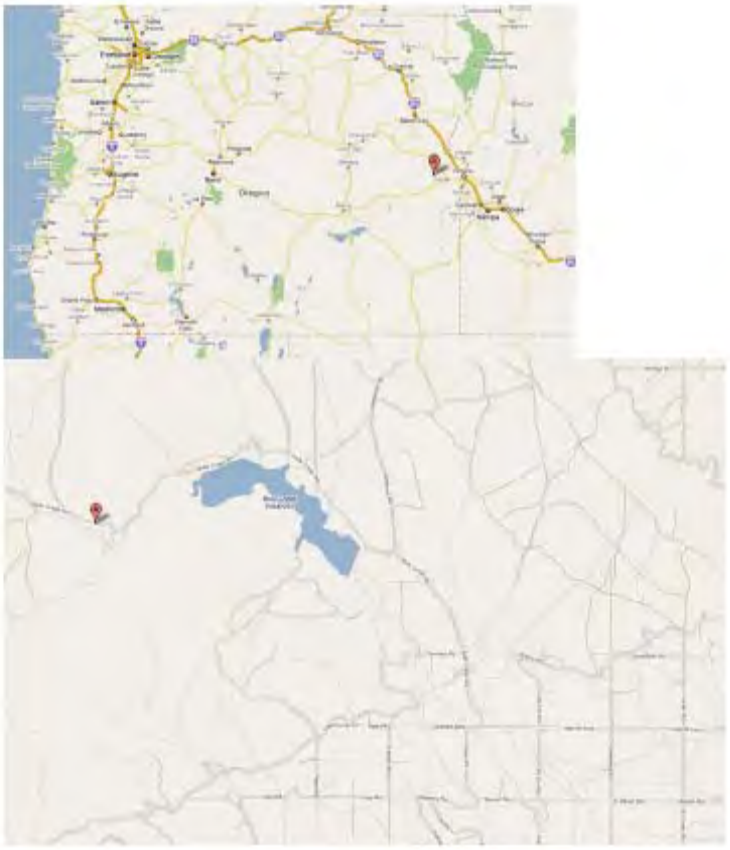
We would greatly appreciate receiving any comments or concerns you may have by July 13, 2009. Please send written comments to me at the following address: U.S. Department of Energy, 1000 Independence Ave., SW, CF-1.3, Washington, DC 20585. I can also be reached by telephone at 202-586-7248, or by email at matthew.mcmillen@hq.doe.gov.

Respectfully,

Matthew McMillen
Director, NEPA Compliance
DOE Loan Guarantee Program Office

Enclosures

EXHIBIT 6 - LETTERS TO TRIBES



Project Description

The proposed action is the construction and operation of a 22MW Geothermal facility, to be built in the Cottonwood Creek watershed, a tributary to Bully Creek. In general, project area environment consists of rolling hills with clayey, deep and well-drained soils vegetated with sage, bluegrass, wheatgrass, rabbit brush, and salt brush Walton. Natural surface water is located within one-half mile of the survey area at hot springs and at Bully Creek, Cottonwood Creek, and their tributaries. The site is located at 2,800 feet above sea level in the Owyhee uplands. The Owyhee uplands lie in the northwest corner of the Great Basin. This region differs from the rest of the province in that it is a flat deeply dissected plateau with little interior drainage. There are dominant rock outcrops and the site is typical of mid-elevation, sage brush rangelands.

U.S. Geothermal proposes to construct an access road and drill pad that will disturb approximately 2.7 acres of surface land. Facilities would include 1.0 acre of road access, 1.6 acres for an exploration drilling pad, and .1 acres for a temporary pipe line. The proposed surface disturbance is limited to the construction of the access road and drill pad.

No wetlands have been identified on the site and there are no rivers, streams, lakes, or other water bodies present on the project site. No known threatened or endangered species or related habitats would be expected to be affected by the project. No historic and archaeological resources are known to be present on the site. Additionally, no sites of cultural or religious significance are known to exist on the site.

June 11, 2009

Honorable Edmund Reymus
Chairman of the Tribal Council
Walker River Paiute Tribe of the Walker River Reservation
P.O. Box 220
Schurz, NV 89427

Subject: U.S. Geothermal Neal Hot Springs Geothermal Facility

Dear Chairman Reymus:

The U.S. Department of Energy (DOE) is evaluating the application of US Geothermal for a Federal loan guarantee to construct a geothermal facility in the city of Vale, Malheur County, Oregon. DOE is conducting an environmental review of the proposed U.S. Geothermal project in compliance with the National Environmental Policy Act (NEPA) and an historic resources review in compliance with Section 106 of the National Historic Preservation Act (NHPA).

Our records show that your Tribe has expressed an historical interest in Malheur County. I am writing this letter to extend an opportunity to you to engage DOE in government to government consultation on the proposed project. Consideration of any comments or concerns you provide will help ensure that DOE complies with its NEPA and NHPA Section 106 responsibilities.

The project site is located in the northeast ¼ of Section 9 Township 18 South Range 43 East. Neal Hot Springs. Well 1 (NHS-1) is located at north 44° 01' 31.1" latitude, west 117° 28' 0.3" longitude. The project site is located along the north side of the east-west trending Cottonwood Creek drainage. Our review of the project has not identified any historic or archeological resources, or sites of religious and cultural significance in the vicinity of the proposed project site; however, we want to give you the opportunity to raise any issues or concerns you may have regarding the site. A more detailed description of the proposed project and a map showing the site and its location are enclosed.

We would greatly appreciate receiving any comments or concerns you may have by July 13, 2009. Please send written comments to me at the following address: U.S. Department of Energy, 1000 Independence Ave., SW, CF-1.3, Washington, DC 20585. I can also be reached by telephone at 202-586-7248, or by email at matthew.mcmillen@hq.doe.gov.

