



**State of Idaho**

**DEPARTMENT OF WATER RESOURCES**

322 East Front Street • P.O. Box 83720 • Boise, Idaho 83720-0098

Phone: (208) 287-4800 • Fax: (208) 287-6700 • Website: [www.idwr.idaho.gov](http://www.idwr.idaho.gov)

**C.L. "BUTCH" OTTER**  
Governor

**GARY SPACKMAN**  
Director

August 29, 2018

John Shervais  
Department of Geology  
Utah State University  
4505 Old Main Hill  
Logan UT 84322-4505

Re: Utah State University Permit - Drilling for Geothermal Resources Application # 37-GR-8  
Exploration Well, Camas USU-1.

Mr. Shervais:

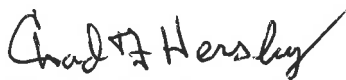
Application # 37-GR-8 for Permit to Drill for Geothermal Resources is approved and this permit is issued subject to compliance with Idaho Administrative Procedures Act (IDAPA) 37.03.04, Drilling for Geothermal Resources Rules, and compliance with Sections 42-4001 through 42-4015, Idaho Code and the following conditions.

**CONDITIONS:**

1. Idaho Department of Water Resources (Department) is to be notified at least five working days prior to the start of drilling operations
2. The drilling prospectus and drilling plan (Attachment 1) submitted with the geothermal application will be adhered to.
3. This permit does not relieve the permit holder from complying with other legal requirements, statutes, or regulations imposed by other agencies of government.
4. The bond in the amount of twenty-thousand dollars is to remain in effect or be renewed annually for the life of the well. The Director of this Department reserves the right to reevaluate the bond amount if deemed necessary prior to decommissioning or modifying the well.
5. Utah State University shall notify and give the Department ample opportunity to have personnel on site to observe all required testing of blow out prevention, blind rams, pipe rams, master valve, H2S and CO2 testing prior to or during the drilling process.
6. Pursuant to IDAPA 37.03.04 Rule 30, within 30 days of completion of the well Utah State University shall send a copy of all well logs, drilling logs, geophysical logs, temperature logs and reports pertaining to the drilling and testing of the well to this Department. This information will be held confidential for one year as provided in IDAPA 37.03.04 Rule 30.03.
7. This borehole is to be properly decommissioned within one year of completion unless an extension is approved by the Department. Compliance with IDAPA 37.03.04, Rule 45 is required for decommissioning of a geothermal resource well.

8. A notice of intent to decommission the well must be submitted to the Department five days prior to beginning decommissioning procedures.
9. Production and /or Injection of geothermal resources is limited to rig-on flow tests for reservoir characterization or other research related activities.
10. Production and /or Injection for resource development requires additional prior authorization from the Department.
11. This Geothermal Resource Permit does not authorize the use of water for any beneficial purpose.
12. Utah State University shall comply with all state air and water quality statutes and regulations.
13. Drilling derived fluids, and fluids incidental to the drilling process shall be contained in the mud pit or tank and allowed to evaporate or disposed of by other appropriate means.
14. Drilling derived cuttings will be buried in the pit during reclamation or, disposed of on-site or spread according to the land owner's direction.
15. Utah State University shall immediately report all spills or accidental discharges of pollutants, or situations that could result in the contamination of geothermal or fresh water resources to the Department, Idaho Department of Environmental Quality ("IDEQ") and to the owner of the property at the site of discharge. The Department may require additional conditions or stipulations at that time.
16. Utah State University shall apply for an NPDES discharge permit issued by EPA and certified by the IDEQ prior to any discharge into surface waters.

Sincerely,



Chad F. Hersley, P.G  
Technical Hydrogeologist, Ground Water Protection Section

Attachments

DocuSign Envelope ID: C2F106B0-BAE8-4857-B3F4-E613EC14B766

Form 4003-1, Page 1 of 2  
Revised January 2011

Geothermal Application No. 37-GR-8

STATE OF IDAHO  
DEPARTMENT OF WATER RESOURCES

APPLICATION FOR PERMIT  
TO DRILL FOR GEOTHERMAL RESOURCES

1. Name of applicant Utah State University, Department of Geology (John Shervais)  
Address 4505 Old Main Hill, Logan Utah, 84322-4505

