TECHNICAL SPECIFICATIONS

CLEARING AND CLEANING MAKUU WELL 3088-01
Halona, Puna, Hawaii

CONTENTS

SECTION I - MOBILIZATION AND DEMOBILIZATION

I.1 – MOBILIZATION

Mobilization shall consist of the furnishing, transporting, assembling, constructing, installing and making ready for use at the well site all equipment, machinery, structures, utilities and incidentals necessary to do the work covered by this contract.

I.2 - DEMOBILIZATION

Demobilization shall consist of the dismantling and removal from the well site all of the above-mentioned equipment, machinery, structures, utilities and incidentals not incorporated in or made a necessary part of the completed well.

I.3 - MEASUREMENT

Measurement for payment of the work under this section will be made as follows:

1. The contract lump sum price for "Mobilization" will be paid when in the Department of Hawaiian Home Lands' (DHHL) opinion the Contractor has fully mobilized at the well site with a rotary rig, drilling tools, and appurtenant equipment and supplies and is has begun rotary drilling.

2. The contract lump sum price for "Demobilization" will be paid after all work has been completed and accepted by the DHHL and the well site satisfactorily restored as near original condition as reasonably possible.

I.4 - PAYMENT

Mobilization and demobilization will be paid for at the bid lump sum prices for:

Item No. 1, "Mobilization (not to exceed $50,000)", and

Item No. 2, "Demobilization (not to exceed $25,000)",

as the case may be, which prices shall be full compensation for all the work specified in this section.

END OF SECTION

SECTION II – DRILLING OUT DEBRIS AND SWABBING THE WELL CASING

II.1 - GENERAL

This section covers the requirements for clearing and cleaning the well located at Halona, Puna, Hawaii as shown on the Location Map. The well shall be cleared and cleaned out of all loose rocks and other debris between the depths of approximately 800 feet and 930 feet, which interval includes approximately 100 feet of 16-inch diameter stainless steel louvered screen casing and 30 feet of 15-inch diameter open hole as shown in the As-built Section of the well. The exact condition of the well below the visible loose rocks, small sapling branches, and other debris observed in the well at the approximately 800-foot depth as shown in Photographs 1 and 2 is not known. It is understood that the clearing and cleaning work will not require a Well Construction Permit, but the Contractor shall, as a courtesy, notify the Hawaii Commission on Water Resources Management of the clearing and cleaning work to be performed on the well.

The clearing and cleaning of the well shall be performed with a rotary rig with sufficient capacity and capability to drill, fish, swab, pump surge, and otherwise clear and clean out all loose rocks and other inorganic and organic debris in the well by utilizing properly sized and special drilling tools. In order to protect and minimize damage to the well casing, special non-rotating, steel-reinforced, rubber sleeve stabilizers shall be used on the drill pipe during all rotary drilling and clearing operations.

All drilling tools and equipment (such as drill bits, drill pipe, swabbing tools, pump and pump column, and drill water) to be used in the well shall first be disinfected with a chlorine solution and subsequently kept from direct contact with the bare ground.

Drilling operations in excess of eight hours a day must be requested by the Contractor and approved in writing by DHHL. The general order of work shall be as follows:

1. Drill, fish, and otherwise clear and clean out all rocks, and debris in the well utilizing rotary drilling and air-foam circulation.

2. Video the well (Video Log #1).

3. Swage (a contingency item) the well casing where the circular section is distorted so that a 10-foot long, 15-inch diameter dummy will pass freely.

4 Swab and clean, uniformly, the entire length of the well casing; and flush and disinfect with a chlorine solution the length of the well casing above the water table.

5. Video the well (Video Log #2).

6. Install 1000 gpm test pump assembly and clean the well by pump-surging.

7. Chlorinate the well; rest the well overnight or longer.

8. Conduct step drawdown test.

9. Conduct 24 hour constant rate test.

10. If field test shows no chlorine residual, assist in collection of water samples.

11. If laboratory test shows well is not contaminated, remove test pump assembly.

12. Video the well (Video Log #3).

13. Seal the well with a welded plate on top of casing.

14. Demobilize from the well site.

II.2 - DRILLING MEDIUM AND DRILLING METHOD

Only air, potable water, and NSF approved drilling foam may be used in drilling the well; and only the rotary method of drilling may be used.

II.3 - DISPOSAL OF DRILL WATER

In order to avoid NPDES requirements, water and debris from clearing and cleaning the well shall be properly disposed of onsite as far away from the wellhead as possible. Seepage pits or holding tanks are acceptable. Use of a centrifuge, geofabric filters, temporary berms, barriers, and above-ground detention ponds to confine and rid drill water of solids may be required. No drill water or cuttings shall be allowed to run off the project site.

The Contractor understands that no compensation will be paid due to any difficulty encountered incidental to the disposal of waste water and all damages resulting there from shall be the responsibility of the Contractor.