Respectfully,

Matthew McMillen
Director, NEPA Compliance
DOE Loan Guarantee Program Office

Enclosures

June 11, 2009

Honorable Robert Bear
Chairman
Shoshone-Paiute Tribes of the Duck Valley Reservation
P.O. Box 219 NV
Owyhee 89832

Subject: U.S. Geothermal Neal Hot Springs Geothermal Facility

Dear Chairman Bear:

The U.S. Department of Energy (DOE) is evaluating the application of US Geothermal for a Federal loan guarantee to construct a geothermal facility in the city of Vale, Malheur County, Oregon. DOE is conducting an environmental review of the proposed U.S. Geothermal project in compliance with the National Environmental Policy Act (NEPA) and an historic resources review in compliance with Section 106 of the National Historic Preservation Act (NHPA).

Our records show that your Tribe has expressed an historical interest in Malheur County. I am writing this letter to extend an opportunity to you to engage DOE in government to government consultation on the proposed project. Consideration of any comments or concerns you provide will help ensure that DOE complies with its NEPA and NHPA Section 106 responsibilities.

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Respectfully,

Matthew McMillen
Director, NEPA Compliance
DOE Loan Guarantee Program Office

Enclosures

June 11, 2009

Honorable Arlan Melendez
Chairman
Reno-Sparks Indian Colony
98 Colony Road
Reno, NV 89502

Subject: U.S. Geothermal Neal Hot Springs Geothermal Facility

Dear Chairman Melendez:

The U.S. Department of Energy (DOE) is evaluating the application of US Geothermal for a Federal loan guarantee to construct a geothermal facility in the city of Vale, Malheur County, Oregon. DOE is conducting an environmental review of the proposed U.S. Geothermal project in compliance with the National Environmental Policy Act (NEPA) and an historic resources review in compliance with Section 106 of the National Historic Preservation Act (NHPA).

Our records show that your Tribe has expressed an historical interest in Malheur County. I am writing this letter to extend an opportunity to you to engage DOE in government to government consultation on the proposed project. Consideration of any comments or concerns you provide will help ensure that DOE complies with its NEPA and NHPA Section 106 responsibilities.

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We would greatly appreciate receiving any comments or concerns you may have by July 13, 2009. Please send written comments to me at the following address: U.S. Department of Energy, 1000 Independence Ave., SW, CF-1.3, Washington, DC 20585. I can also be reached by telephone at 202-586-7248, or by email at matthew.mcmillen@hq.doe.gov.

Respectfully,

Matthew McMillen
Director, NEPA Compliance
DOE Loan Guarantee Program Office

Enclosures

June 11, 2009

Honorable Mervin Wright Jr.
Chairman
Pyramid Lake Paiute Tribe of the Pyramid Lake Reservation
P.O. Box 256
Nixon, NV 89424

Subject: U.S. Geothermal Neal Hot Springs Geothermal Facility

Dear Chairman Wright Jr.:

The U.S. Department of Energy (DOE) is evaluating the application of US Geothermal for a Federal loan guarantee to construct a geothermal facility in the city of Vale, Malheur County, Oregon. DOE is conducting an environmental review of the proposed U.S. Geothermal project in compliance with the National Environmental Policy Act (NEPA) and an historic resources review in compliance with Section 106 of the National Historic Preservation Act (NHPA).

Our records show that your Tribe has expressed an historical interest in Malheur County. I am writing this letter to extend an opportunity to you to engage DOE in government to government consultation on the proposed project. Consideration of any comments or concerns you provide will help ensure that DOE complies with its NEPA and NHPA Section 106 responsibilities.

The project site is located in the northeast ¼ of Section 9 Township 18 South Range 43 East. Neal Hot Springs. Well 1 (NHS-1) is located at north 44° 01' 31.1" latitude, west 117° 28' 0.3" longitude. The project site is located along the north side of the east-west trending Cottonwood Creek drainage. Our review of the project has not identified any historic or archeological resources, or sites of religious and cultural significance in the vicinity of the proposed project site; however, we want to give you the opportunity to raise any issues or concerns you may have regarding the site. A more detailed description of the proposed project and a map showing the site and its location are enclosed.

We would greatly appreciate receiving any comments or concerns you may have by July 13, 2009. Please send written comments to me at the following address: U.S. Department of Energy, 1000 Independence Ave., SW, CF-1.3, Washington, DC 20585. I can also be reached by telephone at 202-586-7248, or by email at matthew.mcmillen@hq.doe.gov.

Respectfully,

Matthew McMillen
Director, NEPA Compliance
DOE Loan Guarantee Program Office

Enclosures

June 11, 2009

Honorable Alvin Moyle
Chairman
Paiute-Shoshone Tribe of the Fallon Reservation and Colony
565 Rio Vista Road
Fallin, NV 89406-9159

Subject: U.S. Geothermal Neal Hot Springs Geothermal Facility

Dear Chairman Moyle:

The U.S. Department of Energy (DOE) is evaluating the application of US Geothermal for a Federal loan guarantee to construct a geothermal facility in the city of Vale, Malheur County, Oregon. DOE is conducting an environmental review of the proposed U.S. Geothermal project in compliance with the National Environmental Policy Act (NEPA) and an historic resources review in compliance with Section 106 of the National Historic Preservation Act (NHPA).

Our records show that your Tribe has expressed an historical interest in Malheur County. I am writing this letter to extend an opportunity to you to engage DOE in government to government consultation on the proposed project. Consideration of any comments or concerns you provide will help ensure that DOE complies with its NEPA and NHPA Section 106 responsibilities.

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Respectfully,

Matthew McMillen
Director, NEPA Compliance
DOE Loan Guarantee Program Office

Enclosures

June 11, 2009

Honorable Dale Barr
Chairperson
Fort McDermitt Paiute and Shoshone Tribes of the Fort McDermitt Indian Reservation
P.O. Box 457
McDermitt, NV 89421

Subject: U.S. Geothermal Neal Hot Springs Geothermal Facility

Dear Chairperson Barr:

The U.S. Department of Energy (DOE) is evaluating the application of US Geothermal for a Federal loan guarantee to construct a geothermal facility in the city of Vale, Malheur County, Oregon. DOE is conducting an environmental review of the proposed U.S. Geothermal project in compliance with the National Environmental Policy Act (NEPA) and an historic resources review in compliance with Section 106 of the National Historic Preservation Act (NHPA).