If partnership, joint-venture, association, or unincorporated group, attach names and places of domicile of partners or persons. If corporation, attach list of corporate offices and their place of domicile, and the names and place of domicile of any person owning thirty percent (30%) or greater interest in the corporation. Also give:

- a. Place of incorporation and date \_\_\_\_\_
- b. Principal place of business \_\_\_\_\_
- c. Location of home office \_\_\_\_\_
- d. Is applicant making application as an agent for another person, corporation or entity?  Yes  No
- e. If so, state name, address, and interest of your principal. \_\_\_\_\_
- f. Designation of agent residing in the State of Idaho \_\_\_\_\_

2. Location of proposed well:  
GPS coordinates, reported in degrees and decimal minutes.  
Longitude -114.9091667 Latitude 43.29888889  
Public land survey coordinates \_\_\_\_ ¼, \_\_\_\_ ¼, Section \_\_\_\_, Township \_\_\_\_, Range \_\_\_\_, B.M.  
Well number or well name Camas USU-1

3. Type of well:  Exploration  Production  Injection

4. Well construction:  
Describe specifically or attach information pertinent to the proposed casing program and well construction including casing size, thickness, length of conductor, surface and production pipes; proposed grouting procedures, safety devices, valving, and other measures designed to conserve and protect the geothermal resources and ground water of the state.  
See attached drilling prospectus

5. If the proposed well is for exploration or production, explain the means by which you expect to contain and control the resources. (Use additional sheets if necessary).  
See attached drilling prospectus. Blow-out preventers will be used.

6. What is the character and composition of the material you expect to derive from the well? Include parameters such as phase, estimated temperatures, etc. Hot water circa 212-248°F.

7. Is this application a part of a program for exploration or development of an already explored geothermal resource?  No  Yes, area known as \_\_\_\_\_

8. What is the estimated cost of the construction of the well and related uses? \$420,000. Attach a validated financial statement showing the applicant has sufficient financial resources to complete the project.

9. If the proposed development will involve the use of water for purposes other than geothermal uses, has the applicant applied for a permit to appropriate water as prescribed in Chapter 2, Title 42, Idaho Code?  
 Yes  No

10. List in detail or attach information describing the applicant's previous experience in geothermal resource development. Project Hotspot (2010-2013). See attached prospectus. Project funded by the U.S. Department of Energy.

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Form 4003-1, Page 2 of 2  
Revised January 2011

Geothermal Application No. 37-GR-8

11. What does the applicant intend to do with waste products, brine or water from the well? Attach additional information if necessary. We will dig containment pits to hold cuttings and drilling fluids. Reservoir test will fresh well water.

12. Idaho law requires that a bond be filed with the Department indemnifying the State of Idaho, conditional upon the performance of the duties required by the Idaho Geothermal Resource Act and the proper abandonment of any well covered by permit of not less than \$10,000 per well, the actual amount set as a condition of the permit. Identify the company that will underwrite your bond and provide confirmation that they will issue such bond upon payment of the necessary fees. \_\_\_\_\_

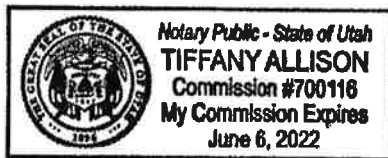
Dwight E. Davis  
Signature of Applicant

State of UTAH )  
County of CACHE ) ss.

Dwight E. Davis being first duly sworn and on his (her) oath, deposes and says:  
(Applicant)

That he (she) is the applicant in the above matter; that he (she) has read the foregoing application and knows the contents thereof, and the facts therein contained are true as I verily believe.

