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6/25/79  
Energy Services

PRELIMINARY  
DRILLING PLAN  
FOR  
UTAH ROSES  
PRODUCTION WELL

A. PROJECT CONTROL

This project is being conducted by Utah Roses, Inc. under contract with the U.S. Department of Energy (DOE). The well drilling is part of a cooperative project between Utah Roses, Inc. and DOE designed to demonstrate the useful space-heating application of geothermal energy in greenhouse operations.

Project control will be exercised by the Utah Roses, Inc. Owner/Project Manager, Ralph Wright and his representative project engineers, Energy Services, Inc. All project decisions are the responsibility of the Project Manager or his designated representative.

B. LOCATION

The geothermal well will be located on the grounds of Utah Roses, Inc. in Sandy, Utah. Sandy is located approximately 13 miles south of Salt Lake City at 90th South, just west of I-15.

C. PRODUCTION WELL CONSTRUCTION

The drilling will be accomplished using a portable rotary drilling rig. The drilling will be contracted through prepared and approved drilling specifications and bidding process. The preliminary production well design is shown in the attached drawing.

The production well will be drilled to an appropriate depth to encounter the geothermal resource of the required temperature (at least 120°F). It is anticipated that the top of the production zone will be encountered at a depth of less than 3,000' and that the well will be drilled 1,000' into the zone to obtain the desired amount of water, a total depth of less than 4,000' ±.

After the conductor pipe is emplaced, the contractor shall accomplish the initial drilling with a 17½" minimum diameter borehole with mud to approximately 500' below the ground surface. 13 3/8" casing will then be set to total depth and cemented in place.

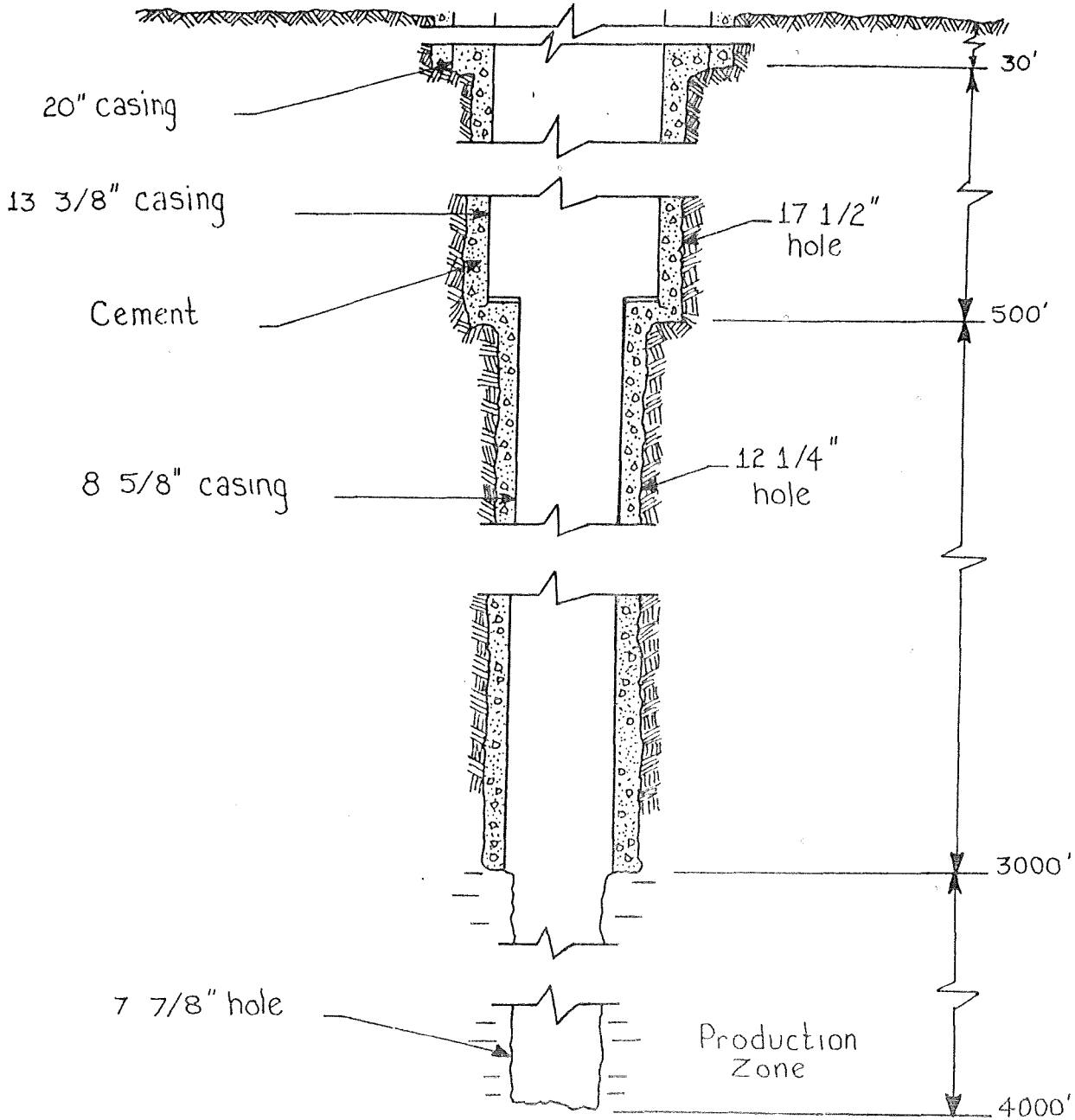
The contractor shall then drill a 12¼' hole with light mud and water to a depth of less than 3,000' below the surface or until stopped by the Project Manager or his representative. 8 5/8" solid casing shall then be hung and cemented from the 13 3/8" casing to the top of the production zone (less than 3,000'). A 7 7/8" open hole will then be drilled through the production zone to a total depth of less than 4,000" ±. The drilling and production water shall be disposed of in a manner approved by the Project Manager.