Our records show that your Tribe has expressed an historical interest in Malheur County. I am writing this letter to extend an opportunity to you to engage DOE in government to government consultation on the proposed project. Consideration of any comments or concerns you provide will help ensure that DOE complies with its NEPA and NHPA Section 106 responsibilities.

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We would greatly appreciate receiving any comments or concerns you may have by July 13, 2009. Please send written comments to me at the following address: U.S. Department of Energy, 1000 Independence Ave., SW, CF-1.3, Washington, DC 20585. I can also be reached by telephone at 202-586-7248, or by email at matthew.mcmillen@hq.doe.gov.

Respectfully,

Matthew McMillen
Director, NEPA Compliance
DOE Loan Guarantee Program Office

Enclosures

June 11, 2009

Honorable Ronald Suppah
Chairman of the Tribal Council
Confederated Tribes of the Warm Springs Reservation
P.O. Box C
Warm Springs, OR

Subject: U.S. Geothermal Neal Hot Springs Geothermal Facility

Dear Chairman Suppah:

The U.S. Department of Energy (DOE) is evaluating the application of US Geothermal for a Federal loan guarantee to construct a geothermal facility in the city of Vale, Malheur County, Oregon. DOE is conducting an environmental review of the proposed U.S. Geothermal project in compliance with the National Environmental Policy Act (NEPA) and an historic resources review in compliance with Section 106 of the National Historic Preservation Act (NHPA).

Our records show that your Tribe has expressed an historical interest in Malheur County. I am writing this letter to extend an opportunity to you to engage DOE in government to government consultation on the proposed project. Consideration of any comments or concerns you provide will help ensure that DOE complies with its NEPA and NHPA Section 106 responsibilities.

The project site is located in the northeast ¼ of Section 9 Township 18 South Range 43 East. Neal Hot Springs. Well 1 (NHS-1) is located at north 44° 01' 31.1" latitude, west 117° 28' 0.3" longitude. The project site is located along the north side of the east-west trending Cottonwood Creek drainage. Our review of the project has not identified any historic or archeological resources, or sites of religious and cultural significance in the vicinity of the proposed project site; however, we want to give you the opportunity to raise any issues or concerns you may have regarding the site. A more detailed description of the proposed project and a map showing the site and its location are enclosed.

We would greatly appreciate receiving any comments or concerns you may have by July 13, 2009. Please send written comments to me at the following address: U.S. Department of Energy, 1000 Independence Ave., SW, CF-1.3, Washington, DC 20585. I can also be reached by telephone at 202-586-7248, or by email at matthew.mcmillen@hq.doe.gov.

Respectfully,

Matthew McMillen
Director, NEPA Compliance
DOE Loan Guarantee Program Office

Enclosures

Cc: Robert Brunoe
THPO Department of Cultural Resources

Department of Energy
Washington, DC 20585

JUL 14 2009

Tim Wood
Oregon Parks and Recreation Dept
State Historic Preservation Office
725 Summer St NE, Suite C
Salem, OR 97301

Subject: Determination of No Effect, U.S. Geothermal Neal Hot Springs Facility

Dear Mr. Wood:

The Department of Energy is preparing an Environmental Assessment (EA) under the National Environmental Policy Act for guaranteeing a loan to U.S. Geothermal Inc. for the development of the Neal Hot Springs facility. This letter is to request concurrence on a "finding of no historic properties affected" for the U.S. Geothermal project on the basis of those materials required by 10 CFR Part 800.11d (1) through (3).

1) A description of the undertaking, specifying the Federal involvement, and its area of potential effects (APE), including photographs, maps, drawings, as necessary:

The proposed action relating to the Federal loan guarantee is the construction and operation of a 22MW Geothermal facility, to be built in the Cottonwood Creek watershed, a tributary to Bully Creek (see Map 1). In general, project area environment consists of rolling hills with clayey, deep and well-drained soils vegetated with sage, bluegrass, wheatgrass, rabbit brush, and salt brush Walton (see Figures 1-3). Natural surface water is located within one-half mile of the survey area at hot springs and at Bully Creek, Cottonwood Creek, and their tributaries. The site is located at 2,800 feet above sea level in the Owyhee uplands. The Owyhee uplands lie in the northwest corner of the Great Basin. This region differs from the rest of the province in that it is a flat deeply dissected plateau with little interior drainage. There are dominant rock outcrops and the site is typical of mid-elevation, sage brush rangelands.

U.S. Geothermal proposes to construct an access road and drill pad that will disturb approximately 2.7 acres of surface land. This is the Area of Potential Effect (APE). Facilities would include 1.0 acre of road access, 1.6 acres for an exploration drilling pad, and .1 acres for a temporary pipe line (see Map 2). The proposed surface disturbance is limited to the construction of the access road and drill pad.

2) A description of the steps taken to identify historic properties, including, as appropriate, efforts to seek information pursuant to Part 800.4(b);

In August 2008, an archaeological inventory was conducted for U.S. Geothermal Company's Neal Hot Springs 3 Well Pad & Associated features in Malheur County, Oregon. The background site record and survey report search was conducted in consultation with the Vale District, Bureau of Land Management (BLM). A list of archaeological surveys in the project area was compiled from the Oregon State Historic Preservation Office bibliographic website.

EXHIBIT 7 - LETTER TO SHPO

Fieldwork was authorized by BLM cultural resources use permit number OR-40516. An intensive pedestrian survey of the 2.7-acre APE was designed to locate, record and evaluate the significance of cultural and paleontological resources visible on the ground surface and in exposed profiles. The pedestrian inventory was conducted in parallel transects spaced 30 meters apart, as determined in consultation with the BLM archaeologist.

Additionally, DOE provided the tribes listed above with a description of the proposed project and invited them to initiate government to government consultation and share any concerns they might have regarding sites of religious and cultural significance (attached). No concerns were reported to DOE and there are no known sites of religious or cultural significance listed on or eligible for listing on the National Register of Historic Places in the immediate vicinity of the proposed project.

3) The basis for determining that no historic properties are present or affected.