Subscribed and sworn to before me this August 20, 2018  
(Date)



Tiffany Allison  
Notary Public for Utah  
Residence: Logan, Utah  
Commission expires: June 6, 2022

ACTION OF THE DIRECTOR, DEPARTMENT OF WATER RESOURCES

This application has been reviewed in accordance with Title 42, Chapter 40, Idaho code and is hereby

- Approved with conditions, stipulations, and limitations identified in the attached permit.
- Denied

August 29, 2018  
Date

Chad H. Hershey  
Signature of Authorized Department Representative

FOR DEPARTMENT USE ONLY

Received 8/21/18 by CH

Fee received \_\_\_\_\_ by \_\_\_\_\_ Receipt No. \_\_\_\_\_

Attachment 1  
Drilling Prospectus and Drilling Plan

DocuSign Envelope ID: C2F106B0-BAE8-4857-B3F4-E613EC14B766

## **Drilling Prospectus: Camas USU-1 Geothermal Test Well The Snake River Plain Geothermal Play Fairway Analysis Project**

Submitted by John Shervais, Department of Geology  
Utah State University, Logan UT, 84322-4505  
[john.shervais@usu.edu](mailto:john.shervais@usu.edu); 435-797-1274

The Snake River Plain Geothermal Play Fairway Analysis Project has three main goals: (1) to adapt the methodology of Play Fairway Analysis for geothermal exploration, creating a formal basis for its application to geothermal systems, (2) to assemble relevant data for the Snake River Plain volcanic province from publicly available and private sources, and (3) to build a geothermal play fairway model for the Snake River Plain that will allow us to identify the most promising plays. This model integrates diverse data sets within ArcGIS and serves as a point of departure for future exploration efforts.

We selected two related play types for further evaluation: (1) blind geothermal systems in the WSRP similar to that discovered in MH-2 by Project Hotspot, and (2) more traditional play-types in the Camas Prairie-Mount Bennett Hills area, which are associated with exposed surface fault systems and hot springs, but represent nonetheless a variation of the basalt-sill complex geothermal system developed in our conceptual model. New data acquisition included field investigations of structures and volcanics, magnetotelluric surveys, high-resolution gravity and magnetic surveys, active source seismic surveys, and water chemistry from springs and wells.

Our primary goal for FY2018 is to validate our methodology by drilling a slim hole in the Camas Prairie area designed to intersect permeability and heat in a hydrothermal system. Basement rocks in this area have elevated  $^3\text{He}/^4\text{He}$  ratios, high thermal gradients, and moderately high reservoir temperatures from multi-component geothermometry. Our analysis of the local geology shows that the depth to basement is much shallower than under the western SRP and that we have the potential to intersect permeability at depths of less than 2000 feet. The validation drill hole at Camas Prairie will allow for extensive reservoir testing and analysis, which have been budgeted separately from drilling.

This project is funded by the U.S. Department of Energy award number DE-EE0006733, with a budget of \$442,106 for drilling by the U.S Geological Survey Research Drilling Program, \$435,894 to Utah State University and its subawardees (*U.S.G.S. Geothermal Program; Boise State University; Leidos*), and \$122,000 to Federally-funded Research and Development Centers: *Idaho National Laboratory (INL), Lawrence Berkeley National Laboratory (LBNL), and the National Renewable Energy Laboratory (NREL)*.

The drill plan is detailed in a letter from the U.S. Geological Survey Research Drilling Program (attached as page 2 of this prospectus) and schematically (page 3). Funds for plug-and-abandon are included in the USGS budget. Funds for geophysical logging and reservoir testing are included in the USU budget. We plan to drill late Summer-early Fall 2018, and complete operation by late Fall, including P&A.

Coordinates for the well site are: 43.29888889, -114.9091667, at approximately 300 South on Barron Road (600 West) near Fairfield, Idaho. Maps are shown on page 4.

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## United States Department of the Interior

### U.S. GEOLOGICAL SURVEY RESEARCH DRILLING PROGRAM

3595 E Patrick Lane  
Suite 100-200  
LAS VEGAS NEVADA 89120  
702-823-1235 Telephone

June 29, 2018

To: Dr. John Shervais  
Department of Geology  
Utah State University  
4505 Old Main Hill  
Logan Utah, 84322-4505  
435-797-1274

Subject: Drilling Plan for Camas Prairie Geothermal Test Well

The USGS Research Drilling Program (RDP) proposes the following plan for drilling operations. RDP plans to use two types of rigs for this project. A multimethod top head TH60DH rig will be used to drill and install conductor and surface casings. It will also drill into the bedrock and ream all intervals cored. A CS1000 core rig will be used to collect N sized core in intervals of interest and those to be tested.