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### UTAH ROSES PRODUCTION WELL



D. SPECIFIC WELL DRILLING REQUIREMENTS

1. Drilling Mud

Water or a very light drilling mud will be employed to control the artesian water pressure and possible lost circulation zones anticipated during drilling. The mud additive to be employed will be a degradable type. Bentonite base mud is not anticipated at this time but will be used if necessary.

2. Logging

The contractor shall support the conduct of a temperature survey log of the borehole each morning after a depth of 500 ft. is reached in the well. This survey may be taken inside the drill string or open hole whichever is most convenient to the contractor at the time.

Electronic logging shall be accomplished in the wellbore before casing is set and grouted and again when total depth is attained. Prior to logging, the hole shall be properly conditioned and prepared by circulation sufficient to remove the cuttings. The electronic logging will normally consist of resistivity, self-potential, natural gamma, density and caliper logs.

3. Conductor Pipes

The Contractor will set a minimum of 30 feet of conductor pipe in the well. The pipe will be 20-inch or larger diameter CMP or other suitable casing. This pipe is not considered part of the permanent well but shall serve only to protect the top of the hole during construction. This casing may be emplaced by any acceptable method the Contractor chooses.

4. Plumbness and Alignment

The wellbore shall be near enough vertical to allow casing to be run to total depth without binding. Also a pump must operate inside the 13 3/8" casing and be free and clear of binding at a maximum setting depth of 490 feet.

5. Mud Pits

Mud pits shall be large ( 40' x 40' x 7') enough so that no appreciable amount of cuttings shall be carried through the pits and circulated back down the well. After the well is completed, the pits may be cleaned out and retained for testing purposes. Backfilling, grading and final restoration shall then be the responsibility of Utah Roses, Inc.

6. Materials and Placement

a) Furnishing and Setting Casing

The Contractor shall furnish and set the casing as follows:

1) 13 3/8" diameter casing shall be set in the top 500 + feet of the production well and cement grouted in place. The casing shall be new casing of black steel with a minimum wall thickness of 1/4-inch. The 13 3/8" casing shall extend a minimum of 1 foot above the ground surface.

2) 8 5/8" diameter casing shall be set to less than 3,000 ft. in the production well and cemented from the 13 3/8" casing to total depth.  
The casing shall be new casing of black steel with a minimum wall thickness of 3/8-inch. A

total depth < 3000'

A liner hanger , or other type packer approved by the Project Manager or his representative, shall be installed in the annular space between the 13 3/8" casing and the 8 5/8" casing.

3) The 13 3/8" casing shall be solidly supported during the cementing operation and for at least twenty-four hours following completion of the cementing.

b) Grouting Material and Placement

The contractor shall fill the annular space between the bore hole and well casing with cement grout. The grout shall be proportioned of Class G (A.P.I.) Sulfate Resistant Cement and the least quantity of water (not over six gallons per cubic foot of cement) required to give a mixture of such consistency that it can be forced through the annular space between the casing and the drill hole. Bentonite clay may be added to the grout mixture in amounts up to three percent (by weight) in order to improve its flow properties. The mixture, method of mixing, and consistency shall be approved by the Project Manager or his representative before grouting of the well.

Before beginning the cementing operation, the Contractor shall submit a detailed explanation to the Project Manager of the method he proposes to use. The Project Manager may approve any variations from the method proposed herein if he believes satisfactory results will be produced.

## H. WELL COMPLETION

### 1. Well Development

The Contractor shall develop the well by such methods as will effectively extract from the water bearing formation the maximum practical quantity of drilling debris, fine sand, and silt, or other fine materials. Development shall be sand free at the maximum discharge rate.

### 2. Wellhead Fittings and Valves

The Contractor shall furnish and install all fabricated flanges, tees, blind flanges, gaskets, valves and all appurtenances and incidentals associated with the wellhead. Installation shall be in strict conformance with the various manufacturer's recommendations.

### 3. Well Yield and Abandonment

#### a) Well Yield

Location of a suitable aquifer system is desired at the previously listed site capable of producing about 600 gpm of geothermal water. Regardless of the well yield obtained, the Contractor shall make every reasonable effort to obtain accurate drawdown and recovery information.

#### b) Abandonment of Well

In the event the well shall not be accepted prior to completion due to insufficient capacity, unsatisfactory chemical or bacteriological quality or should it be abandoned for any cause not the fault of the Contractor, the Contractor shall, as directed by the Project Manager fill the hole with puddled clay or clay and concrete as necessary to plug the well.

I. COMPLETED WELL

The completed wells shall consist of a borehole with 13 3/8" diameter casing, cement grouted from the geothermal water bearing formation to the ground surface, wellhead fittings/valves installed and hung slotted casing installed. The well will be left in a maximum developed and cleaned-out condition.

J. SITE CLEANUP

Upon completion of all work specified, the Contractor shall remove from the drilling site all equipment and materials not originally present before move-in occurred. The ground shall be returned, as near as possible, to the original topography. The mud pits shall be backfilled and mounded to allow for settlement or cleaned-out and left for testing purposes. All work shall be done to the Project Manager's satisfaction.