Based on the archaeological inventory methods and procedures described above and in the attached report, no historic properties or paleontological resources were located in the area of the proposed drill site and access road [36CFR800 Section11(d)(3)]. Therefore DOE has determined that no historic properties would be affected by the proposed project and *No Effect on Historic Properties* as defined in NHPA regulations would occur (36 CFR 800.16(b)).

This finding, along with field survey results and background research are contained in the attached report *U.S. Geothermal Neal Hot Springs 3 Well Pad and Associated Features Archaeological Inventory Malheur, Co., Oregon*, filed with the Vale District BLM in September 2008. The District has reviewed and approved the report.

We would appreciate a concurrence on our determination of no effect. You may fax this information to me at (202) 586-7809 or mail to Joseph Marhamati, U.S. Department of Energy, CF-1.3, 1000 Independence Ave. S.W., Washington, DC 20585. You may also contact me by phone at (202) 586-8198 or via email at joseph.marhamati@hq.doe.gov if you have any questions.

Sincerely,

Joseph Marhamati
NEPA Document Manager
DOE Loan Guarantee Program Office

Enclosures

U.S. Geothermal Neal Hot Springs 3 Well Pad & Associated Features Archaeological Report

Letters to Tribes

UNITED STATES
DEPARTMENT OF INTERIOR
BUREAU OF LAND MANAGEMENT

OREGON CULTURAL RESOURCES SURVEY REPORT

Project Information

1. **Name:** U.S. Geothermal Neal Hot Springs 3 Well Pad & Associated Features Archaeological Inventory

2. **Project Number:** **3. Project Acreage:** 2.7

4. **Description:**
U.S. Geothermal Inc. (USG) is proposing to construct an access road and drill pad that will disturb approximately 2.7 acres of surface land. This area is the Area of Potential Effect (APE). Facilities include 1.0 acre of road access, 1.6 acres for the exploration drilling pad, and .1 acres for the temporary pipe line. USG has applied for a right-of-way site (Site) that encompasses 11 acres located in the SE1/4, SE1/4, Section 5, Township 18 South, Range 43 East WM in the Bully Creek drainage (Maps 1, 2). The Site is at an elevation of approximately 2780 feet above mean sea level (AMSL). The additional acreage will allow for field adjustment of the access road and drill pad and negate the opportunity for incidental encroachment upon the right-of-way (ROW) boundary.

5. **Nature of Disturbance:**
The proposed surface disturbance is limited to the construction of the access road and drill pad, an area of 2.7 acres.

Survey Area Location

6. **District:** Vale **7. Field Office:** Malheur

8. **Legal Description:**
SE¼ SE¼SE¼ Section 5 T 18 S., R 43 E
Willamette Meridian

9. **Land Status:** Public land administered by the Bureau of Land Management

10. **County:** Malheur

11. **Map Reference** (U.S.G.S. Quad): Hope Butte 7.5' USGS quad

12. **Relationship to Cadastral Markers and Other Permanent Features:** No section corners were noted in the field or on the quad map in the immediate project area.

13. **Survey Area Environment**
The project is located in the hills overlooking the Cottonwood Creek and Bully Creek drainages (Figure 1). In general, project area environment consists of rolling hills with clayey, deep and well-drained soils vegetated with sage, bluegrass, wheatgrass, rabbit brush, and salt brush Walton (1989). Vegetation on site

3

EXHIBIT 8 - ORGEON CULTURAL RESOURCES SURVEY REPORT

is includes rabbit brush, sagebrush, and grasses. Slope at the proposed drill site is 10%, aspect southwest. Natural surface water is located within one-half mile of the survey area at hot springs and at Bully Creek, Cottonwood Creek, and their tributaries. An abandoned irrigation canal borders the drill pad (Figure 2). The primary contemporary uses of this area are livestock grazing and row crop farming (Walton 1989).

14a. Surveyor(s): Mark Druss, Ph.D., R.P.A.

14b. Qualifications of Surveyor(s):

Druss — Ph.D. in Anthropology, Columbia University, January 1978; Senior Archaeologist, Cultural Resources Management Consulting, Boise, ID 2004 to Present; Senior Archaeologist/Cultural Resources Manager, Environmental Affairs Department, Idaho Power Company, 1991-2004; Archaeologist, Idaho BLM State Office and Shoshone District, 1988-1991 (Please request resume for earlier positions).

15. Organization: Cultural Resources Management Consulting, Boise, ID **16. Permit Number:** OR-40516

17a. Consultation/Existing Data Review:

A review of archaeological survey reports and site records was conducted in consultation with Diane Pritchard, Archaeologist, Malheur Field Office, Vale District, BLM; also, a list of archaeological surveys in the project area township was compiled from the Oregon SHPO bibliographic website report, available online at Oregon SHPO bibliographic database (Tables 1, 2). The site records reviewed indicate that Native American and Euroamerican sites are relatively rare in the project area. The site records also indicate that some of the spring areas were exploited by Native Americans and Euroamericans. It is expected that Native American sites will have chipped stone indicating tool making. Euroamerican sites are expected to be associated with homesteading.

Table 1. Cultural Resource Survey Reports – Malheur County, T17 & 18S, R43 E

Project Name/type	Reference	Description	Results
Bully Creek Reservoir Survey[1]	Cole, D.L. 1961	Surface survey at Bully Creek Reservoir. T18S, R43 E	Two sites recorded
Power Line Inventory[1]	Harrison, R.R. 1986	Surface survey at Bully Creek Reservoir. T18S, R43 E	One prehistoric site recorded
Public Land Sale[1]	Marti and Fuller 1983	238 acre survey of 2,382 project acres in T 14-19S, R41-46E	No prehistoric or historic sites or isolates found.
Bully Creek Reservoir Test Excavations[1]	Newman, T.N. 1964	Test excavations at Bully Cr. Reservoir. T18S, R43 E	Seven prehistoric sites excavated.
Bully Creek Reservoir Survey[1]	Osborne, D. 1948	Several southern Oregon reservoirs investigated T18S, R43 E	No sites reported
Township Inventory	Walton, B. 1989	Inventory report for T18S R43E. Summarizes Hauck 1976, 1977, 1978a,b; 1979a,b.	Two lithic scatters (157R/1, 177A/3) and 1 historic dump (177A/4) located w/in 1 mile of the Neal HS project area.
Geothermal drill site inventories	Hauck, F.R. 1976	Surveyed six 1-acre geothermal drill sites in T18S, R 43E, Sections 4, 5, 8; T17S, R 43E, Section 32.	No sites located within Section 5 and adjacent sections.