The current plan is to use mud rotary methods and drill a 15" hole to 40' and set then cement in 10" conductor casing. A 9" + hole will be drilled to bedrock again using mud rotary methods. Depending on depth to bedrock we may step down in bit size as we descend. Then 6 5/8" 0.25" wall surface casing will be set then cemented into place. A Haliburton collar, shoe and float will be used for cementing the surface casing with the last batch of cement being Thermalok type cement. Note RDP will always keep at least a 1" annular space for cementing the surface casing.

During the curing time for cement RDP will install the Torus style 2000psi Blow Out Preventer (BOP), diverter and diverter casing then TH60DH rig will continue to drill into bedrock until the permeable zones of interest are hit. If possible and until temperatures reach unsafe limits, air percussion methods will be used in the bedrock. Once temperatures begin to elevate RDP will have to switch back over to fluids and keep up-hole temperatures at safe levels. To control temperatures RDP will have around 10,000 gallons of fresh clean water. A constant supply of water and a batch of mud will be on hand should the well need to be killed. Barite will also be on site ready if additional head is required. A nearby irrigation well will be the water supply for our operations. RDP will also have 2 water trucks on hand to transport the water to the onsite containers for resupply.

Coring will be performed with the CS1000/P6L core rig using N size bits and rod. During coring a second BOP will be placed above the first BOP and used for the wireline operations. Promising fracture zones will be the targets of coring. Once coring has been completed, RDP will switch back to the larger TH60DH rig and ream the cored interval to approximately 6".

Downhole temperature and pressure testing will follow reaming of the hole and take approximately 4 full days. ....

Abandonment of the test well is the last phase. Once all testing and measurements are completed RDP will properly abandon the borehole with cement using tremie pumping from the bottom up and all the way to surface. The well head will be shutdown and secured as required.