II.4 – SWAGING, SWABBING AND DISINFECTING THE WELL CASING

If Video Log #1 shows that any interval of the well casing (between the ground surface and the depth of 50 feet below mean sea level) has been distorted, the Contractor shall conduct an alignment test with a Contractor-furnished 15-foot long, 15-inch diameter

cylindrical dummy. If the dummy fails to move freely through such interval, the Contractor shall correct the problem with a Contractor-furnished swaging tool specifically designed to correct such distorted casing problem.

The Contractor shall also furnish and utilize swabbing equipment to scrub and clean the inside of the well casing from top to bottom in a uniform, continuous manner. The swabbing equipment shall be designed to dislodge any loose material from the louvered screen section of the well casing. The Contractor shall also use the swabbing equipment to disinfect and rinse with a chlorine solution the length of the well casing above the water table.

II.5 - DRILLER'S LOGS

The Contractor shall keep a daily log of all activities on forms acceptable to DHHL. The logs shall include all pertinent facts connected with the clearing and cleaning work and a copy shall be kept available at the well site for inspection by DHHL. A copy of the daily logs shall be emailed or otherwise submitted to DHHL or its representative in a timely manner.

II.6 – WELL PROTECTION

During the work, the Contractor shall secure the well at all times for safety and protection against vandalism whenever the drill crew is not at the well site.

II.7 – MEASUREMENT AND PAYMENT

Measurement and payment of work acceptably completed under this section will be made at the applicable bid prices for:

Item No. 3, "Drilling out rocks and debris to total well depth and swabbing the well casing", and

Item No. 4, "Swaging the well casing (A contingency item)",

as the case may be, which prices shall be full compensation for performing all the work specified in this section, for all costs of delays due to inclement weather to lack of equipment and equipment breakdowns, and for all labor, equipment, tools, materials, and incidentals necessary to complete the work.

END OF SECTION

SECTION III – PUMP SURGING, PUMP TESTING, AND SAMPLING THE WELL

III.1 – GENERAL

This section covers the installation of a 1,000 gallons per minute test pump, clearing and cleaning of the well by pump surging, conducting a step drawdown and constant rate test, chlorinating the well, and assisting in collecting water samples. At the Contractor's option, the test pump may be electrically or fossil fuel powered.

III.2 – TEST PUMP AND MATERIALS

The Contractor shall furnish and install a test pump capable of discharging at various sustained rates between 500 and 1000 gallons of water per minute to the ground surface. The Contractor shall also furnish and install all other associated equipment and materials, except as specified herein, and shall supply power required to operate the test pump as required.

All Contractor furnished equipment and appurtenances shall be in good operating condition. The Contractor must submit in writing to DHHL the description, pump characteristics, curves and specifications of the test pump and driver, including the size and length of the pump discharge column and pump bowls.

After clearing and cleaning the well by pump surging, the Contractor shall furnish and install an approved water meter to measure the rate of pump discharge necessary to perform the step drawdown test and constant rate test. The water meter shall be installed with a 5-foot straight run of pipe before and after the meter and controlled by an approved valve furnished and installed by the Contractor at least six (6) feet beyond the meter. The Contractor shall furnish any and all other equipment and materials that may be required to measure the rate of discharge and it shall be the Contractor's responsibility to determine and provide the necessary and proper fittings to connect the water meter. The Contractor shall also provide the necessary facilities and make arrangements for the proper disposal of the well water and obtain all necessary permits, including a National Pollutant Discharge Elimination System (NPDES) permit, if required

For the purpose of collecting representative well water samples for laboratory analyses, a spigot shall be installed in a safe, convenient location on the discharge piping near the pump head.

The Contractor shall also furnish and install a 1/4-inch diameter airline assembly for water level measurements during the step drawdown test. The airline assembly shall include a 6-inch minimum diameter precision test gauge with a maximum range of 0 to 30 psi and readable to the nearest 0.1 psi; and a 1/4-inch nominal diameter non-jointed, semi-rigid nylon tubing complete with regulated air supply, a needle-type control valve, and all fittings and

appurtenances necessary to accurately measure water levels. The airline shall be securely fastened to the pump discharge column and set within the operating range of the precision test gauge and as approved by DHHL.

The airline assembly shall be tested for leakage by subjecting it to a pressure equal to the submergence of the airline below static water level. At the required test pressure, the airline pressure shall not drop more than 1.0 foot of water during a period of five minutes.

III.3 – INSTALLING TEST PUMP AND PUMP SURGING THE WELL

After the Contractor has satisfactorily cleared and clean the well as specified in Section II, the Contractor shall satisfy himself that the well is adequately prepared for the installation and operation of the test pump before installing the test pump assembly. The Contractor shall then clear and clean the well by pump surging as specified below.

To satisfactorily clear and clean the well by pump surging, the Contractor shall intermittently pump-surge the well at 15-minute intervals at the maximum rate of the test pump until the well is free of particles of extraneous debris and the pumped water shows no turbidity and less than 1 c.c. of solids per liter.