Geothermal drill site & access road inventories	Hauck, F.R. 1977	Surveyed one 1-acre geothermal drill site in T17S, R 43E, Section 32.	No sites located.
Seismic line inventory	Hauck, F.R. 1978a	Surveyed one seismic corridor in T18S, R43E, Section 5.	Site 157/R1, a lithic scatter, are located within one mile of the Neal HS project area.
Temperature gradient holes & seismic line inventories	Hauck, F.R. 1978b	Surveyed one 1-acre geothermal drill site in T17S, R 43E, Section 32 and three seismic corridors in T18S, R43E, Section 4.	Sites 177A/3, a lithic scatter, and 177A/4, a historic dump, are within one mile of the Neal HS project area.
Reconnaissance	Hauck, F.R. 1979a	Surveyed four 1-acre geothermal drill site in T17S, R 43E, Sections 32 and 33; and two drill sites in T18S, R43E, Sections 4 and 8..	No cultural resources were located.
Reconnaissance	Hauck, F.R. 1979b	Proposed access road reconnaissance in T18S, R43E, section 22, Outside the project area.	No cultural resources were located.
Fence line survey	Pritchard 1998	Survey of 2.4 acres in T18S, R43E, Sections 2, 3, and 4.	No cultural resources were located.

[1] Source: Oregon SHPO bibliographic database, August 2008.

Table 2. Summary of archaeological sites near the Neal HS project area.

Site no.	Description	Reference	Location
157/R1	Disturbed lithic scatter. No diagnostics	Hauck 1978a.	T18S, R43E, Sec. 5 NW ¼ SW ¼ SW ¼.
177/A3	Lithic scatter: biface manufacturing, obsidian, opaque white chert, tan and red sandstone Debitage.	Hauck 1978b.	T 18S, R43E, Sec. 3, NW ¼ SW ¼ NW ¼
177/A4	Small historic refuse dump with metal scrap, purple glass and a ceramic jug dated to late 1800s or early 1900s. Abandoned homestead near spring.	Hauck 1978b, Weder 1978.	T 18S, R43E, Sec. 4, SW ¼ SW ¼ NE ¼
V-23	Lithic scatter at Coyote Springs. Mostly pressure flakes of jasper, basalt, and obsidian. Utilized flakes, basalt side scrapers, chert and jasper cores.	Pullen 1976	T 18S, R43E, Sec. 5, NW ¼ SE ¼ NW ¼

18a. Consultation/Existing Data Review: Prehistory:

Diane Prichard, archaeologist, Malheur Field Office, Vale District BLM, provided information on regional prehistory, summarized below.

Table 3. Regional Prehistory

Period	Dates (years ago)	Characteristics

5

Paleoindian	13,000-10,500	Large spear points (Clovis and Folsom) for hunting late Pleistocene mega fauna such as mammoth and bison. Some sites located around Great Basin pluvial lakes and marshes.
Western Pluvial Lakes Tradition	10,500 - 8,000	Terminal Pleistocene: Great Basin Pluvial lakes recede as glaciers recede; forests replaced by sagebrush/juniper steppe and grassland. Folsom points continue; atlatl, large unnotched points appear. Obsidian quarrying appears. Basalt – primary tool stone.
Early Archaic	8,000 - 5,000	Post Pleistocene warming and drying: most Great Basin lakes dry up, grasslands and sagebrush steppe expand, Mt. Mazama erupts. Decreased use of rock shelters; seasonal transhumance between higher and lower elevation; population decline in Great Basin lowlands, increased use of higher elevation spring sites. Corner-notched and side-notched points. Increased used of manos & metates. Obsidian –primary tool stone.
Middle Archaic	5,000-2000	Climate warmer and more humid. Tree lines lower, grassland reduced, increased stream flow, pluvial lakes expand and contract with climate change. Narrow corner-notched points, twine, textiles. Numic expansion northward, possibly including Northern Paiutes, 3000-1000 years ago.
Late Archaic	2,000-Contact	Bow & arrow ca. 1,300 years ago: small projectile points. Hopper mortar bases, camas baking ovens. Anadromous fish harvested, large winter villages, smaller upland camps; communal antelope, rabbit drives, extensive trade.

Source: Pritchard (2008).

18b. Consultation/Existing Data Review: History:

Prichard (2008) provides an outline of regional history, summarized below.

Table 4. Regional History

Topic	Dates	Description
Contact period	Begins ca. 1730AD	Horse introduced into Great Basin from Spanish ca. 1730AD. Horses and riders appear in pictographs. European-introduced smallpox epidemics of 1780 and 1801 killed as many as 45% of the Native American population by Lewis and Clark's arrival (1804-1806).