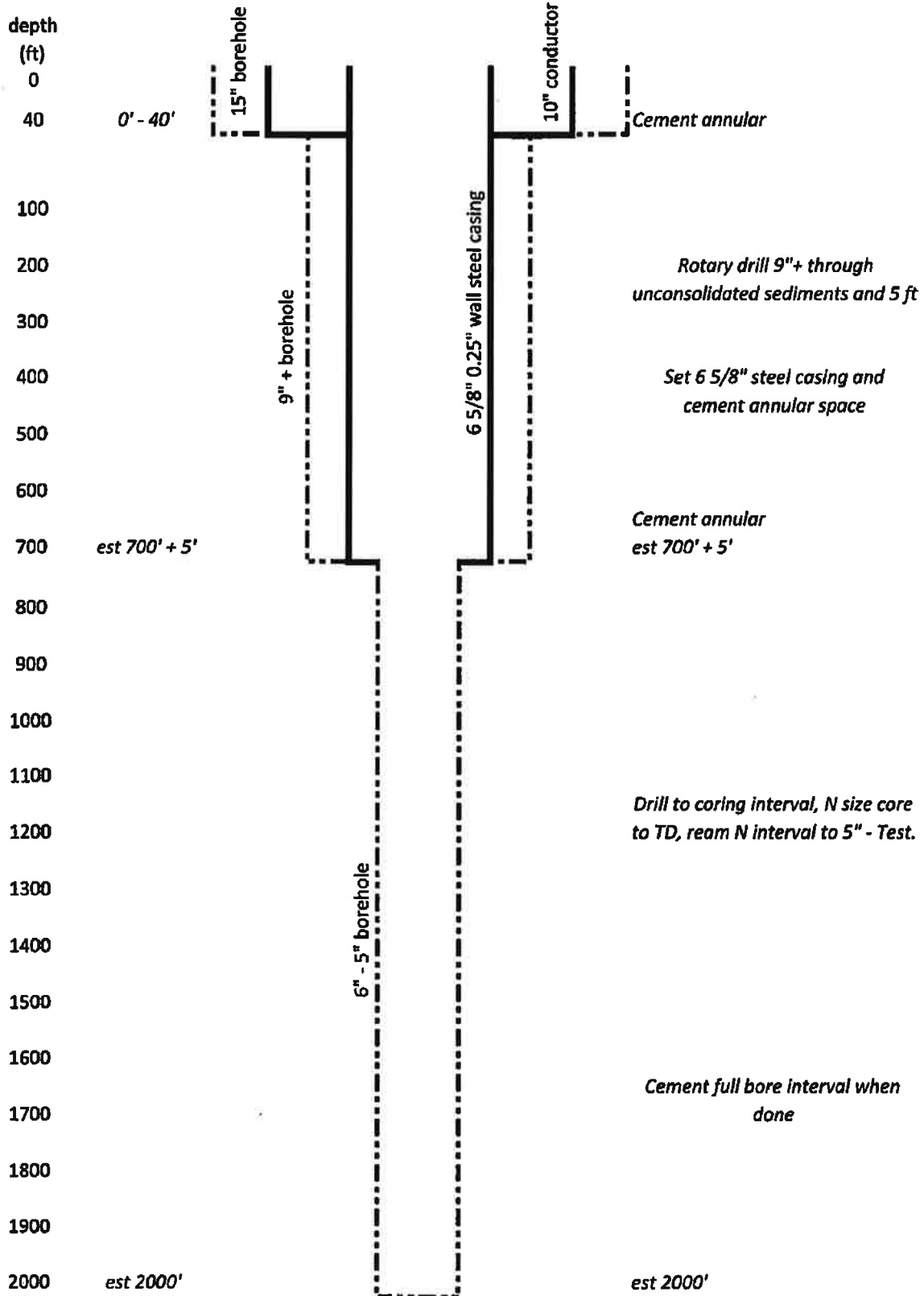
Sincerely,

Steven Crawford  
Supervisory Geologist  
Chief USGS Research Drilling Program  
smcrawfo@usgs.gov

cc. Michael Weathers, Department of Energy

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### Camas Prarie Geothermal Test Well As-built





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### Drilling Prospectus: Camas USU-1 Geothermal Test Well

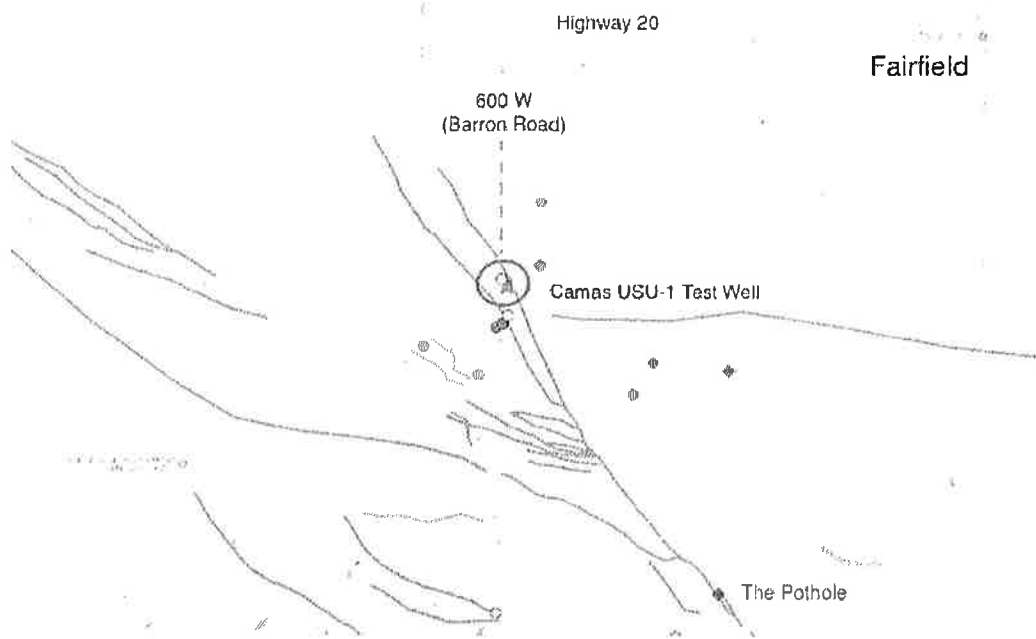


Figure 1. Camas USU-1 Test Well site, located on 600W (Barron Road), SW of Fairfield, Idaho. Faults: Grey lines; Springs and wells: Blue dots; volcanic vents: Red diamonds.



Figure 2. Detail map showing well location, Sun Valley Ranch, and inferred fault locations. Well will be at least 100 feet from Barron Road.