The clearing and cleaning of the well by pump surging shall be considered complete and satisfactory if the pumped water remains free of any extraneous debris particles after three (3) consecutive 30-minute intervals of pump surging at a pumping rate of 1000 gallons per minute.

After pump surging the well, the Contractor shall chlorinate the well as provided in Section IV.

III.4 – PUMP TESTING AND COLLECTING WATER SAMPLES

After chlorinating the well as provided in Section IV, the Contractor shall conduct a step-drawdown test in which the well shall be pumped at three or four different rates of pumping for a period of one hour at each rate, and a constant rate test in which the well shall be pumped for a minimum of 24 hours at a rate of 1,000 gallons per minute. The Contractor shall have at least one man available at the well site to operate and maintain the test pump and appurtenant equipment, record the data, and assist in performing other incidental work related to the well tests and subsequent collection of water samples. The Contractor shall be responsible for efficient and continuous operation of the test pump assembly including measuring devices. DHHL will not pay for any damages to the pumping test equipment for any cause.

After completing the step drawdown and constant rate tests and field test(s) show no chlorine residual in the well, the Contractor shall assist DHHL in collecting water samples for

water quality tests by certified laboratories as required by the Hawaii Department of Health for new potable water sources.

III.5 – MEASUREMENT

The installation of the test pump assembly to be measured for payment shall be considered complete when the pump surging has begun and the removal of the test pump to be measured for payment shall be considered complete when the test pump assembly has been removed from the well. Pump surging, pump testing, and assistance in sampling the well will be measured for payment as the actual number of hours the pump has been operated as approved by DHHL. Time lost due to any failure, inability to meet specification requirements, or inefficient operation of the pumping equipment or measuring devices will be at the Contractor's expense.

III.6 – PAYMENT

Furnishing, installing, operating, and removing of all test pump equipment, appurtenances, and materials for pump surging, pump testing, and assisting in collecting water samples will be paid at the applicable bid prices for:

Item No. 5, "Furnishing, installing, and subsequent removal of test pump assembly", and

Item No. 6, "Pump surging, pump testing, and sampling the well",

as the case may be, which prices shall be full compensation for installing and subsequently removing the test pump assembly, for clearing and cleaning the well by pump surging; for testing the well; for assisting in collecting water samples; for furnishing the fuel and power; for keeping the records; for operating and maintaining all pumping equipment and measuring devices; for furnishing, hauling and installing test pump, power unit, power supply, discharge column, ¼" airline assembly using semi-rigid nylon tubing, measuring devices, pipeline and materials necessary for the proper disposal of the discharge water, for all delays necessitated by the nature of the work, and for all labor, equipment, tools, materials, and incidentals necessary to perform the work specified in this section.

END OF SECTION

SECTION IV – CHLORINATING THE WELL

IV.1 – GENERAL

The well shall be disinfected to remove any bacteriological contamination that may have been introduced into the well. Disinfection shall be done by chlorinating the well with a chlorine solution of available chlorine compounds.

IV.2 – PROCEDURES

Initial Disinfection of Well: After the step drawdown and constant rate tests have been completed, the Contractor shall disinfect the well by rapidly discharging into the well, through the test pump, 2000 gallons of chlorine solution with a concentration of at least 50 parts per million; and then rest the well overnight or preferably over the weekend. After the well has been rested and a field test shows that no chlorine residual is present in the well, the Contractor shall then assist DHHL in collecting multiple water samples for laboratory testing for bacteriological contamination and other water quality parameters required by the Hawaii Department of Health for new potable water sources.

Final Disinfection of Well: The Contractor shall not remove the test pump from the well until a satisfactory bacteriological test has been obtained. If the initial bacteriological test shows that the well is contaminated, it shall be the Contractor's responsibility and cost to repeat the initial disinfection and assist with the chlorine residual test and collection of a bacteriological water sample, until testing confirms that the well is no longer contaminated.

IV.3 – MEASUREMENT AND PAYMENT

Chlorination of the well will be measured and paid for at the bid lump sum price for:

Item No. 7, "Chlorinating (disinfecting) the well",

which price shall include all necessary standby time, labor, materials, tools, equipment and incidental necessary to complete the work as specified herein.

END OF SECTION

SECTION V - VIDEO LOGGING THE WELL

V.1 – GENERAL

The Contractor shall video the well on three separate occasions as shown in Section II. The video shall be acceptably recorded in color with date and depth footage encoded in the video, using industry standard DVD recording format. It shall be the responsibility of the Contractor to ensure that the well water is clear and the equipment is in good working condition to produce a video log of satisfactory quality to identify and analyze conditions in the well.

Three DVD copies of each video log shall be delivered to DHHL, which copies shall become their property.

V.2 – MEASUREMENT AND PAYMENT

Measurement and payment for video logging shall be measured and paid for at the bid price each for:

Item No. 8, "Video logging of well",

which price shall be full compensation for all labor, equipment, tools, materials and other incidentals necessary to complete the work specified in this section.

END OF TECHNICAL SPECIFICATIONS