Fur Trade and Early Exploration:	1811-1837	Parts of Malheur County explored by trappers Wilson Price Hunt and Ramsey Crooks (1811), Crooks and Robert Stuart (1812), and Donald McKenzie (1818-1819).
Immigration	1834-1860	Trappers became guides and fur-trappers 'trading posts became forts and suppliers for immigrants. 1834-missionaries travel through Malheur County. 1836-missionaries in Willamette and Walla Walla Valleys urge travel to Oregon Territory. 1843-Oregon Trail became main route west.
Mining	1849-1934	Miners from California Gold Rush of 1849 spread through Northwest, including Oregon Territory. Gold discovered in several Oregon areas beginning in 1850 resulting in large temporary population concentrations.
Military Activity	1849-1878	1849-1858: Military escorts along Oregon Trail and military exploration. 1858-establishment of Military Dept. of Oregon to aid and protect Euroamerican expansion. 1859-military exploration to establish additional supply and communication lines. 1859-60 military wagon road surveyed to connect the Dalles with Salt Lake City. 1864-1867: military maps, road construction, protection of routes Owyhee mines in Silver City and protection of settlements against Indian attacks. 1866-1868: Government attacks by Warm Springs Reservation Indians against non-reservation Indians. Bannock War of 1878.
Reservation Period	1865-1878	Reservations created in part to protect Northern Paiutes. Malheur Reservation established 1872, sold to Euroamericans in 1883 as a result of presidential order.
Growth and Development	1860-1930	Mining gives way to agriculture. Irrigation canals built 1881-1882. First general store in Vale, 1885. Increased settlement in SE Oregon in 1880s. 1884-increased sheep raising. Sheep and cattle-raising prospered in 1890s. Sheep raising declined with 1934 Taylor Grazing Act. Telephone service in Malheur County by 1888. First automobile – 1905; road building 1917-1939; Owyhee Dam built in 1932.

18c. Consultation/Existing Data Review: Native American Cultures:

The following information is summarized from Prichard (2008). Great Basin and Plateau Indians ranged widely over the project area and the surrounding region, especially after the introduction of the horse. This innovation resulted in increased long-distance trade and increased hostilities among Native American groups. The Malheur Basin was used by Northern Paiute groups (Stewart 1939 *in* Pritchard 2008). Some groups coalesced to pick huckleberries and hunt elk in the fall (Whiting 1950 *in* Pritchard 2008) or to gather *wada* , identified as rye grass seeds by Steward (1938) or crickets. In addition to freshly gathered food, stored foods were used during winter.

7

18d. Consultation/Existing Data Review: Paleontological Resources:

No project area paleontological resources were noted during consultation with the Malheur RA archaeologist.

Field Survey Results

19. Field Survey Design:

Mark Druss, Ph.D., RPA conducted a Class III inventory using pedestrian transects spaced less than 30 meters apart. The survey for this project was designed to locate, record and evaluate all prehistoric and historic cultural resources visible on the ground surface. Scott Nichols, Project Manager, U.S. Geothermal, Inc., accompanied Druss and indicated the area to be inventoried. Also, the project area had been staked before our arrival. Survey was conducted over a 5-acre area in order to accommodate both the drill pad and access road and to allow for a buffer area for pad or road re-positioning, if necessary.

26. Field Date(s): 27 August 2008

27. Acres Surveyed: **Intensively** 5 **Extensively** 0 **Not Surveyed** 0

28. Survey Results:

Surface visibility in the NHS-3 survey area ranged from 50% to 100%, with most areas being 100% visible (Figure 3). No cultural resources were located in the area of the proposed drill site and access road.

29a. Additional Data Needs/Recommendations:

No additional data are needed. The project should proceed as planned provided that (1) vehicle travel and staging areas be confined to the area inventoried and (2) that the notification stipulation mentioned below in §29.b (below) is followed.

29b. Impacts to Cultural Resources from the Project as Planned:

There are no presently known impacts. However if unexpected cultural and/or paleontological resources are located during the implementation of this project, all activities will cease and a professional archaeologist will be notified immediately. Project work will not continue until the archaeologist has evaluated the discovery.

30. Eligibility/Protection Recommendations:

No eligibility or protection recommendations are needed at this time.

31. UTM Grid: Survey Area (Map1)

Zone	Easting	Northing
11	462,424	4,874,993
11	462,599	4,874,993
11	462,591	4,874,749
11	462,424	4,874,749

8

32. Time Expenditure: Field: 6 Office: 25 Total: 31

33. Signature of Surveyor in Charge:

34. BLM Specialist:

BLM Specialist Signature if different from signature above Date:

NEIC: Earthquake Search Results

U. S. GEOLOGICAL SURVEY

EARTHQUAKE DATA BASE

FILE CREATED: Tue Jun 16 19:33:41 2009
Circle Search Earthquakes= 6
Circle Center Point Latitude: 44.010N Longitude: 117.460E
Radius: 160.000 km
Catalog Used: PDE
Data Selection: Historical & Preliminary Data

CAT	YEAR	MO	DA	ORIG TIME	LAT	LONG	DEP	MAGNITUDE	IEM NFO TF	DTSVNWG	DIST km
PDE	1992	06	12	201430.63	44.23	116.29	10	5.1 MLBJI	...	.....	96
PDE	1992	09	13	191658.82	44.24	116.22	10	4.7 MLBJI	...	.....	102
PDE	1998	12	19	060917.88	43.44	116.42	10		...	.....	104
PDE	1999	01	29	054423.88	44.66	115.71	10	5.0 MwHRV	..M	.....	157
PDE	2002	10	20	154619.67	44.62	117.37	33	4.6 mbGS	...	.....	68
PDE	2002	10	20	155212.92	44.76	117.29	33	4.2 mbGS	...	.....	83

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EXHIBIT 9 - NATIONAL EARTHQUAKE INFORMATION CENTER REPORT

FEDERALLY LISTED, PROPOSED, CANDIDATE SPECIES AND SPECIES OF CONCERN UNDER THE JURISDICTION OF THE FISH AND WILDLIFE SERVICE WHICH MAY OCCUR WITHIN MALHEUR COUNTY, OREGON

LISTED SPECIES

Fish

Inland:

Lahontan cutthroat trout	*Oncorhynchus clarki henshawi*	T
Bull trout	*Salvelinus confluentus*	CH T

Plants

Howell's spectacular thelypody	*Thelypodium howellii ssp. spectabilis*	T

PROPOSED SPECIES

None

No Proposed Endangered Species	PE
No Proposed Threatened Species	PT

CANDIDATE SPECIES

Reptiles and Amphibians

Inland:

Columbia spotted frog	*Rana luteiventris*

SPECIES OF CONCERN

Mammals

Terrestrial:

Pygmy rabbit	*Brachylagus idahoensis*
Pallid bat	*Antrozous pallidus pacificus*
Townsend's western big-eared bat	*Corynorhinus townsendii townsendii*
Silver-haired bat	*Lasionycteris noctivagans*
Small-footed myotis bat	*Myotis ciliolabrum*
Long-eared myotis bat	*Myotis evotis*
Long-legged myotis bat	*Myotis volans*
Yuma myotis bat	*Myotis yumanensis*
Preble's shrew	*Sorex preblei*

Birds

Northern goshawk	*Accipiter gentilis*
Western burrowing owl	*Athene cunicularia hypugaea*
Ferruginous hawk	*Buteo regalis*
Greater sage-grouse	*Centrocercus urophasianus*
Black tern	*Chlidonias niger*
Olive-sided flycatcher	*Contopus cooperi*
Willow flycatcher	*Empidonax traillii adastus*
Yellow-breasted chat	*Icteria virens*
Lewis' woodpecker	*Melanerpes lewis*

EXHIBIT 10 - LIST OF SPECIES

FEDERALLY LISTED, PROPOSED, CANDIDATE SPECIES AND SPECIES OF CONCERN UNDER THE JURISDICTION OF THE FISH AND WILDLIFE SERVICE WHICH MAY OCCUR WITHIN MALHEUR COUNTY, OREGON

Mountain quail	*Oreortyx pictus*
White-faced ibis	*Plegadis chihi*
Reptiles and Amphibians	
Northern sagebrush lizard	*Sceloporus graciosus graciosus*
Invertebrates	
Insects:	
Lynn's clubtail dragonfly	*Gomphus lynnae*
Clams:	
California floater mussel	*Anodonta californiensis*
Plants	
Malheur Valley fiddleneck	*Amsinckia carinata*
Mulford's milk-vetch	*Astragalus mulfordiae*
Cliff paintbrush	*Castilleja rupicola*
Slender wild cabbage	*Caulanthus major var. nevadensis*
Barren valley collomia	*Collomia renacta*
Greeley's springparsley	*Cymopterus acaulis var. greeleyorum*
Golden buckwheat	*Eriogonum chrysops*
Prostrate buckwheat	*Eriogonum prociduum*
Cronquist's stickseed	*Hackelia cronquistii*
Cooper's goldflower	*Hymenoxys lemmonii*
Grimy ivesia	*Ivesia rhypara var. rhypara*
Davis' peppergrass	*Lepidium davisii*
Smooth stickleaf	*Mentzelia mollis*
Packard's stickleaf	*Mentzelia packardiae*
disappearing monkeyflower	*Mimulus evanescens*
Playa phacelia	*Phacelia inundata*
Mackenzie's phacelia	*Phacelia lutea var. mackenzieorum*
Profuse-flowered mesa mint	*Pogogyne floribunda*
Ertter's ragwort	*Senecio ertterae*
Biennial stanleya	*Stanleya confertiflora*
Leiberg's clover	*Trifolium leibergii*
Owyhee clover	*Trifolium owyheense*

DELISTED SPECIES

Birds	
American Peregrine falcon	*Falco peregrinus anatum*
Bald eagle	*Haliaeetus leucocephalus*

Definitions:

Listed Species: An endangered species is one that is in danger of extinction throughout all or a significant portion of its range. A threatened species is one that is likely to become endangered in the foreseeable future.

Proposed Species: Taxa for which the Fish and Wildlife Service or National Marine Fisheries Service has published a proposal to list as endangered or threatened in the Federal Register.

FEDERALLY LISTED, PROPOSED, CANDIDATE SPECIES AND SPECIES OF CONCERN UNDER THE JURISDICTION OF THE FISH AND WILDLIFE SERVICE WHICH MAY OCCUR WITHIN MALHEUR COUNTY, OREGON

Candidate Species: Taxa for which the Fish and Wildlife Service has sufficient biological information to support a proposal to list as endangered or threatened.

Species of Concern: Taxa whose conservation status is of concern to the U.S. Fish and Wildlife Service (many previously known as Category 2 candidates), but for which further information is still needed. Such species receive no legal protection and use of the term does not necessarily imply that a species will eventually be proposed for listing.

Delisted Species: A species that has been removed from the Federal list of endangered and threatened wildlife and plants.

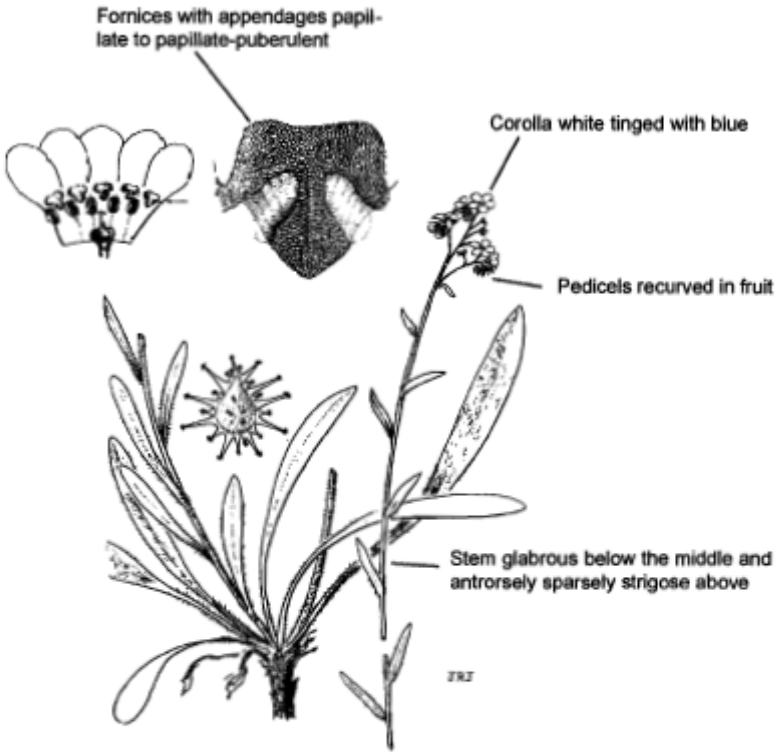
Key:

E	Endangered
T	Threatened
CH	Critical Habitat has been designated for this species
PE	Proposed Endangered
PT	Proposed Threatened
PCH	Critical Habitat has been proposed for this species

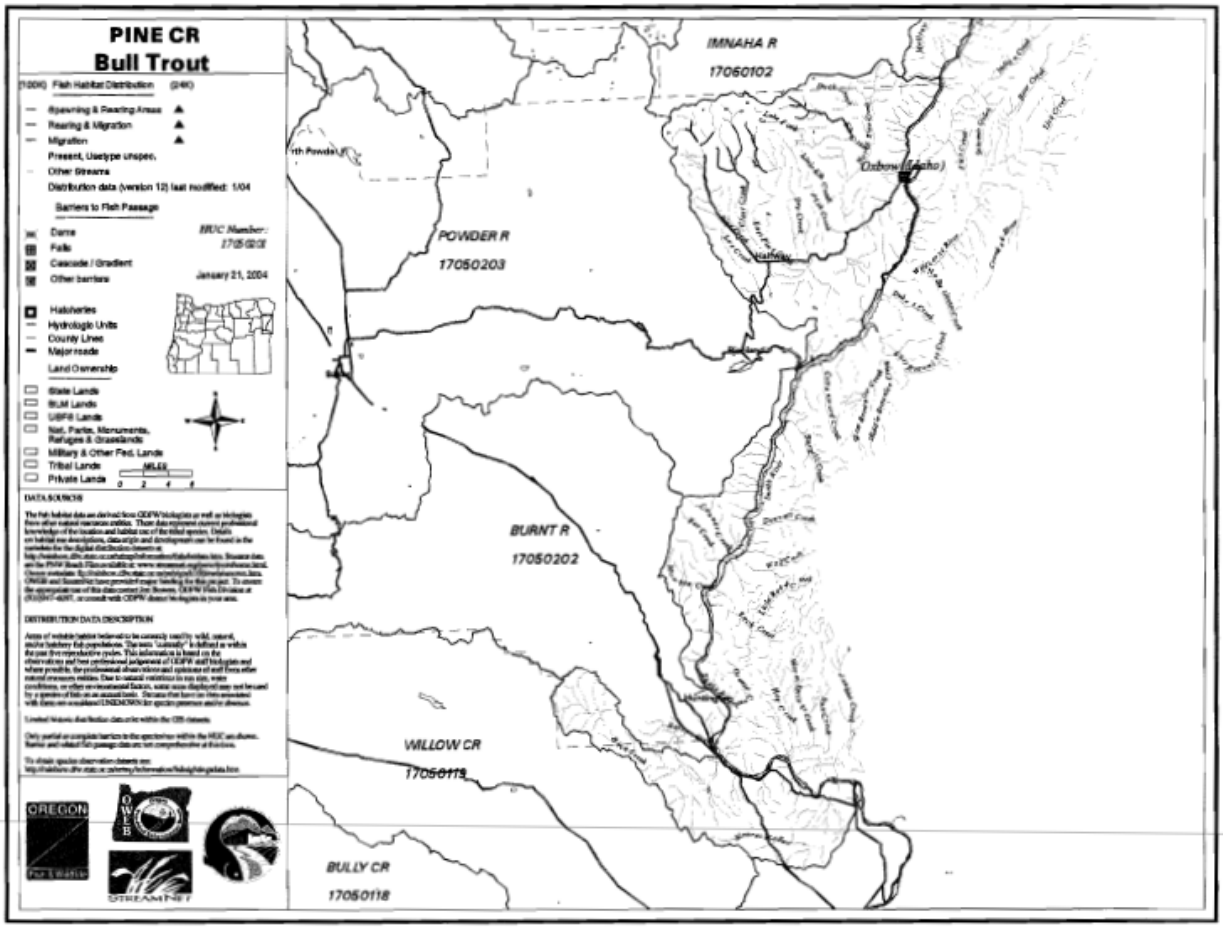
Notes:

Marine & Anadromous Species: Please consult the National Marine Fisheries Service (NMFS) (http://www.nmfs.noaa.gov/pr/species/) for marine and anadromous species. The National Marine Fisheries Service (NMFS) manages mostly marine and anadromous species, while the U.S. Fish and Wildlife Service manages the remainder of the listed species, mostly terrestrial and freshwater species.

Cronquist's stickseed ***Hackelia cronquistii***



Scientific Name: *Hackelia cronquistii* J. Gentry
Bibliographic Reference: Gentry, 1972. Madroño 21: 490.
Common Name: Cronquist's stickseed
Family (Common Name): Boraginaceae (Borage Family)
Synonyms: *Hackelia patens* (Nutt.) I.M. Johnston var. *semiglabra* Cronq.
Idaho Native Plant Society Category: Global Priority 3
Natural Heritage Program Rank: S1
Distribution: Payette and Washington counties, Idaho; Malheur County, Oregon.
Habitat: Sandy or loamy soils of sagebrush-bunchgrass slopes mostly on north exposures, 700-800 m elevation.
Phenology: May.
Look-alikes: Similar to *H. patens* var. *patens*, but differing clearly in stem pubescence which is glabrous below the middle and anthrorsely sparsely strigose above, and the corolla fornices just papiliate or papillate-puberulent.


PINE CR
Bull Trout
Fish Habitat Distribution
Spawning & Rearing Areas
Rearing & Migration
Migration
Present, Usetype unspec.
Other Streams
Distribution data (version 12) last modified: 1/04
Barriers to Fish Passage
Dams
Falls
Cascade / Gradient
Other barriers
HUC Number:
17050203
January 21, 2004
Hatcheries
Hydrologic Units
County Lines
Major roads
Land Ownership
State Lands
BLM Lands
USFS Lands
Nat. Parks, Monuments, Refuges & Grasslands
Military & Other Fed. Lands
Tribal Lands
Private Lands
MILES
0 2 4 8
DATA SOURCES
DISTRIBUTION DATA DESCRIPTION
IMNAHA R
17060102
POWDER R
17050203
BURNT R
17050202
WILLOW CR
17050113
BULLY CR
17050118
Oxbow (Idaho)
OREGON
OWEB
STREAMNET